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Encyclopaedia

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THE
ENCYCLOPÆDIA AMERICANA.

A
SUPPLEMENTAL DICTIONARY

OF
ARTS, SCIENCES, AND GENERAL LITERATURE.

ILLUSTRATED.

VOLUME II.

CEN.—FAC.

J. M. STODDART,
NEW YORK, PHILADELPHIA, LONDON.

1885.

ENTERED AT STATIONERS' HALL.



FERGUSON BROTHERS & Co., ELECTROTYPERS,
Philadelphia, U. S. A.

HUBBARD BROTHERS, MANUFACTURERS,
Philadelphia, U. S. A.

PREFATORY NOTE TO VOLUME II.

THIS work was designed by its Publishers to meet a demand for a Supplement to the *Encyclopædia Britannica* which should contain fuller information on American topics and on other subjects in which the large body of American readers are interested. The generous reception accorded to the first volume of the new undertaking, and the tributes of approval from subscribers to the various editions of the *Encyclopædia Britannica* and from disinterested critics of the highest rank, have been duly appreciated by the Editors and Publishers of this work, and have stimulated them to carry out the same plan in the preparation of the second volume. The work has been executed under the same editorial care, with the assistance of an able corps of contributors, most of whom are specialists in the various departments or topics assigned to them.

In the present volume the articles on American geography, natural history, scientific research, and whatever relates to the vast resources and rapid development of this country, will be found adequate to their theme.

The articles on Coal, Coke, Cotton, Schools of Design, Electricity, and Dairy Products, occupy a large space, but not disproportionate to their practical importance to the public.

The religious denominations have generally been treated by prominent members of each and embody a complete view of their history, doctrines, and latest statistics. In the case of some smaller religious bodies it has been deemed advisable to intrust the work of gathering information and preparing the several statements to one who is justly noted for his wide and accurate information in this department.

In the department of biography prominence has been given to those distinguished in literature, and an estimate of their works is included in the sketches. The lives of men of note in American history and in recent European history have been treated with due regard to their influence on public affairs.

Various philosophical subjects which have been omitted in the *Encyclopædia Britannica* will be found discussed at length by competent critics.

The results of recent research and exploration in various parts of the world have been carefully embodied in articles which will be found instructive and interesting.

A list of contributors to the present volume, including the Editors of the several departments, is appended, and it is trusted will be found to sustain the reputation established by the first volume, and to justify the high claim made for the literary excellence and great importance of the entire work.

LIST OF CONTRIBUTORS TO ENCYCLOPÆDIA AMERICANA.

VOLUME II.

This list embraces the names of those contributors whose names are signed (by their initials) to articles in the present volume.

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ENCYCLOPÆDIA AMERICANA.

CENTRALIA—CEREALS.

CENTRALIA, a city of Marion co., Ill., is 60 miles E. of St. Louis, on the Illinois Central Railroad, which has here a branch line. It was laid out in 1853 by this railroad company, and contains its car-shops. It was incorporated in 1859, and contains three hotels, a national bank, three weekly newspapers, eight churches, a high school, two other public schools, two private schools, and a public library. Its industries comprise, besides the railroad-shops, a foundry and machine-shop, nail-works, plough-works, two flour-mills, and in the vicinity there are two coal-mines. The coal-vein is 569 feet below the surface, and is 7 feet 2 inches thick. Centralia is lighted with gas, and has water-works and a park. The property is assessed at \$600,000, but is worth nearly \$2,000,000. There is no city debt, and the yearly expenses are \$11,500, including \$4000 for educational purposes. The Centralia fair attracts thousands of visitors each year. The population by the U. S. census was 3621, but a census taken by the board of education in 1882 showed 4085.

CERAMIC ART. See **POTTERY**.

CEREALS may be defined as seeds or grains used as food and derived from the family of grasses (Gramineæ). It is rather an unfortunate limitation that, regardless of a general similarity in composition, seeds such as those of buckwheat should be excluded from the class of cereals simply because they do not belong to the order of grasses. The term "cereal" should be regarded as expressing a popular rather than a scientific idea, and as indicating use rather than structure. However, accepting the above limitation, the following are the most important representatives:

Barley (*Hordeum*) was one of the earliest domesticated cultivated corn-plants. Under cultivation it has varied immensely. It may be recognized by the two-sided arrangement of its spikelets, which are grouped in threes on opposite sides of the main stem. It is capable of wider geographical range, and hence of enduring greater extremes of temperature, than any other of our common cereals.

Guinea Corn, called also "Indian millet," and in Arabic *durra* or *doura*, is a form of *Sorghum vulgare* which has its grains forming compact nodding masses. It is recognized by botanists as the variety *cernuum*, just as the sweet sorghum, or Chinese sugar-cane, or imphee, which is cultivated for its saccharine juice, is known as the variety *saccharatum*. Broom-corn is a close botanical relative. The native country is supposed to be either India or Africa. *Penicillaria spicata*, Willd., which is quite another plant, is also known as

Guinea corn and bajree. This last and the *Sorghum vulgare* are said to be the support of the negro race in Africa, and both are extensively grown in India.

Indian Corn (*Zea mays*) is a native of America, and is now among the most important of the cereal grains. Owing to its comparatively recent introduction to the civilized world, it is particularly instructive to study it in relation to the changes and variations which culture has produced or may produce in its seed. It was grown by the American aborigines from Chili to Massachusetts, most likely originating in some warm region, whence it was introduced into its northern and southern ranges. For acclimation over so wide an area no doubt a considerable period was required. Under cultivation it varies in the length of its stalk from 16 inches to 18 feet; in its ears from 1½ inches to 16 inches; and in the number of rows of seeds on the ear, from 6 to 40, or even more, and the grains may be of almost any color save green. The varieties of Indian corn cross with the greatest readiness, and it is impossible to prevent such crossing in neighboring fields. The male flowers are on the summit of the stem, and the female flowers appear in the ear. It is widely cultivated in temperate regions, and probably supports a larger number of human beings than any other cereal except rice.

Millet is a general term used to designate various small, hard-seeded grasses, of which the stems may be used for forage, and the seed, in the form of flour or otherwise, as food for man and beast. *Sorghum vulgare* and *Penicillaria*, besides being known as Guinea corn, are also called millet or Egyptian millet. Under the genus known to botanists as *Setaria* we have the varieties of millets known as Hungarian, German, and Italian, which all produce good flour. This genus is characterized by having the flowers clustered into a dense head or spike, and the peduncles which support the individual flowers terminating in solitary or clustered bristles. *Panicum* is another genus of which three species at least are cultivated in India, and are called millet. The word "millet" is held to imply that seed so named would produce a thousand-fold. The name is applied to a great many species of grass and their seeds.

Oats.—The true oat is the *Avena sativa* of botanists, but besides this other plants also bear the same name. Thus *Avena sterilis* is the so-called "animated oats." A species of *Arrhenantherum* is the false oats. A *Uniola* is also known as water oats; *Zizania aquatica* is the wild rice or water oats of North America; and *Avena fatua* is the wild oats. The one first named

(*Avena sativa*) only can be regarded as a productive cereal. This grain was introduced into cultivation in Europe at least as early as the pre-historic Bronze age; the grains, however, were originally much smaller than those cultivated now. The parent stock and the native land of the common oats are both unknown.

Rice (*Oryza sativa*) is supposed to be of Asiatic origin, though this is by no means certain, and a reputed parent is by some alleged to have been found in South America. It was introduced into this country from Madagascar in the year 1700. Though still a very important crop in the Southern United States, the quantity raised there is not increasing. It is of all the cereals the one in most extensive use over the world, supporting more human beings than any other food, and in the East Indies it furnishes an intoxicating drink as well. Besides the above commercial rice, other plants are also known as one form or another of rice. Thus, *Zizania aquatica*, along with its other names, is called Canada rice and also Indian rice, from the fact of its seeds being used as a cereal grain by the northern aborigines. One form of the genuine rice has been so modified by cultivation that it has lost its awns and can be grown without irrigation.

Rye (*Secale cereale*) is one of the longest known and most generally prized of the cereals. It appears to have been introduced into Switzerland before the times of history. It is distinguished from wheat by having "two flowers in a spikelet and a long-stalked rudiment of a third floret, and the glumes (outer chaff) subulate or awl-shaped." It is said to be less variable than most of the cereals, but this Mr. Darwin explains by supposing that it has been less observed. One observer (Karl Koch) asserts that it has been found small and wild in the mountains of the Crimea. This statement, if true, is far from proving that it originated there. In range barley and rye extend farther north than wheat, maturing on our western coast as far north as latitude 57°, though on the eastern coast they barely reach 52°.

Wheat (*Triticum vulgare*).—Of this two principal varieties may be recognized—i. e., spring and winter wheat; or, regarded from another point of view, we may assert that cultivation has developed not less than 400 varieties out of the one or more parent species from which our wheat has descended. In no other cereal do we find the starchy and the nitrogenized elements so admirably combined; hence no other can be regarded as so nearly furnishing a perfect food. A small-eared, small-grained variety appears to have been cultivated in Switzerland as early as the pre-historic Stone period.

Mr. Darwin has said (*Animals and Plants under Domestication*, vol. i. p. 377): "It is a remarkable fact that botanists are not universally agreed on the aboriginal parent of any one cereal plant. For instance, a high authority writes in 1855, 'We have no hesitation in stating our conviction, as the result of all the most reliable evidence, that none of these Cerealia exist, or have existed, truly wild in their present state, but that all are cultivated varieties of species now growing in great abundance in Southern Europe or Western Asia.' As an offset to the above nearly every year some enthusiastic botanist publishes a positive statement that he has discovered the parent-plant of one or more of our cereals; so that we may well conclude the origin of most, if not all, is fairly an open question."

Besides the above graminaceous plants we may name, as of some importance to man, the sea-lyme grass (*Elymus arenarius*), which, though uncultivated, affords seed which is used in Iceland as a food in want of something better. What is called mand and naglaragee in India is (*Eleusine coracana*) the same as the natchnee of the Coromandel coast, and is of great importance in India on failure of the rice-crop. Fundi or fundingo of the west coast of Africa is produced by *Paspalum exile*. Teff (*Poa Abyssinica*) and tocusso

(*Eleusine Toccus*) are both cereals grown in Abyssinia. Spelt, a grain closely akin to wheat, has a limited culture in Europe, and is sown in a small way in Virginia. The list of possible cereals which the order of Gramineæ could furnish must be considered as very long, for as a whole the order has very few, if any, poisonous species. Hence what seeds shall be utilized as food is largely a question of need on the one hand and abundance on the other.

There are other plants which do not belong to this order, but which, so far as the contents of their seed and their relation to human wants go, might well enough be included with them. Such, for example, are the buckwheat; the Egyptian lotus (*Nelumbium*); quinoa (*Chenopodium Quinoa*), from the Pacific slope of the Chilian and Peruvian Andes; and also various species of *Atriplex*, which have been long used as food by the aborigines in California, Utah, and Nevada.

(J. T. R.)

CERRO GORDO. See MEXICAN WAR.

CERTHIIDÆ, a family of small tenuirostral oscine passerine birds, chiefly represented by the genus *Certhia*, of a few species or varieties of the northern hemisphere. These are the creepers, properly so called, though the name has been applied to many other birds (see CREEPER); their relationships are with nuthatches and titmice. The bill is extremely slender, acute, decurved, about as long as the head; the feet are furnished with large curved claws; the tarsus is scutellate, shorter than the middle toe and claw; the tail is long, of twelve rigid acuminate feathers, like those of a woodpecker; the wings are pointed, with ten primaries, of which the first is very short. The common brown creeper of Europe, Asia, and North America is about 5½ inches long, the wing and tail each about 2¾; the under parts are white, often tinged with rusty brown behind; the upper parts, including the wings, are singularly variegated with blackish, whitish, and different shades of brown, becoming quite bright on the rump, the wings having several bars of tawny or fulvous whitish. The creeper is an extremely active little bird, generally seen scrambling nimbly on a spiral course up the trunks and larger branches of forest trees, the tail pressed against the support like a woodpecker's; it never hangs head downward like a nuthatch. The food consists of small insects which lurk in the cracks of the bark; the nest is built in a natural hollow of a tree, the weak bill of the bird being inadequate to excavate one; the eggs are numerous, white, speckled with reddish brown. The species of *Certhia*, if more than one, are very closely related; *C. mexicana* is one of the most distinct. There are other genera of the family, as that of the European wall-creeper, *Tichodroma muraria*, commonly considered the type of a different sub-family. The Australian genus *Climacteris* is commonly ranged in this family.

(E. C.)

CESNOLA, COUNT LOUIS PALMA DI, an American soldier and archaeological explorer, was born at Rivarolo, near Turin, Italy, June 29, 1832. He was educated at the military schools of his native city, and served in the Italian war of 1848 and in the Crimean war. In 1860 he came to America and gave instruction in music in New York City. At the outbreak of the civil war he enlisted, and was appointed colonel of the Fourth New York Cavalry. After two years' service he was wounded and taken prisoner at Aldie, Va., June 17, 1863. Ten months later he was exchanged, and again served in the operations under Gen. Grant. After the war he was appointed United States consul to Cyprus, and while residing in that island became interested in archaeological exploration. A firman from the sultan enabled him to prosecute his researches on an extensive scale. In 1866 he opened the necropolis of Dali, the ancient Idalium, discovering numerous coins, gems, vases, and bronzes. He excavated also the sites of Salamis, Citium, and Golgos, uncovering at the latter a great temple of Venus with valuable remains of ancient art. In 1870

the jealousy of Turkish officials interrupted his labors. His collection then comprised thirteen thousand articles, and in 1872 it was submitted to the examination of the experts of the British Museum. It was purchased by Mr. J. Taylor Johnston of New York, and presented to the Metropolitan Museum of Fine Arts in that city. Gen. Cesnola brought the collection to New York, and spent several months in arranging and classifying the contents; then, returning to Cyprus, he resumed his investigations, and identified the sites of several ancient cities. In 1875 he explored Curium, and the treasures here found in a vault of a temple were afterward added to the collection in the Metropolitan Museum. This now comprises forty thousand objects of great archæological value. Gen. Cesnola has published an account of his work in *Cyprus: Its Ancient Cities, Tombs, and Temples* (1878). In 1879 he was appointed director of the Metropolitan Museum of Art. He has been elected a member of several European academies, and has received the degree of LL. D. from Princeton and Columbia Colleges. Serious attacks have been made on the genuineness and authenticity of Gen. Cesnola's discoveries, especially by Mr. Clarence Cook of New York. An unpleasant controversy also arose between Gen. Cesnola and Mr. Feuardent, who had been employed as an archæological expert in repairing many of the articles exhibited. A tedious lawsuit which ensued ended in February, 1884, in favor of Gen. Cesnola.

CETEWAYO, CETYWAYO, or KETCHWAYO (died 1884), king of the Zulus, was the son of Panda, or Umpande, who was known as one of the most peaceable and quiet chieftains of his race. Cetywayo in 1854 had a quarrel with his brother Umbulazi regarding the succession, and, with their father's permission, they decided the question by a combat, in which Umbulazi was slain. Cetywayo afterward became regent. His father died in 1872, and in the following year Cetywayo was crowned by Mr. Shepstone, a representative of the Natal government, and soon showed a disposition to return to the extreme savagery of his warlike uncles, Dingaan and Chaka. His rule over his own subjects was atrociously severe. His army, organized with skill and well disciplined, consisted of fifty thousand men, grouped in fifteen "black" regiments of unmarried men, and eighteen "white," or married, regiments. There was an old dispute between the Zulus and the Transvaal boers regarding certain land near the Natal frontier. In 1878 Cetywayo's threatening attitude toward the Natal colony caused much uneasiness; and the ultimatum of Sir Henry Bulwer, the colonial lieutenant-governor, requiring the disbandment of the Zulu army being disregarded by Cetywayo, Lord Chelmsford, on Jan. 11, 1879, threw four columns of troops into the Zulu country. On the 22d a British camp at Isandhlwana (Isandula) was overpowered by twenty thousand Zulus, after a stubborn resistance, and nearly fourteen hundred were slain, over one-half being regular European troops. Almost instantaneously the post at Rorke's Drift was assailed; but its one hundred and thirty-nine defenders repelled the Zulus, three thousand strong, with great slaughter. On April 2, while marching to the relief of Ekowe, Chelmsford gave the Zulus a severe defeat at Ginghilovo. On June 1, Prince Napoleon was surprised and slain near Edutu Kraal. The war was ended by the British victory of July 4, four thousand men completely defeating twenty thousand Zulus; the chiefs and people everywhere submitted. Cetywayo himself was made prisoner Aug. 28, and taken to Cape Town. He was afterward sent to England, but in 1882 he was restored to his dominions, now considerably restricted in area and importance, while a British resident was placed in virtual control of Zululand. In the autumn of 1883, Cetywayo was hunted out of the country by his former subjects. He was compelled to give himself up to the British troops, and by them was sent to Natal

for safety. He was retained a close prisoner, and on his escape was speedily recaptured. He died in captivity in 1884.

CHADBOURNE, PAUL ANSEL, LL.D. (1823-1883), an American educator, was born at North Berwick, Maine, Oct. 21, 1823. At the age of nineteen he entered Phillips Academy, Exeter, N. H., and passed thence to Williams College. He graduated in 1848, and after serving as a tutor in the same institution was made professor of chemistry and botany in 1853. While still retaining this position he was (in 1859) made professor of the same branches in Bowdoin College. He also took part in a scientific expedition to Florida, and in another to Greenland. In 1867 he was elected president of the University of Wisconsin, being also professor of metaphysics. By his wisdom and energy the number of students was greatly increased. In 1870 he resigned this position on account of ill-health, but in 1872 he accepted the presidency of Williams College, where he was equally successful. He did not confine his labors to educational matters, but was prominent in religious and political affairs. In 1876 he was a delegate to the national Republican convention, and in 1880 he presided over the Massachusetts State convention of the same party. He died in New York City, Feb. 23, 1883. He was noted for his wide range of scholarship, his practical sense, and his executive ability. His chief publications were *Natural Theology* (1867) and *Instinct in Animals and Men* (1872).

CHADWICK, JOHN WHITE, an American Unitarian minister, was born at Marblehead, Mass., Oct. 19, 1840. Leaving school at the age of thirteen, he entered a store, and afterward worked at shoemaking until 1857, when he went to the Bridgewater State Normal School. Graduating there in 1859, he pursued further studies at Exeter Academy, and in 1861 entered the divinity school at Harvard University. Upon his graduating, in 1864, he was invited almost immediately to the charge of the Second Unitarian Society, in Brooklyn, N. Y., and has remained in that charge to the present time (1884). In the Unitarian denomination his position is on the extreme left wing, unequivocally rationalistic and anti-supernatural. He has contributed extensively to the Unitarian periodical literature, and to other publications. His writings in book-form are *A Book of Poems*; *Life and Sermons of Rev. N. Augustus Staples*, his predecessor in Brooklyn; *The Bible of To-day*, a course of eight lectures on the contents of the Bible; *The Faith of Reason*, a course of lectures on the leading topics of religion; *The Man Jesus*; *Some Aspects of Religion*; and *Belief and Life*.

CHAIN-MAKING. Most of the chains used in the United States are of foreign manufacture. The decline of the shipbuilding industry in America has kept the chain-makers of the United States from striving to develop a large output, and the business has been established as a regular industry only since 1870, when it was undertaken in Troy, N. Y., and in Philadelphia. The making of small chains by machinery has also been begun in Pittsburg. Machine-made chains are not regarded with as much favor as hand-made chains, because the welding is not so sure as when the heat is determined by the eye of a skilled workman and the welding is done with the hammer.

The workman, taking a rod of the required diameter, brings it to a red heat, and then cuts it to the required length by placing the end against a stop and cutting the bar on a knife-edge by means of hammer blows. The rod is at once returned to the fire, and the piece cut off is bent into a U-shape over the nose of the anvil; this done, the U-shaped link is thrust into the last link of the already made chain, and put into the fire to attain a welding heat, whilst the workman cuts off and bends into shape another piece of the rod; when the link to be welded is at the right heat it is taken out and welded by blows of the hammer upon a nose of the

right form for the inside of the link, and is then a "hammer" chain in shop-parlance. Should it be desired to finish the link to a uniform diameter of iron, a "dolly"—which resembles a hammer-head with a semicircular groove of the proper diameter—is placed upon the weld, and the end of the link hammered into a true round.

The principal varieties of hand-made chain in the market are known as open-link chains, stud chains, and flat or twisted-link chains. The open-link chains are made of open ovals left just as bent by the chain-maker. The stud chains have each link strengthened by a cast-iron brace across the middle before being welded up at the end, and may be safely subjected to a high tensile stress. Flat chains have the links twisted so as to coil flatwise on a drum when used for hoisting. In the case of large chain cables the links are sometimes made of lengths of iron cut at an angle, so that the ends will overlap and are bent by expensive machinery, so that the weld will come at the side instead of the end of the link.

It required some time for chains to displace hempen cables in the ground-tackle of vessels, the opinion of mariners being that the elasticity of hempen rope eased the vessel when struck by heavy seas, and that when necessary to slip cable it would require much more time to cut a chain than rope. The discovery that the sag of chain cables sufficed to ease vessels almost as well as the elasticity of hempen cables, however, finally caused their introduction, and effected a great economy and assured greater safety. Hempen cables rot from their alternate exposure to water and air, and sometimes cut from chafing on rocky ground. Chain cables are now furnished with bolts at every 10 or 15 fathoms, which enable mariners to slip a cable with greater ease than formerly was reached by cutting a hempen cable.

The strength of a chain cable is dependent not only on the quality of the iron used, but also upon the skill and conscientiousness of the workman, but it is sometimes impossible for even the best workman to be sure that the weld is perfect; and for this reason the best makers invariably test their chains before sending them away, and give a certificate of test with the cable. The English admiralty proof-tests have been adopted by the largest makers in Philadelphia, one firm having a testing-machine capable of putting a carefully weighed stress upon chains varying from 25 pounds to 150 tons. The tests required by the English admiralty list are regarded by some as excessive and injurious to the resiliency of the iron. Certainly, nothing but the best quality of iron will withstand these tests unimpaired, but when we consider the awful disasters which have arisen from the breaking of chain cables during a gale we cannot regard a rigid insistence upon the best quality of iron and the most thorough workmanship as other than wise.

CHAIRS. The Egyptians were probably the first people who made and used chairs. The Egyptian chairs and stools were from 10½ to 28 inches high—quite a range, but probably some were intended for children, others to be used with foot-stools. In the tombs at Thebes, Alabastron, and elsewhere are found chairs of almost all kinds, including many that modern ingenuity has revived. Among them are thrones, couches, folding and reclining chairs, leather-seated, cane-seated and split-bottomed chairs, and others made of ebony inlaid with metals and ivory, or with carved backs, sides and legs, often with claw-feet, and upholstered with gorgeous coverings. Illustrations of Egyptian chairs show that they left nothing to be desired in regard either to artistic design or to luxurious ease. Such illustrations are to be found in abundance in the magnificent *Description de l'Égypte*, as well as in Wilkinson's *Customs of the Ancient Egyptians*.

The most elaborate chairs of modern construction are of course still made and finished by the wood-carver and cabinet-maker; but the chairs for every-day

household or office use are, in the United States, mostly made by machinery. The principal machines employed for this purpose are the chair-stuff sawing machine, the chair-seat machine, chair-back machine, the chair-seat boring machine and the chair-mortiser.

Chair-back machines may be simply band or jig saws, that cut out the curved back-piece which is placed on the top of the pillars of the chair-back. Moulding or rounding-machines, for chair-backs, have a holder for the stuff, which is moved against a rotary cutter of peculiar shape, the stuff travelling in a prescribed path, so as to receive the conformation desired. Scraping, dressing and polishing machines for chair-backs are similar in their mode of presentation of the stuff, but differ in the character of the tool or appliance to which the work is presented.

The chair-seat machines include the planing machines, by which the wooden bottoms of the chairs are rounded out. The depth of penetration is governed by side guides, which raise and lower the bed relatively to the revolving cutter, or the latter relatively to the bed which carries the chair-seat. Lemmans' machines for hollowing chair-seats have a pattern-seat, over which a governing ball is moved, determining the depth of penetration of the rotary cutter beneath as it passes over the chair-seat stuff. Machines are also constructed for cutting grooves in chair-seat frames for upholstering purposes or to receive the chair-seat, which is pressed into the frame.

Lemmans' chair-mortiser is the most important of the chair-making machines. It is adapted to all kinds of chair-mortising, and serves also as a horizontal boring and mitering machine.

The principle of the machine is rotary. The fixed end of the boring bar moves in a ball-and-socket joint, allowing the bar to revolve and the vibrating end to be moved in any direction desired. The variations from straight mortises to those of different curves are produced by the position of the curved bar upon which the bearing of the movable end of the boring bar slides; when the bar is placed with the curve horizontal the mortises are straight; and they are changed to the greatest curve when the curved part is perpendicular. The range in length of mortise is from boring a hole to a length equal to the greatest travel of the cutting bits; and this range is changed by the stroke of the crank-pin being made greater or less, and also by the arrangement of a handle moving the end of the connecting rod to any position desired, upon a curved rod; which movement produces a greater or less length of the connecting rods. This arrangement will give any length of mortise desired, within the capacity of the machine. The depth of the mortise is regulated by moving the table holding the stuff by a lever in connection with a pinion and rack. The table is raised vertically by a screw and a hand-wheel, and is provided with three clamps of different forms for holding the stuff in the position required for the work.

(A. F. H.)

CHALLEMEL-LACOUR, PAUL-AMAND, a French statesman and publicist, born at Avranches, May 19, 1827. He entered the normal school of Paris in 1846, and graduated in 1849. In 1852 he was banished from France on account of his republicanism. He became professor of French literature at Zurich in 1856; returned to France in 1859, and was for several years editor of the *Revue moderne*. He was prefect of the department of Rhône from September, 1870, to February, 1871. In January, 1872, he was elected to the National Assembly for the Bouches-du-Rhône and Marseilles. He gained distinction as an orator and able debater, and belonged to the Left, or advanced republicans. In January, 1876, he was elected a senator for nine years by the department of Bouches-du-Rhône. He was the chief editor of Gambetta's organ, the *République française*. He was appointed ambassador to Bern in January, 1879, and ambassador to London in 1880. In February, 1883, he entered the ministry of Ferry as minister of foreign affairs. He has edited the works of Madame Épinay (2 vols., 1869), and has produced, besides other works, *La Philosophie individualiste* (1864).

CHALLENGE, in law, an exception to jurors who are returned to pass upon a cause at its trial.

Challenges are either to the array or to the polls. A challenge to the array is an objection to all the jurors returned collectively, not for any defect in them, but for some partiality or default in the officers who selected, summoned, or arrayed the panel. A challenge to the polls is an objection to one particular juror drawn upon the panel.

Challenges are either peremptory, principal, or for favor. A peremptory challenge is one made without assigning any reasons. Peremptory challenges to the array are not permitted. At common law the defendant in trials for felonies was allowed thirty-five peremptory challenges to the polls. In most States, by statute, this number is reduced to twenty, and in some the privilege is allowed only where the offence is capital. No peremptory challenges were allowed by the common law in civil cases. They are, however, in some States permitted in such cases to a limited extent by statute.

Principal challenges are such as are made for a cause which when substantiated is of itself sufficient evidence of bias against the party challenging. They may be made either to the array or to the polls. The following are common grounds of principal challenge to the array: viz. that the officer making the array is of kindred or affinity to either party within the ninth degree; that such officer is liable to have his goods levied on by either party, or is his servant, attorney, counsellor, or advocate; that he is some way interested in the question to be tried; that either party has brought an action against him, etc., etc.

Principal challenges to the polls may be either *propter honoris respectum* (from regard to rank), which do not exist in the United States; *propter defectum* (on account of some defect), as alienage, infancy, lack of statutory requirements, etc.; *propter delictum* (on account of crime), including cases of legal incompetency on the ground of infamy; or *propter affectum* (on account of partiality), from some bias or partiality, either actually shown to exist or presumed from the circumstances. Common causes of principal challenges to the polls, *propter affectum*, are that the juror has before been heard to express an opinion as to the matter in controversy, that he is of kin either by blood or marriage within the ninth degree to either party, or that he has some interest in the issue of the suit.

Challenges to the favor are those which are made for a cause which, though not of itself sufficient evidence of bias or partiality, nevertheless affords reasonable ground to suspect that such bias or partiality may exist. Challenges to the favor may be either to the array or to the polls. Common instances of challenge for favor to the array are where there is a relation by marriage between the cousin or son of the officer drawing the panel and one of the parties to the cause, or where the officer has an action of debt or the like against one of the parties. The same circumstances constitute valid causes for challenge for favor to the polls. At common law, challenges to the favor were not determined by the court, but by triers chosen for the purpose. There is no limit to the number of principal challenges and challenges to the favor which are allowed to the parties both in criminal and civil cases.

Challenges to the array may at common law be made at any time prior to the swearing of the petit jury. But this is altered in many States by statute, and now the objection must generally be made on the first day in which the panel appears in court.

Challenges to the polls are to be made after the empanelling and before the swearing of the jury. If postponed beyond this point they are too late.

CHALLENGE, in criminal law, a request made by one person to another to fight a duel. The request may be either verbal or in writing. The sending of a challenge is in most civilized countries an indictable offence, for which severe punishment is prescribed. The offence of carrying a challenge is also indictable. (L. L., JR.)

CHAM. See NOE.

CHAMBERLAIN, JOSEPH, an English Liberal statesman, was born in London, July, 1836. He was educated at University College school, and became a member of a firm of wood-screw makers at Birmingham. From this firm he retired in 1874 with independent means. He had previously taken a deep interest in the welfare of that city, and had become prominent as a public speaker. In 1868 he was made chairman of the executive committee of the National Education League, and on its behalf conducted an agitation which resulted in the Elementary Education Act of 1870. Under this act the first school board in Birmingham was elected, Mr. Chamberlain being one of its members. In 1873 he was chosen president of the board. He was an ardent advocate of free, compulsory secular education, and opposed the compromising policy of Mr. W. E. Forster. In articles in the *Fortnightly Review* he criticised the conduct of the leaders of the Liberal party on this and other important questions, urging aggressive, radical measures. These he summed up in the motto he suggested for the party: "Free Church, free land, free schools, and free labor." So bold were his public utterances that many regarded him as desiring not only the disestablishment of the church, but also a republican form of government. Meantime, he was elected an alderman of Birmingham, and for three years (1873-76) was mayor of that borough. In 1874 he was presented as a candidate for Parliament from Sheffield, in opposition to Mr. Roebuck, but was defeated. In 1876 he was elected from Birmingham, which he still represents. Among the measures which he has advocated the Gottenburg system of licensing public-houses is noticeable. He has also steadily labored for the objects set forth in his radical programme. In 1880, when the Liberals returned to power under Mr. Gladstone, Mr. Chamberlain was admitted to a seat in the cabinet as president of the Board of Trade, and is regarded as the leader of the radical wing of the Liberal party. He has taken a deep interest in the improvement of the shipping laws, and has brought forward in Parliament an important measure for that purpose.

CHAMBERLAIN, JOSHUA LAWRENCE, LL.D., an American instructor, born at Bangor, Maine, Sept. 8, 1828, studied at a military school at Ellsworth, Me., and graduated at Bowdoin College in 1852; completed the theological course at the Bangor Seminary in 1855; held a professorship of modern languages in Bowdoin College 1855-62; was engaged 1862-65 in the military service of the United States, attaining the rank of major-general of volunteers and division commander in the Potomac army. He was in twenty-four pitched battles, and was six times wounded. In 1865 he resumed his college professorship. He was governor of Maine 1867-71, and from 1871 to 1883 was president of Bowdoin College.

CHAMBERS, WILLIAM (1800-1883), a Scottish publisher and author, born at Peebles, April 16, 1800. His family, which was respectable, had lived for many generations in his native town, but had become poor, having met with reverses. He and his brother Robert received a good school education, but on the removal of the family to Edinburgh in 1813 were obliged to shift for themselves. They were ardent readers and very industrious. From 1814 to 1819, William led a hard life as apprentice to John Sutherland, a bookseller. He then embarked in the business in a very small way, his capital being five shillings. He kept a bookstall, which expanded in dimensions when, by the generous loan of £10 from Mr. Robert Miller, he bought a number of books at a trade-sale. For £3 he purchased a hand-press, with a lot of old types, and taught himself to print. His brother Robert (1802-1871) had been pursuing a similar thrifty course, and in 1829 they projected jointly *The Gazetteer for Scotland*, which appeared in 1832. Owing to their intelligence, thrift, and industry their fortunes were steadily improving, and

they now projected a work which was greatly to increase their means and reputation. This was *Chambers's Edinburgh Journal*, the object of which was to diffuse valuable information to the people at a very cheap rate. It was issued weekly at three halfpence a number. The success was immediate and great; its circulation was at once over 50,000 copies, and its influence on popular education can hardly be over-estimated. Cheap publications became the order of the day. Not long after appeared the *Penny Magazine* by other hands, but the *Journal* owed nothing to it in original idea or impulsion. In 1834 they began a series of papers on all topics entitled *Information for the People*, which had a very large circulation. *The Educational Course*, a series of manuals for instruction, was begun in 1835. They were prepared under the direction of—and some of them written by—Robert, but published by the firm. These were followed by *Tracts and Papers for the People*, in 12 volumes.

The excellent *Cyclopædia of English Literature*, issued in 1844, in 2 vols. 8vo, and reprinted in America, was the work of Robert Chambers, aided by his friend Dr. Robert Carruthers. In 1849, William purchased the estate of Glen Ormiston in Peeblesshire, where he inaugurated many public improvements, and in 1859 he presented to the town of Peebles a library and reading-room, a museum and an art-gallery, and a lecture-hall, all forming "The Chambers Institution." In 1854 he published *Things as they Are in America*, and in 1855 *American Jottings*. The next year was issued the *Pictorial History of England* and an illustrated *History of the Russian [Crimean] War*. In 1864 he finished a *History of Peeblesshire*, which had been some time in hand. He was honored in 1865 by being elected lord provost of Edinburgh, and his administration was marked by important sanitary reforms in the city. He had begun in 1859 and completed in 1868 *Chambers's Encyclopædia*, in 10 volumes, which accomplished its purpose in presenting a library of universal knowledge at once comprehensive, cheap, and handy. He was re-elected lord provost in 1869, and in 1872 received the degree of LL.D. from the University of Edinburgh. After the death of his brother, he issued a volume entitled *Memoirs of Robert Chambers, with Autobiographic Reminiscences*. During his second term as lord provost of Edinburgh he inaugurated a restoration of the High Kirk of that city, originally called St. Giles Cathedral. The work was completed in 1880, and Mr. Chambers wrote a history of the cathedral as preface to a series of lectures on *The Scottish Church* (1881). He died in London, May 20, 1883. His chief claim to grateful remembrance lies in his successful effort to provide and diffuse literature of an instructive character and pure moral tone.

CHAMBERSBURG, a borough of Pennsylvania, county-seat of Franklin county, situated in the beautiful and fertile Cumberland Valley, and on the East Branch of Conococheague Creek. It is also on the Cumberland Valley Railroad, 52 miles west-south-west of Harrisburg. It is substantially built, has good county buildings, an academy, two banks, three weekly newspapers, railway-shops, prosperous manufactures of castings, flour, farm-implements, paper, woollen, furniture, and other goods. Chambersburg is the seat of Wilson College for young ladies, a Presbyterian institution. A large part of the town was burned by the Confederate forces in 1864. Population, 6877.

CHAMBORD, HENRI CHARLES FERDINAND MARIE DIEUDONNÉ D'ARTOIS, COMTE DE (1820-1883), was born in Paris, Sept. 29, 1820. His father was Charles Ferdinand, duc De Berry, second son of the comte D'Artois (afterward Charles X.). Until the revolution of 1830 he was known as the duc De Bordeaux—a title given him in compliment to the zeal displayed by that city in behalf of the Bourbon family in 1814. In July, 1830, Charles X. abdicated in favor of his grandson, with the consent of the dauphin, but

the duc D'Orleans was called to the throne by the people. The young prince then went into exile, and was thenceforth known as the comte De Chambord, taking his title from his estate near Blois, which had been presented him by a Legitimist subscription. He resided for some years in Scotland and Austria, but in 1845 took up his residence in London. In November, 1846, he married Marie Thérèse Beatrice Gaëtane, the eldest daughter of the duke of Modena, but had no children. After 1850 he went to live at the castle of Frohsdorf, near Vienna. He adhered to the ancient maxims and ideas of his family, and claimed the throne of France by divine right. He was a strict Roman Catholic, and entirely devoted to a theocratic reactionary policy. After the fall of the empire, in 1870, he issued several manifestos to the French people. One of these, dated May 8, 1871, concluded with the famous phrase, "La parole est à la France, et l'heure est à Dieu." In a later one he renounced the title of Chambord, and signed himself "Henri." The wits of Paris retorted by calling it his suicide. He refused to abandon the white flag of the Bourbons and adopt the national tricolor. The Legitimists and Orleanists constituted for a time, under MacMahon's administration, the majority of the National Assembly, and were disposed to unite in raising him to the throne; but their designs were frustrated by his refusal to make any concessions or compromises. In July, 1883, when believed to be at the point of death, he sent for his cousins, the Orleanist princes, and declared the comte De Paris his successor. He died at Frohsdorf, Aug. 24, 1883.

CHAMPAGNE. See WINES.

CHAMPAIGN, a city of Champaign co., Ill., is 128 miles S. of Chicago, on the Illinois Central Railroad, and 118 miles W. of Indianapolis, on the Indianapolis, Bloomington, and Western Railroad; it is also on the Wabash, St. Louis, and Pacific Railroad. It has two banks (one national), six hotels, three weekly newspapers, twelve churches, a female seminary, and other schools. The city is lighted with gas and has a park. Its industries comprise a flour-mill, twine- and bagging-factory, sugar- and glucose-works, a machine-shop, a foundry, two furniture-factories, manufactures of barrels and carriages, and a hay-press. It was settled in 1854 and incorporated in 1858. Its property is valued at \$5,231,000; its public debt is \$20,000, and its yearly expenses are \$15,000. The population, about three-fourths of American birth, in 1880 numbered 5103.

CHAMPFLEURY, the assumed name of JULES FLEURY, a French novelist and general writer. He was born at Laon, Sept. 10, 1821, and after receiving an academical education, for a time assisted his father, who was secretary of the municipality. Then removing to Paris while still quite young, he was employed in a bookstore, and in the course of time formed an intimate acquaintance with other young men of literary tastes and aspirations. He wrote stories and sketches for various journals, and for a year or two engaged with enthusiasm in the strange task of preparing plays for rope-dancers. His story, *Chien-Callou* (1847), was quickly pronounced by Victor Hugo a masterpiece. His *Confessions de Sylvius*, which soon followed, was a picture of the Bohemian life of Paris at that time, and to some extent autobiographical. He has since published other recollections of his early friends in his *Souvenirs et Portraits de Jeunesse* (1872). Among his novels may be mentioned *Les Oies de Noël* (1852), *La Succession le Camus* (1857), *La Mascarade de la Vie parisienne* (1860), *La Pasquette* (1876). In all he has adhered steadily to his rule of presenting a faithful picture of life and manners, provincial or Parisian, free from artistic exaggerations. His volume on *Le Réalisme* (1857) was a defence of himself as well as of his friend Courbet, who had adopted the same views in regard to painting. Champfleury's strict fidelity to facts cost him an infinite deal of pains. He studied thoroughly every character, class, and period he had

occasion to depict. In due course he became the acknowledged chief of a realistic school, though his successors have pushed to an extreme the principles he first exemplified. His examination of popular tastes and customs led him into another department of literature, in which he published first the *Chants et Chansons populaires des Provinces de France* (1860), then a volume of investigation in regard to the *Legende du Bonhomme Misère* (1861). These studies of popular literature led him soon after to undertake a complete history of caricature in France. The first volume, *Caricature ancienne*, was published in 1865; others followed, tracing the progress of this branch of art in the Middle Ages and under the Renaissance, the League, the Revolution, the Empire, and the Restoration. The fifth volume, *Caricature moderne*, treats of three principal types; and two volumes on the works of Henry Monnier and Daumier, published in 1879, complete the work. A singular and characteristic book on cats, *Les Chats* (1868), produced in the mean time, was honored with a medal by the Paris society for the protection of animals. Another direction in which Champfleury has been active is in ceramic art. His first publication on this subject was *Histoire des Faïences patriotiques sous la Révolution* (1867), which was followed by *Histoire de l'Imagerie populaire* (1869). In 1872 he was appointed by M. Jules Simon keeper of the ceramic museum at Sèvres, and faithfully devoted himself to the care and arrangement of that famous collection. In 1881 he published *Bibliographie céramique*, giving an account of all works on pottery and ceramic art that have appeared in Europe and the East since the sixteenth century. His latest work is *Les Vignettes romantiques* (1882), an illustrated volume on the art and literature of 1830. Champfleury has also written on education.

CHAMPLAIN, a lake of North America lying between the States of New York and Vermont, and extending beyond their northern boundary a short distance into Canada. It was called by the Indians "The Lake which is the Gate of the Country"—a very appropriate name, since it lies in the basin between the Adirondacks on one side and the Green Mountains on the other. The strategic importance of this lake was discovered by the explorer Samuel de Champlain, governor of Canada, who traversed its waters in 1609 on his way to destroy the Iroquois. The lake was called "Corlear's Lake" by the Iroquois, who thus honored a favorite Dutch governor. Its length from north to south is 126 miles (about 105 in direct line). The breadth varies from 40 rods to 15 miles, the widest unobstructed portion being ten miles in breadth; the southern portion is a mere channel through a marsh. There are about fifty islands of various sizes, the larger ones being at the northern end. According to Emmons its greatest depth is 600 feet. The principal rivers on the Vermont shore are the Otter, the Winooski (or Onion), the Lamoille, and the Missisquoi. On the New York shore the rivers are the Saranac, the Chazy, the Au Sable, and Wood Creek. The latter streams abound in scenery of the most romantic character, the western shore being very precipitous. There are on this shore large deposits of iron-ore. The Vermont shore is more fertile, owing to the marbles and other limestone rocks, that enrich the soil by disintegration. The Champlain Canal, on the south, gives access to the Hudson River, and the outlet—the Richelieu River—on the north gives access to the St. Lawrence River. The surface of the lake is about 90 feet above tide-water. Salmon, trout, pike, and other varieties of fish are found in great numbers. The chief towns are Burlington, in Vermont, and Plattsburg, in New York. Lines of steamers run to the various points on the lake during the season of navigation.

Lake Champlain has a history that far surpasses that of any other American lake in interest. As early as 1666 there were French forts along its shores, which threatened the Dutch settlements at the south, the French having claimed the territory on which the latter

were built. Many expeditions were fitted out both by the French and by the English successors of the Dutch, and the usual route was by this lake, as it afforded the easiest method of transporting artillery. The portages between Albany and Montreal aggregated only 12 miles. The French forts at Ticonderoga and Crown Point, on the New York shore, were the cause of constant irritation to the English, and finally they were won by the latter as the result of the disasters which caused the French to lose all Canada, in 1759. These two forts were allowed to fall into decay, but they were in the hands of both the Americans and the English during the war of the Revolution; since that time they have never been kept in repair. This was the route taken by the American general Montgomery on his way to Quebec in 1775. Lake Champlain is noted for two naval battles. On the 11th of October, 1776, the Americans, with eighty guns, under Benedict Arnold, met the British, with ninety guns, under Captain Pringle. The first day's encounter was a drawn battle. During the night the American vessels retreated. On the following day the British vessels overtook the runaways and defeated them. The second battle was on the 11th of September, 1814, when the British fleet, with ninety-five guns, under Com. George Downie, were overcome by the American fleet, with seventy guns, under Com. Thomas McDonough. The result of this victory was that the British army was forced to retire to Canada, and to abandon its mission of subduing the whole country as far south as the city of New York. (F. G. M.)

CHAMPLIN, JAMES TIFT, D.D., an American clergyman and teacher, born in Colchester, Conn., June 9, 1811, graduated with honors at Brown University in 1834; was an instructor in that college 1835-1838; pastor of a Baptist church at Portland, Me., 1838-41; professor of ancient languages in the college at Waterville, Maine, 1841-57; and president of the college 1857-72. He published an edition of *Demosthenes on the Crown* (1843), *Demosthenes' Select Orations* (1848), *Æschines on the Crown* (1850), *First Principles of Ethics* (1861), *A Text-Book of Political Economy* (1868), also an *Intellectual Philosophy*, Greek and English grammars, a translation of Kühner's Latin grammar, and other educational works, including an edition of Butler's *Ethics*.

CHANCELLORSVILLE, a place in Spottsylvania county, Va., near the Rappahannock River, about 50 miles south-west of Washington and 11 west of Fredericksburg. It is noted as the scene of a battle fought May 2-4, 1863, between the Union army under Gen. Joseph Hooker and the Confederate army under Gen. R. E. Lee. After Gen. A. E. Burnside had failed in his attack on Fredericksburg, Gen. Hooker had been appointed to the command of the Army of the Potomac, Jan. 26, 1863. By his judicious measures its *morale* was restored and its reorganization effected. At the end of April it contained 131,491 men and was divided into seven corps: First, under Gen. J. F. Reynolds; Second, Gen. D. N. Couch; Third, Gen. D. W. Sickles; Fifth, Gen. G. G. Meade; Sixth, Gen. John Sedgwick; Eleventh, Gen. O. O. Howard; Twelfth, Gen. H. W. Slocum. The cavalry, which numbered 11,541, was commanded by Gen. George Stoneman, and the artillery, which comprised 400 guns, was under the direction of Gen. H. J. Hunt. The Confederate Army of Northern Virginia chiefly lay in its entrenchments on the heights above Fredericksburg, though there were strong earth-works guarded by sufficient detachments along the Rappahannock from the confluence of the Rapidan to Skinner's Creek, a distance of twenty-five miles. Gen. James Longstreet, with the greater part of his corps, had been sent to Petersburg; but two of his divisions, under Gens. Anderson and McLaws, numbering 17,000 men, formed Gen. Lee's left wing, while on the right was the Second Corps, under Gen. T. J. Jackson (immortalized as "Stonewall"). This corps of 33,400 men had four divisions, commanded by Gens. A. P.

Hill, D. H. Hill, Trimble, and J. A. Early. The artillery comprised 170 pieces and 5000 men. The cavalry, under Gen. J. E. B. Stuart, amounted to 2700 men, and was actively employed on the left as far as the Orange and Alexandria Railroad. The total of Gen. Lee's forces was thus less than 60,000 men. The impracticability of attacking him in front had been so decisively proved that when the time for action came Gen. Hooker determined to turn his left flank, while making also a vigorous demonstration on the right. As a preliminary, he ordered his entire cavalry, except Pleasonton's brigade, to set out April 13, and, crossing the river west of the Orange and Alexandria Railroad, to push down to Gordonsville and finally cut Lee's communications with the Confederate capital. A sudden rise in the river on the 16th prevented this, so that the cavalry remained idle till the 27th, when the movement of the infantry began. Gen. Howard then led the way with the Eleventh Corps to Kelley's Ford, 15 miles above this junction of the Rapidan, and the Twelfth and Fifth Corps followed. On the 29th these three corps, under the command of Gen. Slocum, had crossed and were marching back on the south side, while Gen. Stuart, thinking that the movement was toward Gordonsville, took post accordingly, and did not try to prevent the crossing of the Rapidan until it was too late. On the same day the First, Third, and Sixth Corps crossed below Fredericksburg, under the command of Gen. Sedgwick. This movement was intended only as a demonstration, but Sedgwick had orders to carry the enemy's works if a large force should be detached in the opposite direction, and to pursue them if they should retreat toward Richmond. Gen. Slocum reached Chancellorsville on April 30 at 2 P.M. with 40,000 men, and Gen. Couch, who had been waiting until the United States Ford was uncovered, crossed there with the divisions of French and Hancock, and arrived the same evening. The Chancellor house, where Gen. Hooker now established his headquarters, was a large brick mansion in a clearing in the eastern part of the tract known as the Wilderness, and with its outbuildings constituted Chancellorsville. Throughout this region the original forests had been cut down for fuel for iron-furnaces, and a dense secondary growth of pines and scrub covered the scanty soil. From Orange Court-House to Fredericksburg ran an old turnpike road, which had been supplemented by a plank road nearly parallel. For a mile and a half west of Chancellorsville the plank road occupied the line of the turnpike, but to the east they diverged, again reuniting about seven miles from Fredericksburg. Another road ran north-east from Chancellorsville, then turned to follow the course of the river, and touched it at Banks's Ford, four miles west of Fredericksburg.

Gen. Hooker, on the evening of April 30, issued a congratulatory order to his troops on the success of the movement. In fact, Lee's army was in a serious predicament. Sedgwick and Reynolds threatened it on the right below Fredericksburg, while Hooker with four corps was on his left flank, kept back only by Anderson's force, which he outnumbered more than two to one. Gen. Stuart had sent to Lee information of the march and size of Hooker's columns, and on that night set out to report in person to his chief. Encountering part of Pleasonton's cavalry, however, he was obliged to bring up his brigade before he drove them back. Lee perceived that the main attack was to be on his left, and promptly decided to advance to meet it, leaving Gen. Early with 8500 men to defend the strong works on Fredericksburg Heights, while McLaws was sent forward to sustain Anderson. The latter had taken position on the crest of a hill, about two miles east of Chancellorsville, where Gen. Lee ordered entrenchments to be made. Gen. "Stonewall" Jackson, who had held the extreme right of the Confederate defences, was directed to march with his corps to meet Hooker's attack. Arriving at the front

on Friday, May 1, at 8 A.M., he ordered an immediate advance. On the north side of the Rappahannock, Gen. Sickles had made a parallel march, entirely concealed from the Confederates, and arrived at Chancellorsville at 9 A.M. Hooker, after reconnoitring the ground toward Fredericksburg, sent Meade at 11 A.M., with two divisions, along the river-road toward Banks's Ford, while Sykes and Hancock with their divisions advanced along the turnpike and the corps of Slocum and Howard along the plank road. Sedgwick also was ordered to threaten an attack from below, but the orders arrived too late to have any effect on the movements of the day. On each of the roads the enemy was encountered, and though Sykes's column, which was the most advanced, was for a time outflanked, it was speedily relieved by Hancock. Everything was progressing favorably for Hooker's plans, yet before 2 P.M.—the time he had fixed for the junction of the advancing columns—he sent peremptory orders for them to retire to Chancellorsville. This abandonment of his forward movement was depressing to the soldiers at that time, and has been condemned by all the generals engaged in it, and by all military critics since that time. There was every reason to push on both to secure Banks's Ford, thus bringing the two parts of the Union army nearer together by six miles, and also to fight, if there must be a battle, outside of the highly-disadvantageous ground of the Wilderness. The day was wasted, however; and Hooker, forfeiting all the superiority gained by his advance and surprise of the enemy, withdrew to act on the defensive. His troops were massed along the roads leading from Chancellorsville, his line somewhat resembling the letter J. At the top, or extreme left, stood Meade; then came Couch's division, reaching to Chancellorsville. Slocum's and Sickles's corps occupied the curve, and Howard the extremity on the right, at Dowdall's tavern, where the roads diverged. Hancock was at some distance east of the Chancellor house, his line crossing both the river-road and the old turnpike.

Gen. Lee approached this part on Friday evening, and found the Union position too strong to be assailed in front; but Jackson suggested a thoroughly characteristic movement with his whole corps across Hooker's front and around his right flank, which was the only weak point of the Union line, being, in military phrase, "in the air"—that is, without any natural or artificial support. Though such a separation of his forces was condemned by the strict rules of military science, yet Lee, seeing that Hooker had already shrunk back from fighting an offensive battle, and trusting much to Jackson's never-failing energy, gave him full permission to carry out his scheme. On Saturday morning, then, Jackson moved westward by a wood-road, keeping his march as much concealed as possible, and using Stuart's cavalry to feel the Union lines. In passing Wellford's Furnace, however, his column came in full view of Sickles's troops, which had been pushed out near the road to the Furnace. From this time on there were frequent indications of Jackson's movement, but it was generally interpreted as a retreat to Gordonsville. Sickles had soon driven the Confederates from the road, and Birney pushed on to the Furnace, where he captured an entire Georgia regiment. About noon Jackson, and later he obtained the assistance of Pleasonton's cavalry, while Williams's division from Slocum's corps, and even Barlow's reserve brigade from Howard's corps, were sent to support this movement, which, however, was greatly delayed by marching through swamps and woods. Immediately after the first attack, Jackson's trains had turned off on a side-road, which was speedily made available for their passage, and continued on their way without further interruption.

Early in the morning Gen. Hooker had inspected all his lines and pronounced them strong, but at 9.30 A. M. he sent a circular to Slocum and Howard, stating

the probability of Jackson's intending to attack the right flank of the Union army and calling attention to the need of extra defences there. Gen. Howard, whom this warning especially concerned, certainly did not take sufficient precautions to meet the possible flank attack, and only two regiments faced in the direction by which the enemy actually came. Howard's division commanders, in the course of the afternoon, notified him that the enemy were massing in the woods beyond, but both Howard and Hooker seem to have dismissed all apprehension of an attack from this quarter. Gen. Barlow, whose brigade formed Howard's reserve, was withdrawn and sent to support Sickles, who reported that he was fighting the main body of Jackson's troops. But the actual result of Sickles's well-meant advance was to leave a gap of two miles in the Union lines, and fatally to weaken the right.

The increasing frequency of minor attacks toward the Union right had not dispelled the delusion that Jackson was retreating, and at 4 P. M. that wary general had reached the position which he selected as most favorable for his purpose. He had crossed the Orange plank road, by which he might have reached Howard's right, and had gone on to the turnpike which brought him in from the north-west. His troops were formed perpendicularly to the turnpike on each side, Rodes's and Colston's divisions leading, while A. P. Hill supported them and covered both roads. Thus, with his lines overlapping the doomed Eleventh Corps, Jackson advanced through the woods without sending out skirmishers. At 6 P. M. the Union soldiers were scattered through their camp preparing supper, when the Confederates burst from the woods and with a fierce yell dashed against the little handful that confronted them. Gen. Devens bravely exerted himself to stem the irresistible shock, and, though soon wounded, ordered up his reserves; but they also were swept away. Even three regiments which Gen. Carl Schurz had posted north of the turnpike, facing west, were also driven back in utter confusion. Buschbeck's brigade formed behind a slight entrenchment which had been thrown across the road, and with his artillery gave some check to Jackson's headlong career.

The stream of fugitives had already reached Chancellorsville before Hooker was roused to activity. Berry's brigade was now ordered to form across the main road and drive back the enemy. From the artillery of the Eleventh and Twelfth Corps some guns were gathered, and, being planted under Warren's direction, prevented Jackson's further advance along the road. Meantime, Sickles had been recalled, and Pleasanton, with his cavalry, on reaching Hazel Grove clearing, found it filled with a dense mass of struggling fugitives. By a cavalry charge and the effective handling of some guns, but especially owing to the loss of organization produced by their rapid advance through the woods, Jackson's men were compelled to pause, their army having been broken up by its very success. Gen. Lee, as soon as he heard Jackson's guns, made sufficient attack from the opposite side to prevent reinforcements being sent, yet Meade, on the extreme left, was undisturbed.

After night had set in, Jackson, feeling the necessity of withdrawing the troops which had made the attack, that they might reform their lines, ordered A. P. Hill to the front; then with some staff-officers he rode forward beyond his lines to reconnoitre. On his return his party, being mistaken for Federal cavalry, was fired upon by his own men, and he himself wounded. He was carried to the rear, and died a few days later of pneumonia brought on by his injury. Such was the end of one of the most remarkable characters of the war—a revival in the nineteenth century of the English Puritan soldier of the seventeenth.

Gen. Sickles during Saturday night made an attack on Jackson's troops, but finally retired to Chancellorsville. Reynolds's (First) corps came up from the north side of the Rappahannock the same night, but, though

they were fresh and eager for fight, they were detained to guard the fords. The Eleventh Corps had been sent to the extreme left to reorganize, and Meade moved closer to Chancellorsville. These three corps were left unemployed during the battle of Sunday.

Anderson, whose division was on the left of the Confederates that remained with Lee, had steadily worked around toward Jackson, and his endeavors to effect a junction were facilitated by the withdrawal of Sickles. Gen. Stuart quickly occupied the crest near Hazel Grove with artillery, which in the battle following poured a destructive fire on the new line of the Union troops at Fairview, a crest half a mile west of Chancellorsville. Early on Sunday morning the assault was renewed in three columns, and the Union defences both north and south of the plank road, the latter being manned in part by raw troops, were quickly taken by Jackson's veterans, burning to avenge his loss. After a severe struggle the Union troops were finally compelled to fall back to a new line at Fairview Heights, half a mile west of Chancellorsville. The artillery at Hazel Grove, well served by Walker, now began to tell on the Union lines, and inflicted the severest losses of the day. In resisting Stuart's repeated assaults on the Union right centre, Williams had exhausted his ammunition, and could no longer hold his ground. Birney, of Sickles's corps, had steadily supported him, but was now reduced to the same strait. Sickles sent repeated and urgent demands for reinforcements, but about that time a chance ball struck a post against which Hooker was leaning, on the porch of the Chancellor house, and he fell stunned. Before he recovered sufficiently to give orders the Union troops were driven completely back to the Chancellor clearing, where again the veterans trained by Jackson displayed the pertinacity of their leader. Hooker on his recovery ordered the Chancellor house to be relinquished to the enemy and new lines to be formed at the White house, about half a mile north of the former.

Though the Confederates had thus at last gained the central point, so exhausted were they at the time that Gen. Sickles took, instead of losing, men and material, and in his report says that "if another corps, or even 10,000 men, had been available on that part of the field, I believe the battle would have resulted in our favor." And yet there were within easy reach three corps—Meade's, Reynolds's, and Howard's—which had scarcely a man engaged in the fight; while Meade, on behalf of himself and Reynolds, had expressly asked for leave to take part. The disaster was not owing to lack of courage on part of the soldiers, but to lack of generalship on part of the commander. On the opposite side never did troops fight better than those hardy veterans whose leader had been snatched from them by remorseless fate. Through tangled woods, against well-constructed field-works, through death-dealing artillery fire, they toiled, and when their ammunition was gone pressed on with the bayonet till they had won the desperately-contested field.

But the fighting was not all on the Union right; on its left centre, where Geary was posted facing to the south, Anderson pressed on. At 9 A. M., Geary found his position exposed to the fire of Stuart's artillery at Hazel Grove and his flank threatened by Stuart's line of battle, and after making all the resistance possible retired. Then Stuart and Anderson, having effected a junction, began to fortify their position south of the Chancellor house. Stuart's troops, having been fighting and marching continuously since Thursday morning, were exhausted, and made no attempt to molest Hancock, whose position to the east they outflanked. Hancock had steadily confronted McLaws and Anderson, and was the last of the Union commanders to retire to the new lines, which he did in safety.

One part of Gen. Hooker's plan had been that Gen. Sedgwick, after crossing the Rappahannock, should attack Gen. Lee in the rear, and, although he himself had failed to make the attack in front, he insisted the

more that Gen. Sedgwick, who had about 22,000 men, should execute this part of the plan. On Saturday evening Gen. Sedgwick started by the Bowling Green road, leading south, but was afterward ordered to march on Fredericksburg. Gen. Early, who held the Heights of Fredericksburg with 8500 Confederates, had on Saturday morning started out to join Lee, but had returned. Sedgwick's advance cautiously entered the town about daybreak on Sunday, but were assailed from behind a stone wall. The Union general Gibbon, who had so far lain at Falmouth, now crossed directly in front of Fredericksburg and joined Sedgwick's right. Warren, who had come directly from Hooker's headquarters, reconnoitred the ground toward the Heights; at every part it was found that the enemy's batteries bore on the approaches. It was decided then to make the assault on an extended line, so that the enemy's force could not be concentrated at any point. The troops were properly disposed, and moved gallantly to their work. On the left three storming-columns carried Cemetery Hill, then faced to the right and assisted the other storming-party, who had advanced directly from the city, in taking Marye's Heights. The loss of the Union troops was very heavy, but the chief object was gained. Early's force was cut in two, the main part being left below the town, where they might have been crushed had not Sedgwick's orders required him to move in the opposite direction.

Sedgwick, for insufficient reasons, delayed his march till 1 P. M. But, even had he moved with the utmost promptness, the battle of Chancellorsville had been decided while he was gaining the Heights of Fredericksburg. After some resistance to Sedgwick's march, Wilcox fell back to Salem church, about a mile south of Banks's Ford, where McLaws, sent out by Lee with four brigades, had taken a strong position. The church and schoolhouse, forming a salient on the right of the Confederate line, were sharply contested.

While Hooker had sent word to Sedgwick that he must rely on himself, Lee, divining Hooker's intention to remain inactive, sent Anderson back to reinforce McLaws. Gen. Early, too, having been informed of Sedgwick's movement, returned and took the Fredericksburg Heights, where only a handful of troops had been left, and then followed Sedgwick, hoping to reunite the Confederate forces. Thus Sedgwick was surrounded on three sides, while the road to Banks's Ford offered but a precarious line of retreat. At 9 A. M. on Monday he sent a full account of his situation to Hooker, and was directed to hold his position, or at least the south side of the ford, as Hooker intended to renew the advance the next morning. Sedgwick still urged that permission should be given to him to cross the river by night, and additional bridges for this purpose were laid. Keeping the ford at his back, he formed his troops on three sides of a square—Howe on the left, Brooks on the front, and Newton on the right. Both Early and McLaws had already, from opposite sides, made unsuccessful attempts to capture the ford. During the afternoon Lee, again venturing to profit by Hooker's inertness, left Jackson's old corps of less than 20,000 men to hold in check four times that number, and moved with the rest of his troops against Sedgwick. At 6 P. M. he had fully completed his arrangements for attack, and especially directed that efforts be made to break the centre of Sedgwick's line and thus scatter the whole force. Darkness, however, was already coming on, and a fog from the river increased the obscurity. The movements, therefore, were made separately, the chief attack being by Early against Howe's line, which was rendered weak by its length; but the onset was bravely and skilfully repulsed. By these fierce and determined attacks, Sedgwick was confirmed in his opinion of the necessity of recrossing the river, and during the night, having sent several despatches to Hooker, at last obtained from him a reluctant consent. As soon as the enemy discovered the movement they directed their batteries toward the bridges

and the river-banks. Sedgwick went into camp on the north side, keeping a guard near the ford. The Sixth Corps had lost heavily in killed and wounded, but suffered no other detriment; it even brought off over a thousand prisoners.

Gen. Lee, having thus completely succeeded in his immediate object—that of driving Sedgwick over the river—was able again to turn his whole attention to Hooker, who remained nerveless and listless near Chancellorsville. On that night, indeed, Hooker, who had predetermined on a retreat, called a conference of his corps commanders, who were unanimously in favor of a renewal of the attack, except Sickles, who took the ground that the state of political affairs did not then allow even the risk of another defeat. Hooker's determination was unchanged, and Gen. Warren prepared a new line for the army, protecting the United States Ford. On Tuesday evening the artillery began to cross, although a heavy rain had set in, and a few hours later a sudden rise in the river took place. The crossing, however, proceeded without interruption, and was accomplished by 8 A. M., May 6. Lee had already exhausted his ammunition, and made no serious attack on the troops, which thus escaped a still more dreadful catastrophe. Hooker on returning to the position he had occupied during the winter issued a boastful order inconsistent with the plain facts, while Lee, with that true religious feeling which characterized his whole career, thanked his soldiers for their heroic conduct, but ascribed the victory to God. The losses of the campaign, according to the official reports, were, on the Union side, 17,197, of whom 4601 were from the Sixth Corps (Sedgwick's) and 4039 from the Third Corps (Sickles's); on the Confederate side, 13,019, of whom 8292 were from Jackson's corps.

The column of cavalry which had set out under Stoneman on April 27 crossed the Rappahannock on the 29th, and then divided, Averill being directed to push to Culpeper Court-house, while Stoneman moved southward and crossed the Rapidan. Averill was dilatory in his movements, and his command was afterward given to Pleasanton. Stoneman, after reaching Louisa Court-house, dispersed his forces. The smallness of the detachments prevented their doing much damage; minor bridges were burnt, the Virginia Central Railroad was broken up for several miles, but the Fredericksburg and Richmond Railroad—which was the main route of Lee's communications, and the destruction of which was the principal object of the expedition—was left almost intact. When the six days' rations with which he had started were consumed, although the whole country in the rear of the Confederate army was open to invasion, Gen. Stoneman began to return, and on May 6 he recrossed the Rappahannock. The slight damage wrought by his troopers was speedily repaired, and the raid had no practical effect. (J. P. L.)

CHANCERY. The functions of a court of chancery have been discharged in the United States at different times in various ways.

See Vol. V. p. 338 Am. ed. (p. 389 Edin. ed.). Prior to the Revolution no trace of the exercise of equitable jurisdiction can be found in the province of New Hampshire. In Massachusetts the general court seems in the earliest times to have acted as a court of chancery. In 1685, however, the court freed itself from the performance of these duties, imposing them upon the magistrates in each county. In 1692 an act was passed whereby the governor and council were vested with the powers of a court of chancery. In 1694 this act was repealed, and equitable powers were vested in a new tribunal, to consist of three commissioners appointed by the governor, who were to be assisted in their labors by five masters in chancery. For some cause this act was obnoxious to the home authorities, and it was accordingly disallowed by the royal council. From this period until the Revolution no distinct court of equity was erected in Massachusetts. The common-law courts were, however, vested with equitable powers in relation to mortgages, penalties,

and some other distinctive features of equitable jurisdiction. In Rhode Island and Connecticut the powers of the common-law courts with regard to matters of equitable cognizance were in provincial times substantially similar to those exercised by the courts of Massachusetts. In Connecticut the powers with relation to penalties and forfeitures were conferred as early as 1672. In New York, New Jersey, Maryland, Virginia, both the Carolinas, and Georgia the colonial governor seems to have exercised the functions of a chancellor from very early times until the breaking out of the Revolution. In New York the power to hold a court of chancery was especially conferred upon the governor by an ordinance of the Lords of Plantations and Trade passed in 1701. Little business, however, was done in this court, owing to a general dislike on the part of the public of its constitution and method of procedure. In New Jersey the governor's court of chancery was first established in 1705. In Pennsylvania the county courts had in the early days of the province a distinct equitable side in which justice was administered purely according to the principles of chancery. So distinct was this branch of their jurisdiction from their ordinary common-law powers that in several instances a county court sitting in equity reversed its own judgment previously entered while sitting as a court of law. A violent opposition to the exercise of these powers was, however, speedily developed among the colonists, and before the year 1700 the equitable functions of the court seem largely to have ceased. In 1720, Gov. Keith erected a court of chancery in the province, in which he himself, assisted by his council, presided. This tribunal did little business, but maintained a precarious existence for sixteen years, when it was finally abolished at the urgent request of the assembly. Since 1736 no separate court of equity has existed in Pennsylvania, nor until nearly the close of the eighteenth century were any equitable powers vested in the courts of common law. Several of the best recognized principles of equity were, however, regarded as imbedded in the law of the State, and justice was accordingly administered to suitors in accordance with those principles through the medium of the forms of the common law. In Delaware the early system of common-law courts with a distinct equity side, which it shared at first with Pennsylvania, was continued until the Revolution.

After the Declaration of Independence the various States in framing their constitutions differed broadly as to the wisest method of providing for the administration of equity. In New York, New Jersey, Delaware, Maryland, and South Carolina distinct courts of chancery were erected, to be presided over by a chancellor. In Virginia separate circuit courts of chancery were erected, the decisions of which were subject, however, to review by an appellate court of law and equity. A like course was subsequently pursued by the State of Michigan in framing its judicial system. In Kentucky, Tennessee, Mississippi, and Alabama distinct courts of equity have always existed. Experience has, however, shown that such tribunals are not well suited to the genius of the American people. Accordingly, in several of the States where separate courts of chancery were originally adopted they have since been abolished. Virginia discarded them in 1830, New York in 1840, Michigan in 1872, and South Carolina in 1873. The remaining States in which separate equity tribunals still exist are New Jersey, Delaware, Maryland, Kentucky, Tennessee, Mississippi, and Alabama.

By the terms of the Constitution of the United States, and of the Judiciary Act of 1789, passed in pursuance thereof, the courts of the United States are vested with jurisdiction in equity as well as at law. In administering equitable relief these courts proceed according to the course and practice of chancery, and will never interfere where there is a plain, adequate, and complete remedy at law. Somewhat similar is the method of ad-

ministering equity now in force in Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, Pennsylvania, Virginia, West Virginia, North Carolina, Georgia, Texas, Florida, Illinois, Michigan, Iowa, Arkansas, and Oregon. In all these States the common-law courts are vested either by the constitution or by statute with specific equity powers, and the method adopted for administering equitable relief is more or less closely modelled upon that obtaining in the former High Court of Chancery in England. In the remaining States of the Union no distinction now exists between actions at law and suits in equity. Courts are erected which have jurisdiction over all civil causes, and codes have been passed providing for the redress of all civil injuries by one form of action. The following are the States which have adopted this course of procedure: New York, Ohio, Missouri, California, Indiana, Kansas, Nebraska, Utah, South Carolina, Louisiana, Wisconsin, Minnesota, Colorado, and Nevada.

But notwithstanding the sweeping change effected in these States, it has nevertheless been found necessary to make provision for the administration of certain equitable remedies, the absence of which would inevitably result in a failure of justice in many cases. Accordingly, injunctions and writs of *ne exeat* are issued, specific performance granted, and receivers appointed according to the practice and course of chancery, but under common-law or special statutory forms.

(L. L., JR.)

CHANDLER, ZACHARIAH (1813-1879), an American Senator, was born at Bristol, N. H., Dec. 10, 1813. After receiving a common-school education he engaged in trade, and in 1833 removed to Detroit, where he was very successful as a dry-goods merchant. In 1851 he was elected mayor of Detroit, and his energy and success in the canvass for that office caused him to be selected by the Whigs as their candidate for governor of the State in the next year, but he was defeated. He afterwards joined in the formation of the Republican party, and was elected to the United States Senate in 1856 to succeed Gen. Lewis Cass. He served on the committee on commerce, and in his two subsequent terms was chairman of that committee. He was actively concerned in all the legislation connected with the Civil War and the reconstruction of the Southern States. When his third term expired the legislature of Michigan elected a Senator less pronounced in opposition to the South, but Pres. Grant appointed Chandler Secretary of the Interior. He discharged the duties of this office with vigor and integrity. In 1876 he was president of the Republican national committee, and not only performed most arduous labor during the campaign, but when the result of the election was in dispute succeeded in having the election of Mr. R. B. Hayes recognized and proved. In 1879 he returned to his former place in the Senate, and during the autumn took part in an exciting political campaign. After making an effective speech in Chicago, Nov. 1, 1879, he was found dead in his bed.

CHANGARNIER, NICOLAS ANNE THÉODULE, a French general, born at Autun, April 26, 1793. After studying at St. Cyr, he was appointed a sub-lieutenant in 1815, and entered one of the privileged companies of the body-guard of Louis XVIII. He took part in the brief campaign of the French army in Spain in 1823, and was promoted to a captaincy in 1825. He was sent to Algeria in 1830, and distinguished himself greatly on every occasion—in the expedition to Mascara and in Gen. Clausel's campaign against Achmet Bey, and especially in his skilful fighting in the retreat from Constantina to Bona. Lieutenant-colonel in 1837 and *maréchal-de-camp* in 1840, he was made a general by the duc d'Aumale, then governor, and was vigorous in the defeat of Abd-el-Kader. Upon the overthrow of Louis Philippe in 1848 he returned to France, and offered his services to the provisional government. He was appointed minister to Berlin, but preferred to remain among the stirring and more important scenes of

Paris. He gave vigorous support to the provisional government, putting down insurrections that would have overthrown it. At this time Cavaignac, then in command in Algeria, was elected to the legislature, and Changarnier was ordered thither to take his place; but, having been also elected to a seat, he remained in Paris; and when soon after the supreme power was in the hands of Cavaignac, he was placed in command of the National Guard. When Louis Napoleon was elected president he retained this command, which, with the troops in the capital, numbered 100,000 men. He was successful in keeping order during this stormy period; but as he was openly opposed to the Republic, he was watched lest he should play the part of Gen. Monk in restoring the monarchy. Although he had many friends and supporters, he was deprived of his command, and when the *coup d'état* came on the 2d of December, he was arrested in his bed in the morning, and taken to Mazas, where he was detained for several days. By a decree of the new Government, on Jan. 9, 1852, he was banished from France. He took up his residence at Malines in Belgium, refusing to return when special permission was granted. In March, 1855, he published a violent denial of the charge made by M. Véron (in his *Mémoires d'un Bourgeois de Paris*) that in 1849 he had joined in the proposal to arrest his colleagues Cavaignac, Lamoricière, and others. On the declaration of a general amnesty he returned to France, and resided on his estates. When, at the beginning of the Franco-Prussian war in 1870, he offered his services for a command in chief, they were courteously declined, but he was called by the emperor to Metz on the 8th of August. On the withdrawal of Napoleon from Metz, Changarnier remained with Bazaine, and participated in the fierce battles around that city. Upon the truce which preceded the capitulation he was sent to Prince Frederick Charles to negotiate terms. The propositions with which he was charged were—1, to be permitted to take the army to Algeria; or 2, to have an armistice, during which Metz and its forces should be revictualled, while the old imperial legislature of France should be called together and requested to form a new government to be supported by Bazaine's army. These propositions being declined and a surrender demanded, he shared the fate of the army, and was for a short time a prisoner in Germany. When peace was concluded he returned to France, and his popularity was manifested by his election to the House by four different constituencies. While in his seat he presented a summary of the events at Metz, in which he blamed Bazaine for want of method. His course as a legislator is marked by a polemic and haughty spirit, but also by candor and fearlessness. He took part in that violent opposition which resulted in the overthrow of Thiers, and was in favor of the succession of Marshal MacMahon. He was a member of the committee of nine appointed to form, if practicable, a monarchical constitution, and to find out the attitude and views of the comte de Chambord, the representative of the Bourbon line, who, it was thought, would accept a constitutional compromise if permitted to ascend the throne. When the prince refused any compromise, Changarnier moved to place the executive power in the hands of MacMahon for ten years from 1873. He was elected a senator for life by the joint vote of the two houses in 1875: he died of serous apoplexy on Feb. 14, 1877.

(H. C.)
CHANNING, WILLIAM ELLERY, an American poet, son of Dr. Walter Channing and nephew of Dr. William Ellery Channing, was born in Boston, June 10, 1818. His mother (of the Perkins family in Boston) dying early, he was sent in his eighth year to the Round Hill School at Northampton, Mass., where Motley the historian was one of his schoolfellows and George Bancroft one of his teachers. After further study in the Boston Latin School he entered Harvard College, where his uncle, Edward T. Channing, was professor of rhetoric; but the regularity of college-life

was not to his taste, and he never graduated. In 1836 he began to write verses for the *Boston Journal*, and printed some youthful essays on Shakespeare, displaying some power as a critic. In 1839 he removed to Illinois, and lived for a year in a log cabin which he built with his own hands. In 1840 he went to Cincinnati, where he lived a studious life, and became connected for a time with the *Gazette*. In 1841 he returned to New England, married Miss Ellen Fuller, a sister of Margaret Fuller, whom he had met in Cincinnati, and fixed his residence in Concord. Mr. Emerson had printed in the *Dial* for October, 1840, an essay entitled "New Poetry," and in it said of Channing's songs: "Here is poetry more purely intellectual than any American verses we have yet seen, distinguished from all competition by two merits—the fineness of perception and the poet's trust in his own genius. The writer was not afraid to write ill; he had a great meaning too much at heart to stand for trifles, and wrote lordly for his peers alone." This praise did not seem quite justified by the extracts given, and when Mr. Channing published his first volume of *Poems* in 1843 it met with no success. Many of these poems had appeared in the *Dial* (1840–44), and he also wrote prose for that magazine. In 1844–45 he was on the editorial staff of the *New York Tribune*. In 1846 he made a brief visit to Europe, sailing up the Mediterranean, and spending most of his time in Italy. Of this journey some record occurs in his *Conversations in Rome*, published in Boston in 1847—the same year that his second volume of *Poems* appeared. This was unfavorably received, while his third volume of verse, *The Woodman* (1849), was scarcely noticed at all. He published nothing more until 1858, when *Near Home* appeared, with a dedication to Henry Thoreau. In 1855–56 he was sub-editor of the *New Bedford Mercury*, and lived in that city for a year or two. His wife died in 1856, and in 1857 he returned to Concord, where he has ever since resided. He was the most intimate friend of Hawthorne while that author lived in the "Old Manse," from 1842 to 1846, and he was also the daily companion of Thoreau in his walks and distant journeyings. In 1863–64 he began a "Life of Thoreau" in the *Boston Commonwealth*, which in 1873 he expanded into a volume and published under the title of *Thoreau the Poet-Naturalist*. This is a most suggestive biography of his friend, though lacking in method. Thoreau is also partly the subject of his poem, *The Wanderer*, published in 1871, since which time no volume of his verses has come out, but single poems have been printed in Emerson's *Parnassus* and elsewhere. Mr. Channing is a writer of vast and irregular learning, an acute critic, an odd humorist, and a poet of profound insight and delicate beauty of verse in his best passages. In other poems he is harsh, rough, careless, and even grotesque, so that he has not made that impression on the public that his rare merits deserve.

(F. B. S.)
CHANNING, WILLIAM HENRY, an American clergyman, cousin of the poet W. E. Channing, was born in Boston, May 25, 1810, the son of Francis Dana Channing. He was educated in Lancaster, Mass., at the Boston Latin School, and Harvard College, graduating at the last in 1829. He studied divinity at the Cambridge Divinity School, and was ordained as a Unitarian minister at Cincinnati in 1835. During the "Transcendental" period (1838–48) he returned to New England, and preached in Boston, New York, and elsewhere; edited *The Present* and *The Harbinger*, and was connected with several experiments in Christian socialism along with Horace Greeley, George Ripley, Charles A. Dana, and Alfred Brisbane. In 1848 he was president of the Boston Union of Associationists, and in the same year published his most important work, the *Memoir of William Ellery Channing*, his uncle. He had previously written much for the *North American Review*, *Christian Examiner*, and *Dial*, and in 1840 had published a translation of Jeoffroy's *Ethics*.

In 1851 he published *Memoirs of James H. Perkins*; in 1852, together with R. W. Emerson and J. F. Clarke, he published the *Memoirs of Margaret Fuller Ossoli*, and soon after a book on *The Christian Church and Social Reform*. In 1857 he went to England, and was the successor of James Martineau at the Hope Street Unitarian chapel in Liverpool for four years. Returning at an early period in the Civil War, he was settled as pastor of a small Unitarian church at Washington, but soon after the war went to England again, and has since resided mainly in London, where in 1872 he published, from Dr. Channing's manuscripts, a posthumous volume of sermons called *The Perfect Life*. (F. B. S.)

CHANNING, WALTER, M. D. (1786-1876), was born at Newport, R. I., April 15, 1786. He entered Harvard College in 1804, but did not graduate, leaving college in 1807 on account of some controversy with the faculty. He studied medicine in Boston and Philadelphia, receiving his degree of M. D. from the University of Pennsylvania, and afterwards studied in Edinburgh and in London. He began to practise medicine in Boston in 1812, and in 1815 was appointed professor of obstetrics and medical jurisprudence in Harvard University, continuing to serve until 1854, just before going abroad. He entered the Massachusetts General Hospital in 1821, soon after it was opened in Boston, and was one of its physicians for nearly twenty years; after which term of service he introduced the use of etherization in childbirth in that and other hospitals, and wrote a book concerning the new benefaction to surgery, *Etherization in Childbirth* (1848). This treatise, which related the history of nearly 600 cases coming under Dr. Channing's own observation, did much to make etherization common in Europe and America. He continued in practice till beyond the age of eighty, and also cultivated literature a little, publishing *Miscellaneous Poems* (1851), *A Physician's Vacation* (1856), *Reformation of Medical Science* (1857).

CHANTAL, JEANNE FRANÇOISE FREMIOT, BARONESS DE (1572-1641), known in the Roman Catholic Church as ST. JEANNE DE CHANTAL, a French religious, born at Dijon in 1572. She was the daughter of Fremiot, president of the parlement of Dijon, and her character was very early marked by exalted devotion and zeal for religion. Married at twenty to the baron De Chantal, and widowed at twenty-eight, she took a vow of perpetual widowhood, thenceforth devoting herself to the aid of the suffering poor and the instruction of her own children. In 1604 she came under the spiritual guidance of St. Francis de Sales, and with his help established at Annecy the order of the Visitation in 1610, but full papal approval was not bestowed till 1626. Before her death (at Moulins, Dec. 13, 1641) the new sisterhood had eighty-seven houses. She was beatified in 1751 and canonized in 1767. One of her grandchildren was the celebrated Madame de Sévigné. Madame de Chantal was a woman of strong and pure character. Her relations to St. Francis de Sales have been made the subject of some discussion, but nothing has ever been alleged to indicate that their mutual respect and esteem had in it any unworthy element.

CHANZY, ANTOINE EUGÈNE ALFRED, (1823-1883), French general, born at Nouart, in the Ardennes, March 18, 1823. At the age of sixteen he entered the navy, in which he remained but a year. Six months after leaving it he enlisted in the Fifth regiment of artillery, and was admitted to St. Cyr in 1841, from which time he passed his grades to that of captain in 1851. He was then sent to Africa, and appointed chief of the bureau at Tlemcen. As a major he was recalled, and served in the Italian campaign of 1859. As colonel of the Forty-eighth regiment of the line he was with the troops that occupied Rome in 1864. Soon after he returned to Algeria, and served during the great insurrection there: in Sept., 1868, he was appointed a brigadier-general and placed in command of two divisions of the territory. Upon the declaration of war against Prussia he

returned to France and solicited a command from the minister of war: it was at first withheld, but after the revolution of Sept. 4 he was appointed in October a general of division, and thus gained the first important step in a very honorable career. In November he was placed in command of the Sixteenth corps, a part of the Army of the Loire, with which he fought valiantly at Coulmiers, and gained a decided advantage at Patay. This caused his appointment in December as commander-in-chief of the second Army of the Loire, with which he gained great glory. Amid almost universal disaster he achieved partial successes, especially in the second battle of Coulmiers, which caused Gambetta to say that he was "a veritable warrior revealed by events." He continued to fight against odds and obstacles, checking the enemy at Beaugency, Josnes, Marchenoir, and Origny. But for the capitulation of Bazaine he might have turned the tide of invasion: even after that fatal event he displayed great vigor and splendid fighting in retreat: during six days of continued conflict he inflicted serious losses upon the enemy, his own army losing 20,000 men. The truce being concluded with Prussia, he urged a continuance of the war, but, peace being arranged, he took an active part for the establishment of the republic. In June, 1873, he was sent to Algeria as governor-general, with the command of the military and naval forces. His administration in that province was marked by the undertaking of important internal improvements, including the construction of railroads, the establishment of meteorological stations, etc. In 1875 he was elected senator for life. In Jan., 1879, he was a prominent candidate, against his wish, for the presidency of the French republic; in February he was sent as ambassador to Russia, and in passing through Berlin was received with marked courtesy by the emperor and Prince Bismarck. This last appointment caused his retirement from the army. In 1871 he published *The Second Army of the Loire* ("La deuxième armée de la Loire"), an account of his own military operations. He died at Chalons, Jan. 4, 1883.

CHAPIN, EDWIN HUBBELL, D. D. (1814-1880), a Universalist minister and popular orator, was born at Union Village, N. Y., Dec. 29, 1814. He was educated at a seminary at Bennington, Vt., began to study law, but soon turned his attention to theology, and became pastor of a small congregation at Richmond, Va. Public attention was early drawn to Mr. Chapin's merits as a public speaker. In 1840 he was called to a church at Charlestown, Mass., and in 1846 to Boston, and two years later to New York. He was one of the most attractive and eloquent public lecturers in the United States. Several of his publications are of a devotional character, as *Hours of Communion*, *Crown of Thorns*, *Token for the Sorrowing*. Some are series of pulpit discourses, as those on *The Lord's Prayer and the Beatitudes*, *Characters in the Gospel*, *Moral Aspects of City Life*, *Humanity in the City*, and *The Book of Proverbs*. He considered no subject beyond the range of the pulpit, and was an earnest advocate of social reforms. In 1872 he became editor of the *Christian Leader*, the organ of the Universalists. In 1867 his congregation founded the "Chapin Home for the Aged and Infirm." He died in New York, Dec. 27, 1880.

CHAPIN, WILLIAM, an eminent teacher of the blind, was born in Philadelphia in 1802. He entered early upon a literary career, was author of a *Gazetteer of the United States* (1839) and of other works, and for six years was in charge of the public schools of Yates county, N. Y. He was superintendent of the Ohio Institution for the Blind 1840-46; founder of a ladies' normal school in New York, and its principal 1846-49; and became principal of the Pennsylvania Institution for the Blind, in Philadelphia, in 1849. He prepared a report to the Ohio legislature (1846) on the benevolent institutions of Great Britain and of and Paris, and wrote the United States census report on the blind for 1860.

CHARCOAL. The United States probably consumes more charcoal than any other nation, Sweden and Russia being at present the most active rivals. Its chief uses in the United States are the production and manufacture of iron, smelting argentiferous and other lead ores, and gunpowder manufacture. Plumbers, tin-smiths, and other artisans employ considerable quantities, and in some cities it is sold and used for cooking and household purposes—not, however, to the same extent as in Paris and other European cities.

It is impossible to form an exact estimate of the quantity annually consumed in the United States, but the amount is great, for in 1882, 697,906 net tons of pig iron and 91,293 net tons of blooms and billets were produced with charcoal, requiring nearly 1,000,000 net tons, or 100,000,000 bushels, of this fuel for the iron industry alone. The probabilities are that the total consumption of charcoal for all purposes in the United States is at least 180,000,000 bushels annually.

A large proportion of the charcoal used is still made in the woods in heaps or meilers. Beyond mere experiment no other form than the conical pile, with the wood standing on end, has been adopted in America. The heaps contain from 15 to 50 cords, but 25 to 30 cords is the size usually adopted. The wood is covered with leaves on which sod or dirt is placed. Fig. 1

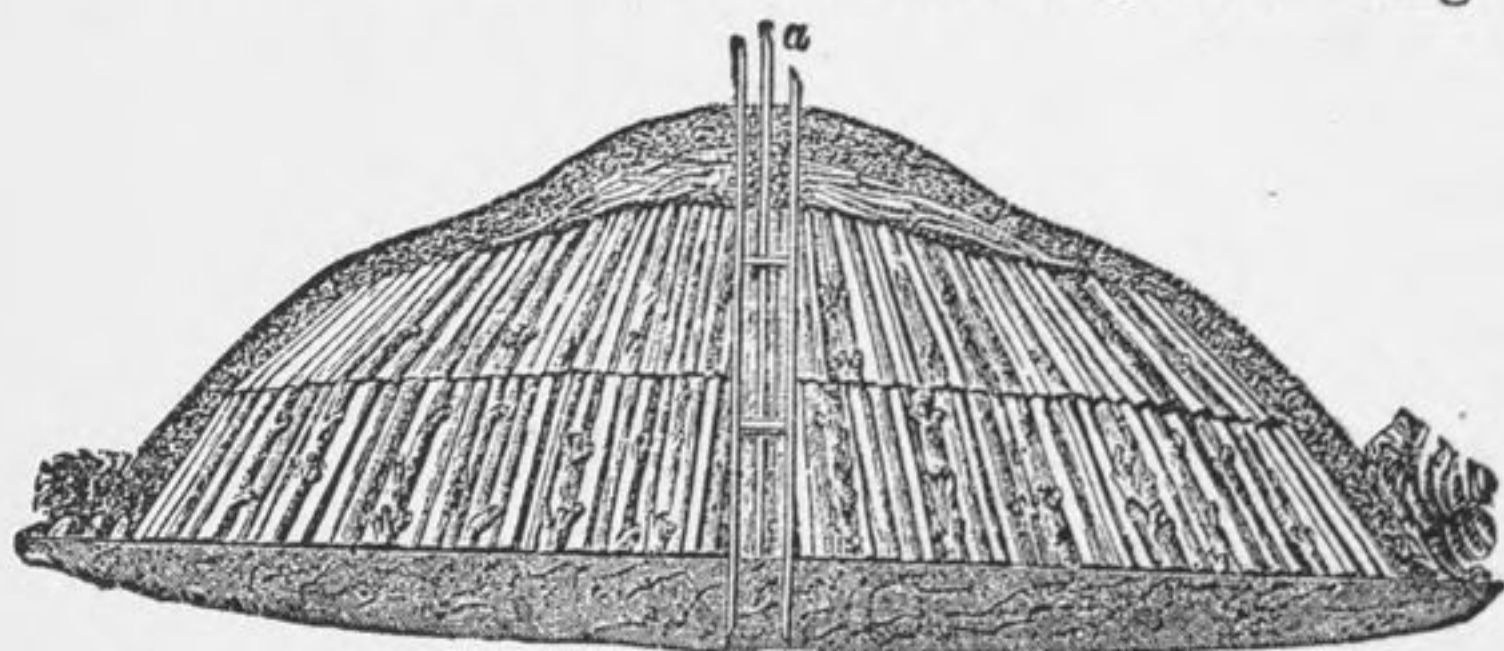


FIG. 1.—Meiler.

shows the construction of a meiler. The average yield of charcoal in meilers is about 28 bushels per cord, but under exceptionally favorable conditions and with extraordinary care as much as 50 bushels per cord have been made. The ultimate practical limit of meiler-charring on a large scale is, at present, probably 35 bushels, for even with straight, solid wood the result attained is always affected by atmospheric changes, as the earthen covering is not absolutely impervious to wind or rain.

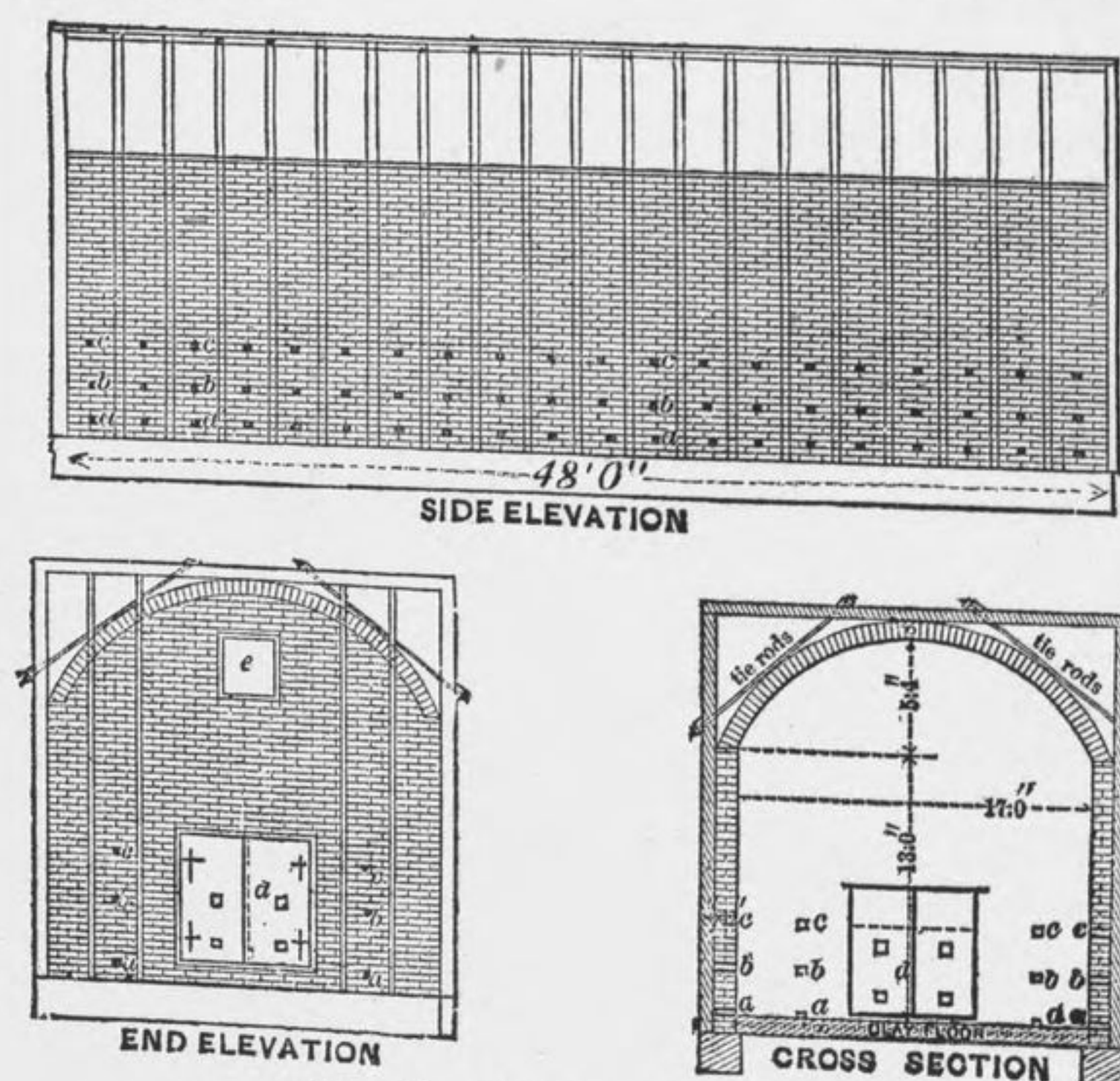


FIG. 2.—Rectangular Kiln.

KILNS (structures of masonry in which wood is carbonized) have been in use for more than twenty years, but until the last decade they have not met with general favor. They are, however, rapidly replacing

the meilers. The average yield of kilns is 40 to 45 bushels per cord, although over 50 bushels have been obtained. Being under more perfect control, the average working of kilns can be kept within smaller limits than the carbonization in meilers. Kilns are constructed of stone or brick, the latter being preferred, and vary in size from 20 to 100 cords capacity, as also in form. They, however, can be divided into three classes:

a. Rectangular Kilns.—These are generally of large capacity, and consist of four vertical walls supporting an arched roof, which is kept from spreading by wooden braces and tie-beams. The illustration (fig. 2) represents a 90-cord kiln used in Michigan; *a*, *b*, *c* show vents; *d* is the lower door, *e* is the upper door.

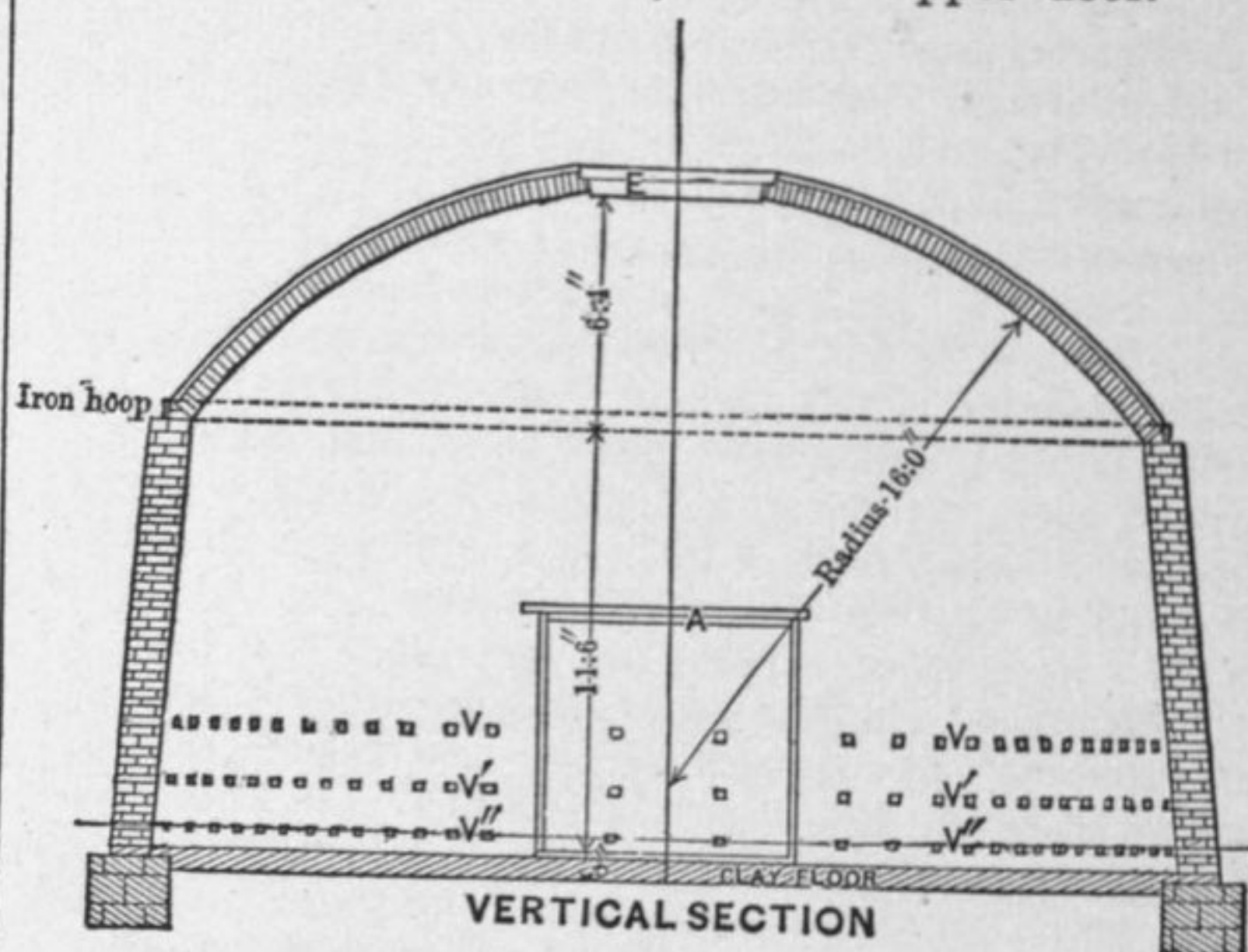


FIG. 3.—Beehive Kiln.

b. Beehive kilns rank next to rectangular kilns in average capacity. They are formed of a vertical or slightly tapering circular wall banded with iron and supporting a dome roof. Fig. 3 shows a plan and section of a 50-cord beehive kiln; the method of laying bricks and placing vents is exhibited on plan; *V*, *V'*, and *V''* show position of vents.

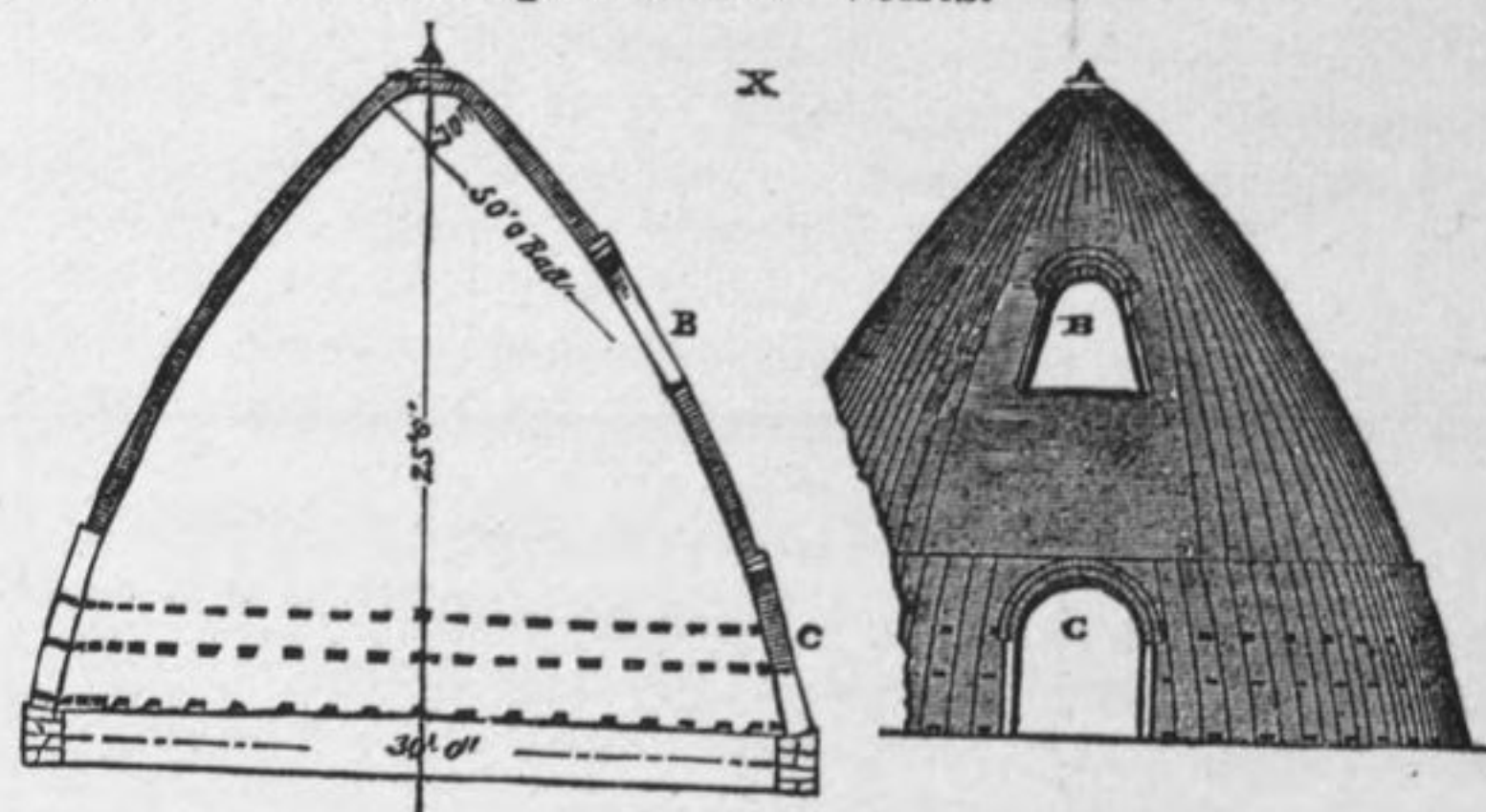


FIG. 4.—Conical Kiln.

c. Conical kilns are ordinarily of small capacity. They are conical in shape, with apex rounded. The most approved form has the sides built upon the arc of a circle of large radius. Fig. 4 represents an elevation and vertical section of a 35-cord conical kiln; *A*, top vent; *B*, upper door; *C*, lower door.

All kilns have one or more charging and discharging openings, about 5 feet square, and a series of vents, generally in three rows near the bottom, all around the kiln. A brick left loose in the structure is ordinarily used for a vent; sometimes iron frames and lids are inserted. A large vent with a lid or valve is often placed on the top to relieve explosions, and used to fill conical kilns closely.

The preferences for various shapes and sizes of kilns are principally local, but the following will fairly express the relative advantages: The larger kilns will give a better yield of coal per cord, because a smaller percentage of the wood is burned in carbonizing the rest; but the smaller kilns, by favoring perfect control of the carbonization, can secure more uniform results.

The conical kilns, as they require no braces or bands, are cheapest in proportion to capacity, and their size permits of locating them in nests, so as to maintain a force of employes constantly where the wood-supply would not be sufficient to operate continuously a plant of more pretentious structures. The small kilns also can be "turned" (that is, filled, coaled, and emptied) in a shorter time than the larger kilns.

The cost of constructing kilns varies, according to size and location, from \$10 to \$15 per cord capacity. The conical kilns ordinarily will hold 25 to 50 cords; the beehive kilns, 35 to 60 cords; the rectangular kilns, 50 to 100 cords.

RETORTS.—The third method of manufacturing charcoal is in closed vessels, the carbonization being effected by extraneous heat; the yield of charcoal under proper treatment is approximately equal to the volume of the wood charged, 50 to 70 bushels being obtained from a cord of wood. Generally, where retorts are used, the acetic vapors arising from the carbonization process are collected, condensed, and converted into methylic alcohol, commercial acetates, and tar. The collection of the acetic vapors is not, however, confined to the use of closed vessels. A number of rectangular kilns are connected by exhausters through trunks, the acetic vapors being utilized as above described. Eighty thousand cords of wood are converted every year into charcoal by this method under Dr. Pierce's patents.

The retorts are of three general classes: (a) *horizontal*, either iron cylinders with one end closed by a suitable door and placed over a fireplace, or a semi-cylindrical iron bottom, forming, with a firebrick arch above it, a horizontal cylinder; (b) *vertical* cylinders of iron

amount of moisture absorbed from the atmosphere. Owing to its bulk and porosity, it keeps the materials in a blast-furnace from packing too closely, and its large exposed surfaces are rapidly oxidized.

The census of 1880 shows that the average consumption of mineral fuel and coke per pound of iron made in blast-furnaces was 1.73 pounds; also that, although the average size of charcoal-furnaces is much less than that of those using other fuels, and although 30 per cent. of them do not heat the blast, the fuel-consumption was 1.24 pounds per pound of iron produced. This demonstrates the superiority of charcoal as a metallurgical fuel in average practice.

Charcoal is generally bought and sold by the bushel, but the cubical capacity of this measure is by no means fixed, it varying from 1989 cubic inches to 2844 cubic inches. A number of States have fixed standards of capacity, but the laws regulating this generally provide for special contracts, and hence the standard cannot be said to be in general use. The following are the standard bushels of some of the States:

New Hampshire.....	1989	cubic inches =	1.151	cubic feet.
New York.....	2150.42	"	1.244	"
Minnesota	2419.5	"	1.4	"
Rhode Island.....	2481	"	1.436	"
Connecticut.....	2564	"	1.483	"
Massachusetts	2566	"	1.484	"
Pennsylvania.....	2571	"	1.488	"
Montana.....	2650	"	1.534	"
Missouri	2680	"	1.55	"
Maryland.....	2747.7	"	1.59	"
Michigan.....	2748	"	1.59	"

The last-named and the Winchester heaped bushel of 2688 cubic inches = 1.556 cubic feet are most in favor.

Much charcoal is now sold by weight, 20 pounds being counted as a bushel of 2748 cubic inches of mixed hard and soft woods.

The density of charcoal varies not only with the density of the wood from which it is made, but the process of manufacture. Rapidity of carbonization also affects it. Under similar conditions charcoal produced from hard woods is heavier than that made from soft woods, and that made by slow carbonization is generally heavier than that produced rapidly. The yield of charcoal per cord of wood is influenced

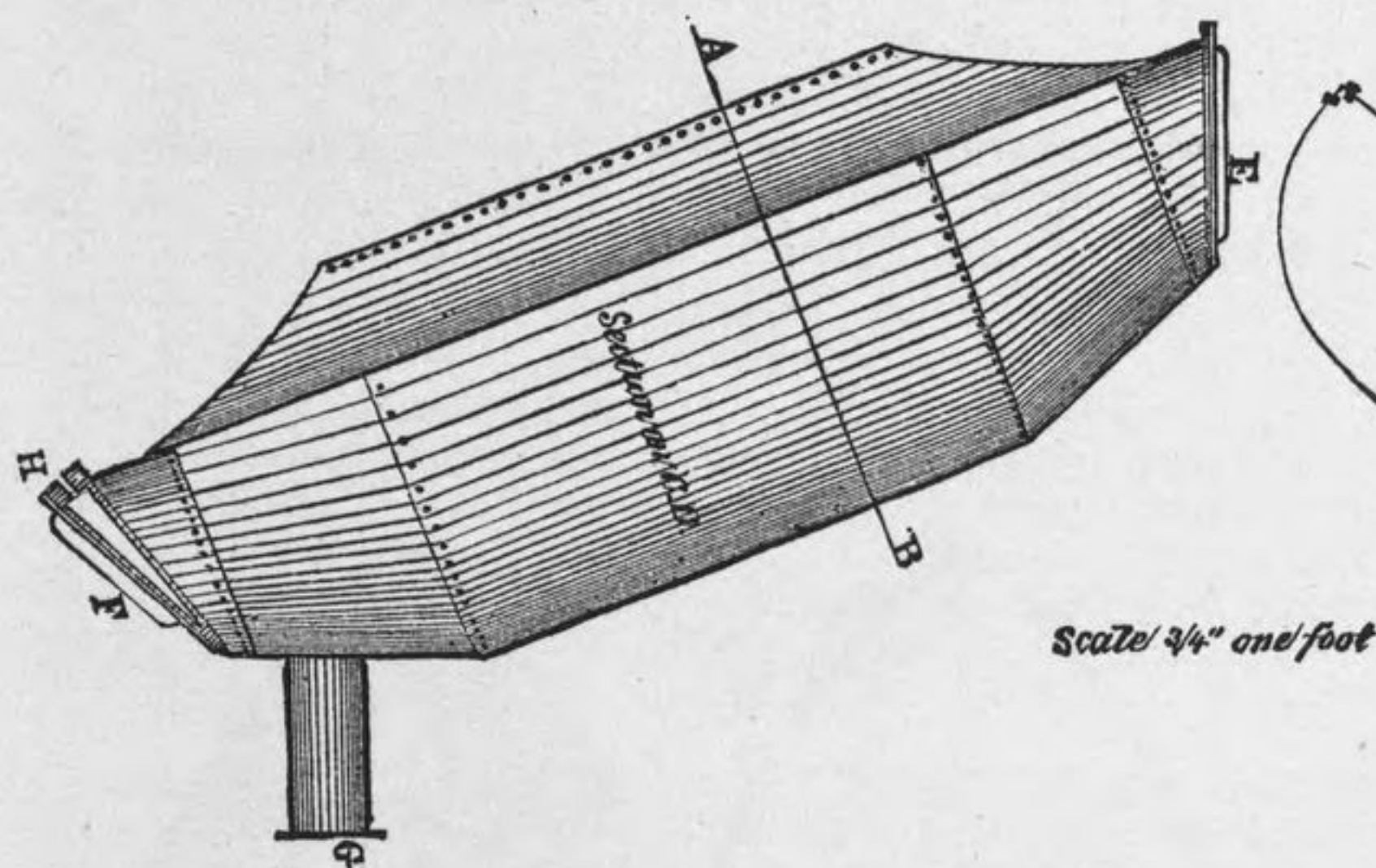


FIG. 5.—Mathieu Retort.

placed in furnaces with flues surrounding them: the cylinders are either lifted bodily out of the furnaces and allowed to cool while others are being heated, or the charcoal is drawn out by a cage within the retort; (c) *inclined* retorts are designed to diminish the labor of filling and emptying the horizontal form, and the most approved are crescent-shaped in cross-section, to secure practically uniform thickness of wood to be acted upon. The illustration (fig. 5) exhibits what is known as the Mathieu retort. E is the opening for filling, and F the opening for emptying, the retort; both are closed by lids suitably secured; G is the pipe to carry off the gaseous products of distillation; and H the tar-drip.

Batteries of a large number of retorts are now placed at some of the more important iron-works. Several of these plants have been erected to utilize the waste wood from large saw-mills, etc., and transform it into fuel for metallurgical purposes.

Acetic acid acts energetically on iron, but as the heat of the retorts is generally sufficient to cause volatilization, they are not destroyed rapidly, unless the acid is allowed to remain in them when it condenses.

The advantages of charcoal as a metallurgical fuel are in its purity and porosity. As used, it is mainly pure carbon, with a small percentage of ash and a varying

greatly by the size and character of timber used. A pile of 4 by 4 by 8 feet is uniformly adopted as a cord, but the volume of solid wood is much greater where the sticks are large, straight, and free from projections. The following percentages of solid wood in piles was determined by the forestry department of Prussia:

For "timber".....	74.07 p. c. (= 80 c. ft. per cord).
For "log (fire) wood" (over 6" diameter).....	69.44 p. c. (= 75 c. ft. per cord).
For "billet" (3" to 6" diameter).....	55.55 p. c. (= 60 c. ft. per cord).
For "brush" wood (less than 3" diameter).....	18.52 p. c.
For "roots".....	37.00 p. c.

(Vide *Journal of U. S. Association of Charcoal-Iron Workers*, vol. iii. p. 20.)

Marcus Bull, in his experiments, found 71½ cubic feet *plenum* or solid dry wood and 56½ cubic feet interstices in a carefully-piled cord of perfectly dry wood. These experiments, which were described in a paper read before the American Philosophical Society April 7, 1826, are epitomized in the following table. The charring was done in meilers or heaps; the bushel used approximated the Winchester standard, 2688 cubic inches. (See also Sargent's tables, in the article FUEL.)

Common names of woods and coals.	Botanical names.	Specific gravities of dry wood.	Avoirdupois pounds of dry wood in one cord.	Product of charcoal from 100 parts of dry wood, by weight.	Specific gravities of dry coal.	Pounds of dry coal in one bushel.	Pounds of charcoal from one cord of dry wood.	Bushels of charcoal from one cord of dry wood.	Time 10° of heat were maintained in a room by the combustion of one pound of each article.	Value of specified quantities of each article, compared with shellbark hickory as the standard.
White ash.....	<i>Fraxinus americana</i>	·772	3450	25·74	·547	28·78	888	31	H. M.	Cord.
Apple tree.....	<i>Pyrus malus</i>	·697	3115	25	·445	23·41	779	33	6 40	77
White beech.....	<i>Fagus sylvestris</i>	·724	3236	19·62	·518	27·26	635	23	6 40	70
Black birch.....	<i>Betula lenta</i>	·697	3115	19·40	·428	22·52	604	27	6	65
White birch.....	<i>Betula populifolia</i>	·530	2369	19	·364	19·15	450	24	6	63
Butternut.....	<i>Juglans cinerea</i>	·567	2534	20·79	·237	12·47	527	42	6	48
Red cedar.....	<i>Juniperus virginiana</i>	·565	2525	24·72	·238	12·52	624	50	6 40	51
American chestnut.....	<i>Castanea vesca</i>	·522	2333	25·29	·379	19·94	590	30	6 40	56
Wild cherry.....	<i>Prunus serotina</i>	·597	2668	21·70	·411	21·63	579	27	6 40	52
Dogwood.....	<i>Cornus florida</i>	·815	3643	21	·550	28·94	765	26	6 10	55
White elm.....	<i>Ulmus americana</i>	·580	2592	24·85	·357	18·79	644	34	6 10	75
Sour gum.....	<i>Nyssa sylvatica</i>	·703	3142	22·16	·400	21·05	696	33	6 40	58
Sweet gum.....	<i>Liquidambar styraciflua</i>	·634	2834	19·69	·413	21·73	558	26	6 20	67
Shellbark hickory.....	<i>Carya alba</i>	1·000	4469	26·22	·625	32 89	1172	36	6	57
Pignut hickory.....	<i>Carya porcina</i>	·949	4241	25·22	·637	33·52	1070	32	6 40	100
Red-heart hickory.....	<i>Carya porcina</i>	·829	3705	22·90	·509	26·78	848	32	6 40	95
Witch hazel.....	<i>Hamamelis virginica</i>	·784	3505	21·40	·368	19·36	750	39	6 30	81
American holly.....	<i>Ilex opaca</i>	·602	2691	22·77	·374	19·68	613	31	6 10	72
American hornbeam.....	<i>Carpinus americana</i>	·720	3218	19	·455	23·94	611	25	6 20	57
Mountain-laurel.....	<i>Kalmia latifolia</i>	·663	2963	24·02	·457	24·05	712	30	6	65
Hard maple.....	<i>Acer saccharinum</i>	·644	2878	21·43	·431	22·68	617	27	6 40	66
Soft maple.....	<i>Acer rubrum</i>	·597	2668	20·64	·370	19·47	551	28	6 10	60
Large magnolia.....	<i>Magnolia grandiflora</i>	·605	2704	21·59	·406	21·36	584	27	6	54
Chestnut white oak.....	<i>Quercus prinus palustris</i>	·885	3955	22·76	·481	25·31	900	36	6 10	56
White oak.....	<i>Quercus alba</i>	·855	3821	21·62	·401	21·10	826	39	6 30	86
Shellbark white oak.....	<i>Quercus obtusiloba</i> ?.....	·775	3464	21·50	·437	22·99	745	32	6 20	81
Barren scrub oak.....	<i>Quercus catesbaei</i>	·747	3339	23·17	·392	20·63	774	38	6 20	74
Pin oak.....	<i>Quercus palustris</i>	·747	3339	22·22	·436	22·94	742	32	6 30	73
Scrub black oak.....	<i>Quercus banisteri</i>	·728	3254	23·80	·387	20·36	774	38	6 20	71
Red oak.....	<i>Quercus rubra</i>	·728	3254	22·43	·400	21·05	630	30	6 30	71
Barren oak.....	<i>Quercus ferruginea</i>	·694	3102	22·37	·447	23·52	694	29	6 20	69
Rock chestnut oak.....	<i>Quercus prinus monticola</i>	·678	3030	20·86	·436	22·94	632	28	6 20	66
Yellow oak.....	<i>Quercus prinus acuminata</i>	·653	2919	21·60	·295	15·52	631	41	6	61
Spanish oak.....	<i>Quercus falcata</i>	·548	2449	22·95	·362	19·05	562	30	6 10	60
Persimmon.....	<i>Diospyros virginiana</i>	·711	3178	23·44	·469	24·68	745	30	6 20	52
Yellow pine (soft).....	<i>Pinus mitis</i>	·551	2463	23·75	·333	17·52	585	33	6 30	69
Jersey pine.....	<i>Pinus inops</i>	·478	2137	24·88	·385	20·26	532	26	6 30	54
Pitch pine.....	<i>Pinus rigida</i>	·426	1904	26·76	·298	16·68	510	33	6 40	48
White pine.....	<i>Pinus strobus</i>	·418	1868	24·35	·293	15·42	455	30	6 40	43
Yellow poplar.....	<i>Liriodendron tulipifera</i>	·563	2516	21·81	·383	20·15	549	27	6 40	42
Lombardy poplar.....	<i>Populus dilatata</i>	·397	1774	25	·245	12·89	444	34	6 10	52
Sassafras.....	<i>Sassafras officinalis</i>	·618	2762	22·58	·427	22·47	624	28	6 40	40
Wild service.....	<i>Amelanchier canadensis</i>	·887	3964	22·62	·594	31·26	897	29	6 20	59
Sycamore.....	<i>Platanus occidentalis</i>	·535	2391	23·60	·374	19·68	564	29	6 20	84
Black walnut.....	<i>Juglans nigra</i>	·681	3044	22·56	·418	22	687	31	6 30	52
Swamp whortleberry.....	<i>Vaccinium corymbosum</i>	·752	3361	23·30	·505	26·57	783	29	6 20	65
									6 30	73

Analyses of Woods, by M. Eugène Chevandier.

Woods.	Composition.				
	Carbon.	Hydro-gen.	Oxygen.	Nitrogen.	Ash.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Beech.....	49·36	6·01	42·69	0·91	1·00
Oak.....	49·64	5·92	41·16	1·29	1·97
Birch.....	50·20	6·20	41·62	1·15	0·81
Poplar.....	49·37	6·21	41·60	0·96	1·86
Willow.....	49·96	5·96	39·56	0·96	3·37
Average...	49·70	6·06	41·30	1·05	1·80

Percentage of Water Expelled.

Temperature.	Water expelled from one hundred parts of wood.			
	Oak.	Ash.	Elm.	Walnut.
257° Fahr.....	15·26	14·78	15·32	15·55
302° Fahr.....	17·93	16·19	17·02	17·43
347° Fahr.....	32·13	21·22	36·94 ?	21·00
392° Fahr.....	35·80	27·51	33·38	41·77 ?
437° Fahr.....	44·31	33·38	40·56	36·56

The preceding table, prepared by M. Violette, shows the proportion of water expelled from wood at gradually increasing temperatures. The wood operated upon had been kept in store during two years. When wood which has been strongly dried by means of artificial heat is left exposed to the atmosphere, it reabsorbs about as much water as it contains in its air-dried state. The wood experimented on was that of black alder, or alder

TABLE I.—Showing the Composition of Charcoal.

Carbonized at—	Percentage of the solid product.				Carbon for a given weight of wood.
	Carbon.	Hydro-gen.	Oxygen, nitrogen, and loss.	Ash.	
150° C.....	47·51	6·12	46·29	0·08	47·51
200°.....	51·82	3·99	43·98	0·23	39·88
250°.....	65·59	4·81	28·97	0·63	32·98
300°.....	73·24	4·25	21·96	0·57	24·61
350°.....	76·64	4·14	18·44	0·61	22·42
432°.....	81·64	4·96	15·24	1·61	15·40
1023°.....	81·97	2·30	14·15	1·60	15·30
1100°.....	83·29	1·70	13·79	1·22	15·32
1250°.....	88·14	1·42	9·26	1·20	15·80
1300°.....	90·81	1·58	6·49	1·15	15·85
1500°.....	94·57	0·74	3·84	0·66	16·36
Platinum melts.	96·52	0·62	0·94	1·95	14·47

buckthorn, which furnishes a charcoal suitable for gun-powder. It was previously dried at 150° C. = 302° Fahr. Table I., showing the composition of charcoal, was also prepared by M. Violette.

Prof. Ledebur burned weighed quantities of charcoal at different temperatures with measured volumes of air, directly determining the amounts of carbonic acid and oxide in the products of combustion, and indirectly the quantity of oxygen consumed. The results of these experiments are given in Table II.

Red charcoal; Fr. *charbon roux*; Ger. *Rothkohle*. Sauvage found by experiments that a perfectly charred coal does not give the largest quantity of combustible matter in the smallest volume, but, on the contrary, that this relative quantity increases to a certain point of the process, and then begins to decrease. After the process had been conducted for five hours he claimed to have attained the greatest yield of combustible matter.

His results are exhibited in Table III. After five and a half hours the water and acetic acid are evaporated, and the product is an imperfectly charred coal of dark-red or brown color. This product, without water and acetic acid, still contains the tar and combustible gases, both of which contribute to a higher heating capacity.

TABLE II.—Showing the Results of the Combustion of Charcoal.

Temperature.	Carbon burned.		Oxygen consumed.	
	To carbonic acid, per cent.	To carbonic oxide, per cent.	Consumed in combustion, per cent.	Unconsumed, per cent.
350° C.....	78·6	21·4	33·0	77·0
440°.....	72·4	27·6	80·6	19·4
520°.....	71·4	28·6	87·9	12·1
700°.....	62·6	37·4	80·3	19·7
1100°.....	1·3	98·7	100·0	0·0

TABLE III.—Showing the Results of Sauvage's Experiments.

	Time of charring (hours).					In the meiler.
	3	4	5	5·5	6·5	
100 weighed kilos of wood yielded.....	65·4	53	47	41·5	39·1	17·2
100 cub. m., measured respectively	86	76	58	55	52	33
100 cub. dec. of wood contain 3153 parts weight of combustible; 100 cub. dec. of coal yielded.....	3118	3139	4009	3849	3997	3867

The result here given for the meiler is rather low for good practice.

A company in Mainz, says Percy, prepares wood for fuel by heating it to a degree sufficient to cause incipient carbonization and change its color to reddish brown. The name *Rothholz* is given to this product. Fresenius recommends it as being easily ignited, and therefore an excellent material for lighting fires; it may be conveniently conveyed and stored, and on burning produces

a copious flame and is capable of developing intense heat. Percy states that the difference in chemical composition between brown (or red), and black charcoal is of itself sufficient to prove that the former has less heating power than the latter. Brown charcoal contains more oxygen and less carbon than black. (J. B.)

CHARITON, the county-seat of Lucas co., Iowa, is on the Chariton River, 55 miles S. of Des Moines, on the Chicago, Burlington, and Quincy Railroad, with branches N. to Des Moines and S. to St. Joseph and Kansas City. It has four hotels, a national bank, a private bank, one daily and two weekly newspapers, nine churches, a normal school, and three fine school buildings with seventeen departments. It has a foundry, a railroad repair-shop, plough-factory, butter-tub factory, and two flour-mills. It is well laid out, with shady streets, and has a park and a good fire department. It was settled in 1847 and incorporated in 1871. Its property is valued at \$781,000; its public debt is \$3000, and its yearly expenses are \$5000. Population, chiefly of American birth, 2648.

CHARITIES, in law, are gifts and devises of land and property for general public uses, to be applied in accordance with the intention of the donor as expressed in the deed of gift or will. Such devises or gifts may be made for the relief of aged, impotent, and poor people; for the maintenance of hospitals or homes for the sick and maimed, and for disabled soldiers, seamen, and marines; for the foundation and support of schools of learning, homes for the support and education of orphans, societies for the aid and support of decayed tradesmen and actors. They may be also made to a municipal corporation for the erection of a town-house for the transaction of town business, or to a municipal corporation for the erection of a suitable college wherein poor orphans may be supported and educated.

The statute of 43 Elizabeth c. 4 is considered the principal source of the law of charitable uses, and has given rise to various questions upon the subject; and to the very extensive jurisdiction of the chancery all such matters are referred. This statute and its preamble designate and enumerate the uses which shall be

deemed charitable; and it is now the established rule that no uses shall be deemed charitable and under the protection of the law except such as come within the word or the obvious intent of the statute. It also provides that all charities shall be inquired into and enforced by a commission issuing out of chancery. After the passage of this statute it became a vexed question whether the court of chancery could grant relief by original bill, or whether the remedy was confined to the process by commission; but in the reign of Charles II. it was decided in favor of the original bill in chancery. In England, if a bequest be for a charity, it matters not how uncertain the persons or objects may be, or whether the persons who are to take are *in esse* or not, or whether the legatee be a corporation capable in law of taking or not; the court will sustain the legacy, and give it effect according to its own principles, and where a literal execution becomes inexpedient or impracticable it will execute it *cy pres*. In former times so strong was the disposition of chancery to assist charities that in equity assets were held to satisfy charitable uses before debts or legacies, though assets at law were held to satisfy debts and legacies before charities; and this was but in conformity to the civil law, by which charitable legacies were preferred to all others. It is laid down in the books of authority that the king in England, as *parens patrie*, has the general superintendence of all charities not regulated by charter, which he exercises by the keeper of his conscience, the chancellor; and therefore the attorney-general, at the relation of some informant, when it is necessary, files *ex-officio* an information in the court of chancery to have the charity properly established and applied. The statute of 9 Geo. II. c. 36 has very materially narrowed the extent and operation of the statute of Elizabeth.

During the dominion of the English Crown over the colonies in America these principles became a part of

the system of jurisprudence here, but after the establishment of their independence some States entirely abolished the operation of the principles of mortmain, and others of whose system the statute was a recognized part modified its operation by endowing their courts with extraordinary chancery powers over charities; and now, with but a few exceptions, the laws of the States permit property to pass by will or deed for charitable uses, whether it be real or personal; and these laws have settled the vexed question whether a religious purpose was a charitable purpose by employing both terms, "religious and charitable uses." Their courts are vested, by legislative enactment or inherent common-law jurisdiction, with authority to see such devises properly executed and the intention of the donor carried into effect. As the States have the exclusive power of making and interpreting laws governing their own citizens, it becomes necessary, in order to treat fully the subject of charity, to view each State wherein that subject is the matter of jurisprudence by itself, and consider its peculiar application of the law to the subject.

In the State of Alabama the courts of chancery have jurisdiction over bequests for charitable uses by virtue of their original common-law powers, and in recognizing the validity of such, without invoking the aid of the English statute, hold that dedication to religious or public uses may be sustained, though it be limited only by the wants of the community or during the pleasure of the person making it. In Connecticut the legislature has the power of an English court of chancery over charitable devises, and may direct the sale of the real estate, though the devisee may have directed that the estate should never be sold, and in cases where the lapse of time or change in the condition of the property makes it prudent and beneficial to the charity to alien the specific lands and invest the proceeds in other securities, providing, however, that no deviation from the gift be made; and so absolute is this power that the courts of the United States have no right to revise the facts upon which the legislature has seen fit to exercise such power. Here a devise to a town directing that all the interest of the devise shall be laid out in repairing the highways and bridges of the town is a valid charitable use under the statute, as is also a devise for school purposes. In Georgia the principles of the statute of Elizabeth have been adopted and constitute a part of the law of the State, departing from it only, however, by not suffering an equitable interest to fail for want of a trustee to support it; and the superior courts have an inherent jurisdiction over bequests to all charitable uses and trusts where the same are definite and specific in their objects and capable of being executed. In Illinois the courts have adopted and administered charities upon *cy-pres* principles, only with the view of sustaining and carrying into effect the intention of the donor, but without authority to change the same; and the charity must be accepted upon the terms proposed; but if the intention of the donor becomes impracticable, it may be altered *cy-pres*. In Maryland the statute of Elizabeth is not in force, but the third section of the declaration of rights prefixed to the constitution of the State goes so far as to render valid a dedication of lands to public and pious uses, though there be no specific grantee or trustee. It is held that a bequest of the income of property to be applied towards feeding, clothing, and educating the poor orphans belonging to a certain congregation, and of a certain county attending school at a certain place, is void, being too indefinite to be carried into effect. In Iowa the courts of chancery have no other than judicial power, and cannot give effect to gifts and devises in those cases where no particular object is designated and no trustee named or person appointed to select the object, and which is administered by the chancellor of England as *parens patriæ*; and if a testator ineffectually dedicates his property to charity or in such manner that the devise is void, the State possesses no prerogative to interfere and dispose of the property. In Maine the general provisions of the statute of Elizabeth are in force, but as the jurisdiction of the supreme court over such cases of trust is not derived exclusively from that statute, it is not restricted by it. When a trust is created by a bequest for charitable purposes, if the charity is definite in its objects, is lawful, and is to be regulated by trustees specially appointed for that purpose, the supreme court of the State has jurisdiction over it independently of the statute of Elizabeth, and will cause it to be executed whether the uses designated are or are not within the terms of that statute; and in cases where there is no trustee to execute the trust the court of

equity will see the use executed by the appointment of a trustee for that purpose. In Massachusetts the statute law bestows upon the supreme court all the authority of a court of general chancery jurisdiction for the purposes of hearing and determining questions of devises for charitable purposes, or to permit such alterations in the mode prescribed by the donor as will best promote the general interest of the charity. In this State a gift designated to promote the public good by the encouragement of learning, science, and the useful arts, without any particular reference to the poor, is a charity, as also a gift or bequest to the poor of a particular church is a public charity. These trusts or charitable uses may be perpetuated in their duration, and may leave the mode of application and the selection of particular objects to the discretion of the trustees; also, a corporation established for the support of poor and old women, which devotes all the funds to the support of such women in its home, and is no source of income to its members, is a charitable corporation, although it requires a payment of money as a requisite for admitting a woman to its home. In New Hampshire a gift of real or personal estate to promote education is a charity, and the laws give and allow such charities. This principle of the law governing charitable uses was most emphatically laid down by the Supreme Court of the United States in the great case of "The Trustees of Dartmouth College vs. Woodward." This case was an action of trover brought in the State court, in which the plaintiff, Woodward, declared for two books purporting to contain the records of all the doings and proceedings of the trustees of the college from the establishment of the corporation until Oct. 7, 1816, the original charter or letters patent constituting the college, the common seal, and four volumes purporting to contain the charges and accounts in favor of the college. The college was founded by a charter granted by the British Crown dated Dec. 13, 1769. After the college had been fully established for the period of fifty years the legislature of New Hampshire passed two acts which in point of fact abolished the old corporation and established a new one. The first of these acts made the twelve trustees under the charter, and nine other individuals to be appointed by the governor and council, a corporation by a new name (Dartmouth University), and to this new corporation transferred all the property, rights, liberties, powers, and privileges of the old corporation, with further power to establish new colleges and an institute, and to apply all or part of the funds to these purposes, subject to the power and control of a board of twenty-five overseers to be appointed by the governor and council. The second act makes further provisions for executing the objects of the college to retain and hold their property against their will. Daniel Webster, for the college, raised the question before the court of the validity and constitutionality of these statutes, and Chief-Justice Marshall, in delivering the opinion of the court, sustained his view, holding "that the college was a private eleemosynary institution whose funds consisted entirely of private donations; that the corporation was not invested with any portion of political power, and did not partake in any degree in the administration of the civil government. It was the institution of a private corporation for general charity. The charter was a contract to which the donors, the trustees of the corporation, and the Crown were the original parties, and it was made on a valuable consideration for the security and disposition of property. Contracts of this kind, creating these charitable institutions, are most reasonably within the purview and protection of the Constitution. That the college was not liable to the control of the legislature, and that the acts of the legislature of New Hampshire altering the charter in a material respect without the consent of the corporation was an act impairing the obligation of the charter, and consequently unconstitutional and void." This decision, according to Kent, did more than any other single act proceeding from the authority of the United States to throw an impregnable barrier around all rights and franchises derived from the grant of government, and to give solidity and inviolability to the literary, charitable, religious, and commercial institutions of our country. In North Carolina the statute of 43 Elizabeth is in force, and by virtue of it the court of chancery has jurisdiction of all charities; but a charity under this statute must be so described in the will that the law will at once acknowledge it to be such; for otherwise it reverts to the heir-at-law or next of kin. The constitution of this State does not prohibit the creation of a permanent fund for charitable purposes. In Ohio the doctrines founded upon the statute of Elizabeth, ch. 4, in relation to charitable trusts to corporations, either municipal or private, have been adopted by the courts of equity, but not by express legislation, and

dedications of lands to charitable and religious purposes are valid without any grantee to whom the fee could be conveyed; such gifts to charitable uses receive the most liberal construction. In Tennessee a charity is a gift to a general public use and the maintenance of universities, colleges, academies, and common schools and other lawful institutions are charitable uses. Such provisions of the statute of Elizabeth as were the law before the enactment of that statute, and are applicable to our institutions, are in force here as a part of the common law. In Virginia the statute of Elizabeth in regard to charitable uses was repealed in 1792, but the code declares that conveyances and devises to charitable use are void. In New York the statute of Elizabeth was repealed in 1788, and the power to enforce charities is now in the court of chancery by virtue of its original constitution; but charities within the definition of that statute will be enforced even where the beneficiaries are too vaguely designated to be able to claim for themselves.

This jurisdiction rests on the understanding that such charities are trusts, and the specific intent of the donor will be enforced if it can be ascertained and does not come under the provisions of the statutes abolishing all uses and trusts except such as are authorized and modified. The prohibitions of the statute extends only to private trusts and accumulations for remote posterity. A bequest for the use of the poor of a town is not prohibited by those statutes, nor a bequest for the use of the poor ministers of an incorporated religious society. Nor do the provisions of the revised statutes concerning "expectant estates" apply to property given in perpetuity to religious or charitable corporations, as the *cy-pres* doctrine, where applied to charitable uses, has never been held in this State. A bequest for accumulation for the purpose of the erection of a church cannot be supported as an absolute gift to take effect immediately. In Pennsylvania the statute of Elizabeth concerning charitable uses does not extend, but its principles, as applied by chancery in England, obtain here by force of our own common law, and relief may be given so far as the powers of the court extend. The peculiar equities commonly ascribed to the operation of the statute are fully administered here when means are found adequate to the purpose; and in this respect the competency has been much enlarged by the laws extending the equitable powers of the tribunals; but a court of equity will not interfere with the exercise of the discretion vested in the trustee of a charity in the distribution of the fund if exercised in good faith. In the administration of a charity unreasonable or impracticable directions in the will in regard to the management of the property will be designated, on the doctrine of *cy-pres*, which to that extent is recognized in Pennsylvania. The most important case establishing the doctrine of charitable uses in this country is that which came under the will of Stephen Girard, which, with that of the Dartmouth College, are the leading cases on that subject. Stephen Girard died in Philadelphia in the year 1831, leaving an estate of some \$7,000,000. After sundry bequests he left by his will the real and personal residue of his estate to "the mayor, aldermen, and citizens of Philadelphia" for the purpose of constructing and furnishing a college and outbuildings for the education and maintenance of not less than 300 orphans, who might come from any part of the State of Pennsylvania (those from the city of Philadelphia to have a preference) or from the cities of New York and New Orleans, said residuary estate amounting to the sum of \$2,000,000. The heirs of Mr. Girard contested the validity of the trusts by reason of the uncertainty of the designation of the beneficiaries of the legacy. They also contended that the corporation of the city of Philadelphia was not authorized by its charter to administer the trusts of this legacy, and that the intentions of the testator would be defeated by the substitution of any other trustee, and that the plan of education proposed is anti-Christian, because in said will the testator forbids a minister of any creed to preach or teach in the college; it is therefore repugnant to the constitution and laws of Pennsylvania. The provisions of the will were defended in a most masterly argument by Horace Binney of Philadelphia, and his views were sustained by the Supreme Court of the United States. It was decided that the trusts created by the will were valid, and that the city of Philadelphia under its charter is invested with powers and rights to take property upon trust for charitable purposes which are not otherwise obnoxious to legal animadversion; that the trusts mentioned in the will of Stephen Girard are of an eleemosynary nature and charitable uses in a judicial sense; that donations for the establishment of colleges, schools, and seminaries of learning, and especially such as are for the education of orphans and poor scholars, are charities in the

sense of the common law; and, finally, that the exclusion of all ecclesiastics, missionaries, and ministers of any sort from holding or exercising any station or duty in a college, or even visiting the same, or the limitation of the instruction to be given to the scholars to pure morality, general benevolence, a love of truth, sobriety, and industry, is not so derogatory and hostile to the Christian religion as to make a devise for the foundation of such a college void according to the constitution and laws of Pennsylvania. Some years after this another attempt was made by the heirs of Mr. Girard to have the trusts declared void on the ground that the act of consolidation of the city of Philadelphia was a merger of the old city in the new, and therefore the city was incapable of executing the trusts beyond that of the college. The Supreme Court, however, decided that the estate was vested by will in the city on valid legal trusts, and it was fully competent to execute; that the Consolidation Act did not destroy the identity of the city as a corporation, and it has every capacity under its new charter to hold, and authority necessary to execute, the trusts of the will. Under these plenary rulings the college, under the careful care of the city, has grown to those magnificent proportions that render it a lasting glory of philanthropy and an undying evidence of the beneficial results of charity. (F. H.)

CHARITY ORGANIZATION. This phrase, derived from the title of the "London Society for Organizing Charitable Relief and Repressing Mendicity" by popular abbreviation, has come into recent use to denote a new phase of bringing the benevolent energies of the community to bear upon the social problems of pauperism and indigence.

There are three systems of relief existing in Europe: first, spontaneous and voluntary; second, sequestered endowments and voluntary contributions supervised and assisted by the civil authority; third, a poor-rate levied by taxation and administered by the officials of the state. In each case this description is more theoretical than actual, since in countries where voluntary private action is left free there are old endowments, the management of which is assumed or supervised by the civil power, and in both the other cases the state has not suppressed independent relief, and in some instances has not even sought to do so. Italy may be taken as an example of unhindered voluntary charity; state supervision of voluntary contributions, with aid from the public treasury, is characteristic of the French empire and of those provinces attached directly to the administration of the First Napoleon; Great Britain and Prussia, with the Scandinavian nations, are instances of the third system, or a poor-tax. As a rule, the United States of America have followed with general fidelity the example of Great Britain. In Prussia, Denmark, Sweden, and in Norway until 1863, the right of a pauper to claim relief from the state is distinctly affirmed by statute. While there is no legislative direction to the same effect in Great Britain, yet a poor-guardian refusing to render the prescribed legal aid to an applicant is liable to penalties for such neglect, and in some instances the pauper can enforce his claim at law.

In 1572, Parliament enacted that "rogues, vagabonds, and sturdy beggars" for the first offence were "to be grievously whipped" and seared in the right ear "with a hot iron of the compass of an inch about;" for the second, they were to be adjudged felons; and for the third, to suffer death without the benefit of clergy. The executions under Elizabeth were from 300 to 400 annually. Such severity characterized most countries of Europe until the close of the last century. Repression so stern demanded as its justification some adequate provision for meritorious destitution. In 1601 the poor-law system of England began in an act of Parliament which, while forbidding vagrancy and begging, also defined the settlement of the poor in parishes, made these responsible for the relief of their impotent and indigent, ordered the establishment of poor-houses, and authorized the levy of a poor-rate upon real and personal property. The responsibility of the parish for its own destitution and the poor-tax are the germinal elements in the law. They remained unchanged until 1834, save that in 1796 an act was

passed giving color to the administration of relief, directing that it should be adequate to the support of the pauper "in a state of comfort." From this time, and simultaneously with the phenomenal increase of modern mechanical inventions, bringing with it a redistribution of population and a concentration of capital and manufactures in great towns, the burden of the taxpayer grew more onerous, until it reached £7,890,000, paid by 11,500,000 inhabitants, in 1818. In some instances the tax amounted to the confiscation of property. A commission appointed to investigate the operation of the poor-laws in 1832 reported that the magistrates were wont to have a scale of maintenance up to which they brought the income of ill-requited labor by supplementing wages with allowance from the parish, arguing that it was better to provide partial than complete support for the poor. This allowance became an element in the market-price of labor. It served to depress it and to bring the families of workmen into deplorable wretchedness. The report led to the Poor-Laws Amendment Bill of Earl Grey's Government in 1834. Its leading provisions were the creation of a board of commissioners to inspect and regulate relief throughout England and Wales; the suppression of the authority of justices to order out-door relief; the erection of work-houses, within which work should be given according to their strength to the impotent and destitute. In these institutions husbands and wives, parents and children, were to be separated, a pauper dress to be provided. The infirm, the young, and the vicious were under the same system of discipline and disgrace. Neighboring parishes might unite under the authority of the commissioners in building a work-house.

The commercial distress which followed almost at once made it impossible to carry the amendment act into complete execution, although the agitation attending its passage so improved the administration of the poor-fund that the expenditure fell from £6,317,255 to £4,044,731 in three years. The history of this law was thus epitomized by Mr. Edward Denison in 1869: "The principle of its framers was to offer board and lodging in the work-house to all who would take it, the only further consideration being how to make the recipient's condition so uncomfortable that he would avoid it as long as he could, and get out of it on the first opportunity. Possibly, this system, thoroughly and universally enforced by able administrators, might have stamped out pauperism altogether, to the infinite advantage of the laboring class. But the law never was in harmony with public opinion, and it was very partially or negligently executed, and of course broke down. The Poor-Law of 1834 has practically been repealed long ago." Its relation to family ties may be illustrated with a single instance. Prof. Fawcett of Cambridge, England, in his book on *Pauperism*, has shown how the provision of the state for a parish child exceeds, in the amount allowed for board, clothing, and medical care to those to whom it is indentured, the sum which an agricultural laborer could grant to a single member of an average family, and in its schooling and visitation by two ladies of the neighborhood the intellectual and moral resources of his home. He observes that the law holds out inducements to him, addressed to the most unselfish parental impulses, to abandon his offspring.

The Scotch law was assimilated to the English in 1845. Under the ancient statute of 1579 no provision was made for the able-bodied. It constituted the provosts, bailiffs, and justices of any burgh or town a commission to register the aged, impotent, and other poor in every parish, to impose a tax upon the substance of the people for their sustenance, to put them at work according to their strength, to indenture children, to license the poor to gather alms at the doors of parishioners, "so as always it be speedily appoynted and aggried how the poore of that parochin sall be

sustained within the same, and not be chargeable to uthers nor troublesome to strangers." By subsequent proclamations of the Privy Council the assessment of rates and the management of the poor-fund was committed to the magistrates of the towns and to the proprietors and kirk-sessions in rural parishes. Under this authority what destitution exceeded the liberality of cotters to each other fell under the oversight of the kirk. The custom arose of taking a collection at the church-door at the Sunday morning service, and in cities of turning it in to the town hospital, whence out-and-in-door relief was distributed among the poor from all the parishes. According to Dr. Chalmers, compulsory assessment did not exist in more than eight Scotch parishes prior to 1740. But in the southern counties, and especially in their cities, the influence of England led to the increase of assessments, so that in 1820 it existed in 192 out of 885 parishes, and in 1839 in more than one-fourth, comprising half the population of Scotland. The disruption of the Kirk impaired the competency of the sessions to administer the poor-funds, and the influx of Irish emigrants, with the depression following Earl Grey's administration, carried pauperism to an appalling height, one-sixth of the population of Glasgow being at one time on the relief-list. In 1845, to promote similarity of method and adequate assistance, Parliament made the Scotch law conform to the English in respect to a general board of commissioners and the work-house test of destitution. As an illustration of the effect of the new system there may be instanced a proprietor who prior to 1845 gave £5 a year to the church-door collection, and was thought liberal, but in 1869 paid in rates £407 17s., and his tenants an equal amount. Our authority adds, "That whereas a more happy, contented set of paupers could hardly be found before 1845, a more discontented set than they are in 1869 and 1870 can hardly be found, notwithstanding a constant system of begging for additional help from the charitable."

While the poor-rates have diminished the kindnesses of the poor to each other, the rich have grown more lavish as their enormous concentration of wealth has removed them from contact with their lowlier neighbors. The charitable foundations of Great Britain also have increased rapidly in value, until their expenditure in London is estimated to exceed that of the parish unions. Of this great mass of private charity there is no authentic computation. Many parochial, municipal, and trust corporations make no accounting to the public. The London City companies are believed to control an annual income from trust funds of over \$500,000. Edward Denison wrote not long before his death in 1870, "Certain calculations put the London charities at a total of £7,000,000—enough to give £17 a head to 400,000 souls"—an estimate which reckons every seventh person in that city a recipient of alms, and allows \$400 to an average-sized family, or more than an unskilled laborer can earn in England. Private charities, when done without personal acquaintance with the poor or executed by the official almoners of some board of directors, have the same effect as public relief. Their evil influence has been accelerated by the changes in the distribution of population arising from industrial reorganization. Great cities have grown up where the poor are pressed into obscure streets and uncleanly outskirts. Thither labor migrates for employment, leaving the restraints and ties of home; thither the predatory come to take advantage of the opportunities afforded by unorganized charity and by the obscurity which a man can have in a crowd. For these provision is made in the casual wards of the work-house or police-station, in night-refuges, in soup and clothing societies, and in the thoughtless alms of the street or the back-door. Acting without concert, the uncounted and irresponsible private agencies of relief strip away the dread of being penniless in a great city and facilitate the practices of the impostor. In all the systems

now passed in review the same features are apparent: pauperism grows with the provision made for its relief; public, corporate, or indiscriminate personal relief deranges the natural laws of economy, weakens the ties of kindred, dries up the fountains of personal kindness, facilitates living among strangers, attracts the depraved and dissolute, extinguishes gratitude under its indifference or mechanical administration, impairs the motives to thrift and frugality, envelops and discourages beneficence with its fruitlessness, or, worse, with its imposture, invades the self-respect of the pauper, degrades the condition of the laborer. They have opened a wide avenue from honorable independence to the inveterate and unsocial vices of self-abandonment, intemperance, squalor, deception, and licentiousness.

Such is the problem charity organizations had to encounter. Fortunately, there was experience to guide its promoters. Dr. Chalmers's administration of St. John's Church, though it was but temporary, remained as more than a reminiscence; it was a demonstration. In 1819 the parish of St. John's, recently organized on the outskirts of Glasgow, was offered by the magistrates to Dr. Chalmers, then settled in the Iron parish of the same city. He says: "The great inducement to the acceptance of that parish was my hope to obtain a separate and independent management of the poor." He stipulated with the magistrates for the withdrawal of St. John's from connection with the town hospital, which was the general agent of the city for relief. The parish was to retain its church-door collection, amounting to £400 a year, and, on the other hand, was to care for all new applicants for aid arising in its limits. Eventually, it offered to take off the hospital lists the paupers previously sent thither from its territory. The parish comprised a population of about 10,000, and was the largest and poorest of any in the city. Dr. Chalmers's writings show that he regarded the Scotch poor-laws as not essentially different from the English, but that the habit and practice of the two countries had been in great contrast until the close of the last century; that the poor-house and compulsory relief had made but slow progress in Scotland, notwithstanding law and royal proclamations; that when there was no assessment or available relief-fund the poor preserved their habits of economy and frugality, were donors of halfpence to the church-collections, maintained an affectionate family solicitude one for another, relieved the distress among themselves with a bounty which, while made up of small benefactions, was greater in the aggregate than the administrators of any relief-fund could allow, awakened the interest and enjoyed the intercourse of their wealthier and more influential neighbors, were soothed and animated by a personal friendliness permeating the community which fostered a pure and noble social unity and morality. Public relief he regarded as an extravagant and corrupting system which reversed these conditions. It awakened by its apparent magnificence expectations in the poor which it could not gratify; it created in them a sense of right to aid in distress, and thus relaxed their thrift and self-reliance: it extinguished gratitude, for compulsory relief was destitute of that spontaneous personal interest which reaches the heart; it separated the rich from the poor, offering its own mechanism to satisfy the conscience of the benevolent; it broke down the generosity of the individual in all classes of society; it hindered the circulation of those influences which flow from example, personal sympathy, counsel, and reciprocal esteem. Dissolving so many social ties, it opened "advantageous scope and license to the dexterity" of a people whom it rapidly rendered criminal by sapping their moral and social resources. Dr. Chalmers wished to return to the earlier practice of the Kirk, and by preventing the rise of new cases of pauperism to extinguish the whole evil through the operation of death upon the old list of dependants. His mode was to create a large body of deacons, one

for each 300 to 500 of the population. They volunteered from other parishes, as St. John's was too "plebeian," to use Dr. Chalmers's term, to furnish enough men qualified by education, experience, and station. These deacons were to attend to every application referred to them or arising in their district; they were to act with tact, friendliness, and judgment, noting the circumstances of the applicant, the causes of his distress, and the available means of putting him beyond dependence on public charity. The means placed at the disposal of the deacons were the proceeds of a church-door collection taken at the evening service, which the doctor conducted for his poor parishioners, his morning congregation being largely composed of proprietors and wealthy people from other districts of the city. This fund amounted annually to about £80; the morning collection was devoted to parochial schools.

During the four years of Dr. Chalmers's charge, so far from driving the poor from the parish, they came in double numbers, and but twenty new cases of pauperism were found, of which five were the result of crime, either illegitimacy or desertion of the family. The evening penny-collection proved more than adequate. His testimony before a committee of the House of Commons was that the poor of his parish were in no worse economic condition than those of any other parish in Glasgow, and that he attributed their comfort to these four causes: "A certain stimulus to their industry and economy when loosened from their dependence on a large compulsory fund; an increased aid and support from relations to each other; an increased kindness among the contiguous families of that neighborhood; and, lastly, a stimulated benevolence on the part of the wealthy to the poorer classes." These conclusions are sustained by a number of instances related in the testimony. Dr. Chalmers's scheme continued in operation at St. John's under successive ministers until the agitation of the Kirk attending its disruption put an end to it. It was imitated in a few other parishes.

Attention has been widely attracted to the methods adopted in Elberfeld, and copied in Barmen and Crefeld. In 1823 the Prussian Government authorized each commune in the Düsseldorf circle to take charge of its own poor-relief, but until 1850 the old system, founded upon that of the French empire, remained in vogue. Then Elberfeld employed its liberty to set on foot its own plan. The town was divided into sixty visiting districts, but the Lutherans, the wealthiest community of the city, were permitted to take charge of their own paupers. The visitors were too few, their duties were neglected, expenditure increased, and the prospect was alarming. Every twelfth person was a pauper, and the cost of the relief in 1852 was £8932, while in the Lutheran community it was 30 per cent. higher than in the rest of the city. At the instigation of Daniel von der Heydt, a banker of Elberfeld and a brother of the Prussian minister of finance, the existing scheme was authorized. It comprises an ordinance and an instruction. The ordinance provides for a central board consisting of a president, four councillors, and four citizens, all chosen by the town council. The official term is three years, and rotates in such a manner as always to preserve an experienced majority. Under this board are eighteen overseers, each with fourteen visitors, all of whom are unpaid. They are recommended for appointment to the town council by the citizens of the several districts, and are bound by law to serve. The visitors of each district meet fortnightly under the presidency of the overseer, and submit a report of each application for and each disbursement of relief. Each case is decided in accordance with minute rules by a majority vote, subject to appeal by the overseer. The records of these meetings are all transmitted to the Verwaltung, or general administrative body above described. It meets on alternate weeks to the district committees, and the overseers are present, with the committees in charge of the poor.

house, the orphanage, and the hospital. The duties of the Verwaltung are "to investigate the condition of the poor and the special causes of pauperism, as well as the means not only of relieving but of preventing it," to hear reports of the overseers and appeals from the district meetings, to receive estimates and make appropriations for each district. The overseer must hand over the appropriations to the several visitors. Funds are raised by special and general taxation imposed by the town council. Visitors are well-conditioned and respected citizens, who are to act as friends and advisers to the poor, and to this end are limited to the charge of not more than four cases of relief at a time.

The instruction is very elaborate. It excludes from relief persons who have relatives bound in law to assist them, and this obligation extends to connections by marriage. It excludes those in receipt of private charity, but in practice private may be supplemented by town aid up to a fixed standard. Those hiring domestic servants must maintain them four weeks after they become destitute from sickness. An applicant must pass through an examination even more scrutinizing than the Leipsic Fragebogen, and this is the only test of destitution. In accepting aid he passes under the surveillance of the visitor, who visits him frequently, notes changes in his circumstances, urges him to find work, and in case of failure to do so assigns him employment. If the pauper refuse his allotted task, waste the relief granted him, or is idle, drunken, or dissolute, his maintenance may be reduced, and until recently he was liable to imprisonment. The relief granted is medical attendance at home or in hospital, a support graduated to a scale of bare sustenance, and schooling. The income of the able-bodied who cannot procure employment may be brought up to this scale by the poor-relief. The poor-house is really a refuge for the aged and infirm, and these go out to work as their strength will permit, and may claim such part of their earnings as exceeds the cost of their maintenance. The result of this system has been that while from 1852 to 1869 population increased from 50,000 to 71,000, the number of paupers declined from 8 to 1.5 per cent., or from 4000 to 1062, and the expenditures from £8932 to £3860. At the same time there was a steady increase in the membership of provident clubs. In 1870 there were reported 822 new cases to the fortnightly meetings, but these were discharged at the rate of 60 each month.

The German plans now adduced agree in these points: in each city the whole field is occupied and virtually controlled by one organization; voluntary effort is joined with official; each society aims not at expending its resources, but at making a resort to them the last resource of the poor; it individualizes each case and adjusts the treatment to its circumstances; it employs a large number of friendly visitors to be the counsellors of the unfortunate, and by their means to make the experience and character of the respected available for the depressed; it enforces education; it stimulates the sense of family responsibility; it compels the pauper to work; it insists that the acceptance of relief carries with it the obligation of complete confidence and of compliance with the judgment of its grantors; it avowedly seeks to understand and remove the causes of pauperism, not by general social reformation, but specifically and individually. In each city success depends largely upon enlisting the services of competent, faithful visitors, and upon the frequency and thoroughness of their conferences and harmony of action.

The causes which led to the formation of the London Charity Organization Society were many and intricate. Its promoters had all the foregoing experience of failure and of success before them. They had seen the Society of St. Vincent de Paul spread itself over nearly all Europe and America, carrying with it the spirit of its founders, who were advised by M. Bailly, the editor of the *Tribune catholique* in Paris, to place "their education, their intelligence, their special knowledge

of law or science, and their general knowledge of life, at the disposal of the poor; that, instead of only taking them some little material relief, they should strive to win their confidence, learn all about their affairs, and then see how they could best help them to help themselves." Its conferences were in every Catholic parish of England.

District-visiting societies had been formed in London as early as 1828 and 1844 to prompt local effort to administer counsel and aid in the homes of the poor—to connect isolated parochial beneficence in concert of action. Older still were societies for repressing mendicity, which distributed investigation-tickets to be given in place of alms to beggars. Immediately before them lay the work of Octavia Hill and Edward Denison, which was peculiarly conspicuous as successfully carried on in the poorest and most abject parts of London at a time when they were visited by severe and protracted distress. Others had preceded Miss Hill in the improvement of tenements for the poor, but she aimed at the reformation of the degraded and their apartments together. Acting as the almoner of John Ruskin, she went into unsightly courts in the east end of London, beginning in 1864, and purchased dilapidated and filthy tenements, which she placed in sanitary condition. She enforced strict regulations of cleanliness upon her tenants, and punctually collected her rents in full with her own hand. The influence of her courage, patience, firmness, and justness availed to induce some of the most squalid families of London to exchange their filthy and dissolute habits for a course of life suited to their improved tenements. Alms were not given; probably they would have marred her moral miracle.

During "the East-End Distress," as it was called, young Edward Denison volunteered to act as the almoner for the Society for the Relief of Distress. He was the son of the bishop of Salisbury and nephew of the Speaker of the House of Commons, was a graduate of Eton and Christ Church, Oxford, and was at this time but twenty-seven years of age. Disappointed with the results of doling out alms, he resolved to locate among the poor and by personal daily contact with them discover the secrets of their wretchedness. In 1868 he removed to Philpot Street, Stepney, and resided there, teaching and visiting, for eight months. Thence he wrote: "I am beginning seriously to believe that all bodily aid to the poor is a mistake; whereas by giving alms you keep them permanently crooked. Build school-houses, pay teachers, give prizes, frame workmen's clubs, help them to help themselves, lend them your brains, but give them no money, except what you sink in such undertakings." Denison and his associates had entered upon schemes to unite the charities of London in some system of co-operation, and they were the pioneers of the London Society for Organizing Charity, and participants in its earliest action. In 1869, Lord Lichfield, Sir Charles Trevelyan, and others, who had joined for some less defined enterprise, resolved to call their association The London Society for Organizing Charity and Repressing Mendicity. Their purpose was much advanced by a minute of the poor-law commissioners passed Nov. 20th, recognizing private charity as an element to be reckoned in the distribution of public relief. The promoters of the new plan aimed at no less than bringing all the charitable relief of London, whether legal, corporate, or individual, into correspondence and concert of administration. They offered their own organization as a device by which this could be achieved without violation of charters, surrender of independence, or wounded *amour propre*. The society is under the presidency of the bishop of London; the chairman of its council is Prince Leopold. The council consists of the chairman, vice-chairmen, and treasurers; of annually-elected representatives from each district committee, with its chairman and secretaries not exceeding two; of additional members in the proportion of one

to four district representatives; and of representatives of London charitable institutions. This council works through an executive committee. There are thirty-eight district committees, one for each metropolitan poor-law union. As far as possible, these consist of ministers of religion, guardians of the poor, and representatives of the principal local charities. The society comprises the district committees and donors of one guinea or more to the funds of the council, and it meets annually or by special call. District committees are to deal with all cases of alleged want referred to them. The council supervises and assists the district committees, considers questions of principle and general methods, seeks the systematic co-operation of London's larger institutions, and to improve the administration of charity, to suppress imposture; and it corresponds with similar societies elsewhere. The objects of the society are—co-operation of all charitable agencies in order to check the evils of "overlapping" relief by independent action; to investigate all applications for relief, however made; to obtain from proper charities or from individuals suitable and adequate aid for deserving cases; to assist, in the absence of other resources, and by loans if possible, cases in which temporary help may tend to permanent benefit; to repress mendicancy by gratuitous distribution of investigation-tickets; to place its investigations at the service of charitable agencies and private persons having a proper claim thereto; to inform the public regarding existing charities; to become a centre of reference and information; to promote social and sanitary reforms and habits of providence and self-reliance. Its main principles of work are thorough investigation before relief, and procuring assistance adequate to render the applicant independent of future aid. It does not desire to be a relieving agency, but to direct the benevolent forces of the community into efficacious channels. Relief is determined by the district committee after investigation, and is not restricted in character; whatever is requisite is attempted, and all appliances and agencies available are utilized. Investigation becomes a discriminative test between imposture and destitution; it often discloses legitimate resources which render the applicant independent of all charity at once, such as the sympathy of kindred, the means of retrieving a false step, a better domestic economy, a pension due, a chance of employment.

The results of the society's work are to be sought in the abatement of the poor-rate, in the reduced expenditure of other charitable institutions, in diminished number of mendicants, and in the arrest of many a progress toward pauperism and vice. It is estimated that the expenditure of London on the care of its poor has been reduced about 30 per cent. since 1869, and it is stated that one can obtain information concerning almost every applicant for aid who may accost him on the streets or at his door in that city within twenty-four hours. The society has about ninety subordinate or affiliated organizations in the three kingdoms. From 1869 to 1881 the number of paupers in England and Wales receded from 1,079,391, of which one-fifth were able-bodied, to 803,126, of which one-seventh were able-bodied. Criminal convictions sank from 14,340 to 11,214 in 1880, and the attendance on inspected schools nearly trebled, while the inspections only doubled. In six poor-unions of London pauperism decreased from 1869 to 1879 from 26,289 to 14,181. The coincidence of these facts with the history of charity organization is at least significant of the remedial influence of the new attack on pauperism.

Similar movements have appeared in the United States, avowedly founded upon the English plan. They were preceded by pioneer enterprises, some of which failed from vagueness of aim or inadequate method, and some merged into the organization societies. In 1869 the Hebrews of Philadelphia merged their five leading relief societies into one administration, to secure for their own community the same

ends as are sought by charity organizationists. In 1873 the Germantown Relief Society was started in a suburban ward of Philadelphia. It had a board of seven managers and an auxiliary corps of women visitors. The old borough was districted so as to give but few poor to each visitor; every case was carefully searched out, and the administration was judicial, sympathetic, and firm. Within a few years the society gained such a hold upon the community that the poor-guardians of Germantown and its dispensary came into hearty co-operation. This organization is now one of the local branches of the Philadelphia Society for Organizing Charity, which was established in 1878. Since then the city councils have cut off their appropriations for out-door relief, which amounted to \$50,000 in 1878, on the ground of the existence of this society. It comprises ward or local branches covering the greater portion of the city, and a central board exercising an advisory supervision over the former. The wards have a local board with a paid investigating and relieving agent, and an auxiliary corps of female visitors. Once a month the entire society is summoned together for conference upon questions of social science.

In Buffalo an organization was made in December, 1877, and the society was very successful from the start in securing the co-operation of the civic authorities and of the leading charitable societies of all denominations. Before its influence the out-relief of the poor-master shrank away by many thousands of dollars. It adheres strictly, except in a very few emergency cases, to the refusal of any relief whatever, but applies itself to investigation, to stimulating provident schemes, and to visitation. In Brooklyn, out-door relief from public funds was abolished in 1878, and in the same year the Bureau of Charities was founded, although it did not begin active operations until three years later. In New York an attempt was made to organize a Board of United Charities for co-operative purposes some years ago, but it fell to pieces, owing to jealousies and misunderstandings not adequately anticipated. For this reason it may be that the metropolis of the country delayed to create a charity organization society until 1882.

In Boston a similar movement takes the name of "Associated Charities." Its initial work was much facilitated by the existence of the Charity Building on Chardon Street, an edifice erected partly by private and partly by civic munificence in order to concentrate under its roof the offices of the municipal and general charities of the city. A certain amount of co-operation was already established, and "The Associated Charities" was able to perfect a very thorough system of registration for the use of the benevolent agencies of the city. The society has created district auxiliaries called "conferences," which are composed of representatives of parishes, of local charities, and of volunteer visitors. No relief is given by the society, as its object and the endeavor of the visitors are to lift each case of distress above dependence on alms.

In all the charity-organization societies there is agreement in aim. They avoid all proselyting on the one hand, and on the other encourage each religious community to provide physical, social, and moral relief for its own members. They are not political, though in some instances, as in Buffalo and Philadelphia, certain civic functionaries, especially those charged with the care of the poor and the criminal, are *ex-officio* managers. In some instances no relief is given, and in others the auxiliary branches of the society are largely occupied with grants of aid. In nearly all instances some new provident or educational or reformatory agency has been instituted by the organization of charities. Owing as well to the nature as to the newness of these establishments statistics of value are unattainable. The report of the National Conference of Charities held in Boston in July, 1881, presents returns from seventeen cities, having a population of 3,000,000, where charity organization has established

itself. To them New York must now be added. Eleven of these associations reported a contributing and active membership of 13,593, and a cost of administration, exclusive of relief, in twelve cities, of \$28,900.37 for the previous year.

The following is a list of all the charity-organization societies known to exist in the United States in July, 1882, with the dates of their founding:

Place.	Name.	When organized.
Buffalo, N. Y.,	Charity Organization Society,	Dec. 11, 1877.
New Haven, Conn.,	Board of Associated Charities,	June 1, 1878.
Philadelphia, Pa.,	Society for Organizing Charity,	" 13, 1878.
Brooklyn, L. I.,	Bureau of Charities,	Nov. 26, 1878.
Syracuse, N. Y.,	Bureau of Labor and Charities,	" —, 1878.
Harrisburg, Pa.,		Jan. 15, 1879.
Newport, R. I.,	Charity Organization Society,	Feb. 18, 1879.
Boston, Mass.,	Associated Charities,	" 26, 1879.
Poughkeepsie, N. Y.,	Charity Organization Society,	June 9, 1879.
Cincinnati, O.,	Associated Charities,	Nov. 18, 1879.
Portland, Me.,	"	" —, 1879.
Indianapolis, Ind.,	Charity Organization Society,	Dec. 12, 1879.
Detroit, Mich.,	Association of Charities,	Feb. 11, 1880.
Cleveland, O.,	Society for Organizing Charity,	Jan. 14, 1881.
Salem, N. J.,	"	" 29, 1881.
Taunton, Mass.,	Associated Charities,	Mar. 28, 1881.
Lowell, "	"	Apr. 26, 1881.
Baltimore, Md.,	Charity Organization Society,	" 30, 1881.
Washington, D. C.,	Associated Charities,	June 7, 1881.
Milwaukee, Wis.,	"	Dec. 22, 1881.
New York,	Charity Organization Society,	Jan. 26, 1882.

CHARITY, SISTERS OF, IN THE U. S. Among the numerous religious societies of the Catholic Church there are several whose general designation is that of "Sisters of Charity." These are all branches of the same parent stock, *La Compagnie des Filles de la Charité*, established in France in the year 1633 by St. Vincent de Paul, with the aid of a widow lady named Legras. There are several orders of the Sisters of Charity in the United States:

I. EMMITTSBURG SISTERS.—The founder of the Sisters of Charity in the United States was an American widow lady, Mrs. Elizabeth Seton, a native of the city of New York and a convert of the Catholic Church. Having removed to Baltimore in 1808, she was encouraged to begin a society for the education of girls and for other pious objects. On June 1, 1809, Mrs. Seton and four companions, with the approval of Archbishop Carroll, formed themselves into a religious community. Mother Seton, as Mrs. Seton was now called, bound herself by vow to poverty, chastity, and obedience, and with her associates assumed a uniform habit, which consisted in a plain black dress with a short cape, a white muslin cap with a crimped border, and a black crape band around the head fastened under the chin. In July, 1809, Mrs. Seton and her companions, who now numbered ten, established themselves near Emmittsburg, in Frederick co., Md., on a small property which they called "St. Joseph's." As it had been intended from the beginning to affiliate the new institute to the Daughters of Charity in France, measures were taken to procure the rules and constitutions of their society, and to invite some of them to come to America and aid in establishing a branch of the order in this country. Bishop Flaget of Bardstown, Ky., succeeded in obtaining the assent of the society at Paris to the proposed measure, and several sisters were appointed to proceed to the United States, but their departure was forbidden by the French Government. A copy of their rules, however, was obtained in August, 1810, and the new community took the name of Sisters of Charity of St. Joseph. In 1812 there were twenty sisters. After many privations the community became quite flourishing, and before Mother Seton's death, which took place Jan. 4, 1821, sisters had been sent to Philadelphia and New York. St. Joseph's continued to be the mother-house, and comprised the novitiate and a boarding-school or academy for young ladies, and the services of the sisters were extended to many parts of the country. On March 25, 1850, the long-delayed union of the Emmittsburg sisters with the sisters of France was completed. The habit hitherto worn was then exchanged for the bluish-gray woollen dress and white *cornette* of the French sisters. In 1878 the Emmittsburg community

numbered 1179 sisters, who directed 106 establishments, such as schools (for girls only), hospitals, and asylums, in different parts of the United States.

II. NEW YORK SISTERS.—The New York Sisters of Charity adhere to the costume and rules of Mother Seton, and represent the original society as it existed up to the union with the French sisters. Bishop Connolly of New York obtained some sisters from Emmittsburg in 1817, and on Sept. 13 they took charge of St. Patrick's orphan asylum in that city. In 1846 there were fifty sisters in the diocese of New York, and Archbishop Hughes determined to organize a community distinct from and independent of that of Emmittsburg. Thirty-one sisters remained in the old congregation, and on Sept. 8, 1846, formed a community under the title of "Sisters of Charity of St. Vincent de Paul." Pope Pius IX. approved the new order, and conferred upon its members all the rights and privileges granted to the Sisters of Charity in France. The growth of the new community was rapid, although its members are now only found in New England and the Middle States. They number (1883) 786 members, who conduct 98 establishments of charity and education. The mother-house, to which are attached the novitiate and an academy for young ladies, is at Mount St. Vincent on the Hudson.

III. MADISON SISTERS.—The Sisters of Charity in New Jersey, with the exception of those attached to St. Mary's Church in Jersey City, are an independent community, although an offshoot from the New York sisters. They were established by Bishop Bayley on Sept. 30, 1857. Their habit differs only in a slight degree from that of the New York community, but their rule is the same. The mother-house is near Madison, in Morris county, to which are attached the novitiate and an academy for young ladies. The number of sisters of this branch of the order is 375, who conduct 3 orphan asylums, 48 select or parochial schools, and 1 protectory, all in the dioceses of Newark and Trenton, N. J. (1883).

IV. NAZARETH SISTERS.—These Sisters of Charity were founded by Bishop David in Kentucky. They form an independent community, distinct from any other. In November, 1812, two pious ladies of mature age, Sister Theresa Carico and Miss Elizabeth Wells, began their work of charity in a small log house. On Jan. 21, 1813, another member, Sister Catharine Spalding, joined the young community, and on the same day their founder and superior presented to them the provisional rules which he had drawn up, unfolding the nature, object, and duties of the new society. In June of the same year the community was increased to six members, and two years later the society adopted the rules of the French sisters. The habit of the sisters is a bluish woollen dress and a white cap without the *cornettes*. The mother-house is at Nazareth, near Bardstown, Ky., which contains the novitiate and an academy for young ladies. There are 338 members in the society, which conducts 1 hospital, 1 infirmary, 1 orphan asylum, and about 26 schools and academies in Kentucky, besides other establishments in Mississippi and Ohio (1883).

V. PROVIDENCE SISTERS.—The "Sisters of Charity of the House of Providence" were established in Canada. The mother-house is at Montreal. It was founded in the year 1844 by Bishop Bourget. The first superior was Madame Garrelin, who procured a copy of the rules of St. Vincent de Paul, which have been since followed by the community. In 1854 a colony of these sisters was established in Burlington, Vt., at the invitation of Bishop de Goesbriand. There are 10 sisters there, who direct the Providence orphan asylum and hospital; and several houses of the order have been founded in the West and on the Pacific coast—viz., 3 in Oregon, 7 in Washington, 4 in Montana, and 2 in Idaho Territories (1882). The habit of the sisters is a dress and cape of coarse black serge, and a coif of same color and material trimmed with white linen.

The *Sisters of Charity of Montreal*, commonly called Gray Nuns from the color of their habit, do not follow the rule of St. Vincent de Paul, but embrace works of charity in hospitals, asylums, and poor schools. They were introduced into the United States by Archbishop Williams of Boston in 1866. (R. S.)

CHARLEMONT, JAMES CAULFIELD, first EARL OF (1728–1799), an Irish politician, born at Dublin, Aug. 18, 1720, the son of the viscount Charlemont. In early life he travelled extensively on the Continent and in the Levant, making careful studies of the antiquities and the costumes of various countries. Returning he took his seat in the Irish House of Peers, and in 1763 was made an earl in consequence of his activity in putting down a rebellion. He was an early patron and friend of Burke, Flood, and Grattan, and in 1775 sent Grattan to Parliament for the borough of Charlemont. In England he was the friend and associate of Johnson, Goldsmith, Reynolds, and Hogarth. During the American Revolutionary war Charlemont commanded the volunteer army for the defence of Ireland. His *Original Letters* (1820) are of much historical interest. He wrote some valuable papers for the Royal Irish Academy, of which he was president, and left a *History of Italian Poetry* (never printed). He died Aug. 4, 1799. Lord Charlemont was a man of amiable character, varied accomplishments, and agreeable manners, and was a liberal patron of art and letters. His conservatism or timidity in conceding the disbandment of the volunteer army is regarded as one of the steps which led to the rebellion of 1798, and the resulting union with Great Britain.

CHARLES XV. (LOUIS EUGENE) (1826–1872), king of Sweden and Norway, was born May 3, 1826. He was grandson of Marshal Bernadotte, who was made king of Sweden in 1818, and succeeded his father, Oscar I., July 8, 1859. He was crowned at Stockholm, May 3, 1860, and at Trondheim, Norway, Aug. 5, 1860. He was greatly beloved by his people, and during his reign many reforms were made both in parliamentary affairs and in the general administration. He was highly accomplished, and was noted for his literary and artistic tastes. He died at Malmö, Sept. 18, 1872, deeply regretted by the whole nation. His fine collection of works of art in the castle of Ulriksdal, including paintings illustrative of Scandinavian history, was bequeathed to the state, as was also his collection of arms, which has been placed in the National Museum at Stockholm.—His only child, PRINCESS LOUISE JOSEPHINE EUGÉNIE, born Oct. 31, 1851, was married to Christian Frederic, prince-royal of Denmark, July 28, 1869.

CHARLES, ELIZABETH RUNDLE, an English writer, was born about 1826. She was married to Mr. Andrew P. Charles of London. She has written a number of popular stories illustrating important periods in the church history and religious life of modern times. The first of these (*Chronicles of the Schönberg-Cotta Family*, 1863) gave a vivid sketch of the life of Luther; the *Diary of Mrs. Kitty Trevelyan* (1864) illustrates the rise of Methodism in England; *The Early Dawn* (1864) relates the conversion of Britain to Christianity; *The Draytons and the Davenants* (1866) is a story of the Parliamentary war; and a sequel to this, called *On both Sides of the Sea* (1867), relates partly to the settlement of New England. Besides these historical stories, she has published various religious books, among which are *Mary the Handmaid of the Lord* (1865), *The Song without Words* (1865), *Women of the Gospels* (1866). Her religious novels include *Winifred Bertram* (1865), *Against the Stream* (1873), *The Bertram Family* (1875), *Conquering and to Conquer* (1875). One of her most valuable books is *The Voice of Christian Life in Song*.

CHARLES CITY, the county-seat of Floyd co., Iowa, is on Cedar River and at the intersection of the Iowa division of the Chicago, Milwaukee, and St. Paul Railroad with the Cedar Falls and Minnesota branch

of the Illinois Central Railroad, 90 miles W. of the Mississippi River. It has a national bank, a savings bank, three weekly newspapers, eight churches, and a high school and other good schools. It has good water-power, and steam is also used in its manufactories. It has foundries, machine-shops, planing-mills, plough-factory, tow-mill, creamery, and other industries. It was settled in 1853, and incorporated in 1870. The inhabitants are chiefly from the Eastern States. No liquor is allowed to be sold in the town. Population, 2421.

CHARLESTON, the county-seat of Coles co., Ill., at the intersection of the Indianapolis and St. Louis Railroad and the Toledo, Charleston, and St. Louis (narrow-gauge) Railroad, 144 miles E. of St. Louis. It has a court-house, two national banks, three hotels seven churches, a fine high school with elegant building and several other schools, a public library, two weekly newspapers, a fair-ground, a stock importing and breeding association, a pork-packing establishment, foundry and stove-factory, broom-factory, woollen-factory, carriage-factory, two flour-mills, and other industries. It has fine water-works, which supply water from the Embarras River, 2½ miles distant. It was laid out in 1831, and incorporated as a city in 1865. Population, 2867.

CHARLESTON, a city and seaport of the United States, the largest town and the commercial emporium of South Carolina, and the county-seat of Charleston county. It stands upon the point of a cape or peninsula having the Cooper River on the E. and the Ashley on the S. W., these two rivers, with the Wando, farther E., having the harbor of Charleston for their common estuary. Lat. of the city, 32° 45' N., lon., 70° 57' W. It is 453 miles direct (610 by rail) S. S. W. of Washington, D. C., 130 miles by rail S. S. E. of Columbia, the State capital, and 115 miles by rail N. E. of Savannah, Ga. Its beautiful harbor is one of the most commodious and accessible on the Atlantic coast, the approaches being safe and easy; and the bar (which had a depth of 16 feet at low tide and 22 at average high tide) has been improved by the erection of stone jetties from Sullivan's and Morris Island, so as to increase the depth of the channel to 26 feet. Besides the main or ship channel there are three swash channels or entrances suitable for vessels of light draft only. The harbor-mouth, or seaward entrance of the port, is 7 miles S. E. of the town, and the estuary covers some 15 square miles. The entrance lies between Sullivan's Island on the N. and Cummings' Point (the N. extremity of Morris Island) on the S. The approaches are well buoyed and lighted, and the inner waters are deep and well sheltered. The fortifications are Fort Moultrie, on Sullivan's Island; Castle Pinckney, on an islet called Shute's Folly, in the mouth of Cooper River; Fort Sumter, the principal defence, on a shoal just within the entrance and to the left of the main channel; Fort Ripley, near Castle Pinckney; and an abandoned work called Fort Johnson, on James Island and on the S. side of the harbor. The town is regularly laid out, and in general is well built. Of its 70 miles of streets, more than 9 miles are paved with cobble-stones, and 5 are planked; other parts are macadamized, and there is a shell-road. The sidewalks in the main part of the city are paved with flagstone or brick. There are 5 miles of street railway. The sewers of the city comprise 5 miles of tidal drains, built 20 inches above mean low tide. These and other street-drains have been found defective, and are now being replaced with iron-stone pipes. Water for drinking and other purposes is obtained from cisterns supplied by rains; but excellent water has been furnished by an artesian well 1970 feet deep, which gives 250 gallons per minute, with a temperature of 99.5 F. The Battery, a massive stone wall on the S. E. front of the city, 10 feet wide and 1500 feet long, furnishes a fine promenade and is bordered by a broad drive; adjoining it are handsome private residences with beautiful gardens.

The environs of the city are pleasant and abound in points of historic interest. Sullivan's Island, to the E., has many fine cottages and suburban homes. To the N. extends a picturesque and fertile plain, and the whole region is characterized by a profuse half-tropical vegetation. Among the principal buildings and public institutions of interest are the custom-house, the city hall, the academy of music, a fine and spacious theatre, the historic St. Michael's Church, the old and interesting St. Philip's Church, the city, Catholic, and colored orphanages, the arsenal (a fine building now leased in perpetuity for the use of a large orphan school for boys), the Central Presbyterian Church, the court-house, the medical college, and the College of Charleston. The churches are numerous, including 6 Catholic, 10 Episcopalian, 9 Presbyterian, 8 Methodist, 5 Baptist, and 3 Lutheran; also Unitarian, Jewish, and other places of worship. The public and private charitable institutions are numerous and well sustained. The schools, public and private, are of every grade. In 1881 the five public schools had 6 male and 85 female teachers, with 2009 white and 2005 colored pupils. The expense of these schools was \$59,320. The high school is supported partly by an appropriation from city council. It has a four years' course, and an average attendance of 150 boys. There are also parochial and denominational schools and excellent private academies for the youth of both sexes. The Avery Normal Institute, under the care of the American Missionary Association, is intended to prepare colored teachers. The College of Charleston is partly endowed and partly supported by the city.

Charleston is one of the chief Southern ports, both in the foreign and coastwise trade. The chief articles shipped hence by sea are upland and sea-island cotton, rice, spirits of turpentine, rosin, timber, phosphate rock, manufactured phosphates (fertilizers), fruits, and market-garden products. The phosphate industry and the market-garden business were not carried on here to any important extent before the Civil War. Charleston's commerce is fed by the following important railways: the Charleston and Savannah, the North-Eastern, and the South Carolina. The latter, which has important interior connections, has recently extended its track to wharves on Cooper River, so that vessels may load directly into the cars. The wharves of the city furnish accommodations for 200 vessels. The foreign trade is chiefly with England, Germany, Cuba, and the British West Indies. Before the American Revolution, and even down to 1816, Charleston exceeded New York in the amount of its commerce; but it has long since lost its former eminence. The coastwise trade now far exceeds the foreign in volume and importance. Lines of coast-steamers ply hence on the "inside route" among the sea-islands of this State and Georgia, along channels entirely protected from the winds and waves of the open sea. In the fiscal year ending June 30, 1883, the imports of the Charleston district amounted to \$498,891, and the exports to \$22,573,167. The chief items of import are soda-nitrate, sulphur (used in the phosphate manufacture), fruits, iron and steel goods, and salt. The direct importations in American vessels are valued at \$46,444; in foreign, at \$452,447. The chief items of foreign export were sea-island cotton (5160 bales, or 1,754,468 pounds, worth \$506,629), other cotton (367,742 bales, or 173,736,398 pounds, worth \$20,126,456), fertilizers (\$205,417), spirits of turpentine (2,476,830 gallons, worth \$1,045,421), rosin and turpentine (234,411 barrels, worth \$619,618), oil-cake (1,192,880 pounds, worth \$11,740), cotton seed (688,672 pounds, worth \$7475), lumber (1,291,000 feet, worth \$18,572), besides shingles and shooks to the value of \$26,583. Of rice the export was only 7341 pounds.

Charleston carries on an active wholesale trade with the towns of the interior. The number of firms engaged in wholesale and retail trade in 1883 was 924, and their annual sales were estimated at \$28,955,000. There were 6 banks, with a total capital of \$1,120,000 and a surplus of \$637,000. The mechanical and man-

ufacturing establishments numbered 273, with a capital of \$6,628,470, giving employment to 5167 hands and producing goods to the value of \$9,010,731. The principal manufacture is that of fertilizers, the phosphate rock so abundant in the vicinity being utilized in this industry. The product was valued at \$2,552,000.

The financial receipts of the city for 1882 from all sources were \$709,578, and its expenditures were \$698,807. The city debt, which in 1870 stood at \$5,241,710, had been reduced to \$4,229,251, of which \$3,413,300 is in four-per-cent bonds, the rest being at higher rates. Rigid laws now restrain the power of increasing the indebtedness. A paid fire department was established in 1882, which consists of 100 men and has 8 steam fire engines, 2 hook and ladder trucks, and other apparatus. The fire-alarm telegraph has 30 miles of wire.

The healthfulness of the city is shown by a death-rate of 22 per 1000 among the whites; but the mortality among the colored population is 41 per 1000.

The original settlement, called Charles Town in Carolina, was made on the Cape Fear River, in what is now Brunswick co., N. C., in 1664, under Sir John Yeamans, at or near the mouth of Old-Town Creek, and Yeamans became a landgrave or governor of a colony or county called Clarendon, which then included all South Carolina. Another Charles Town in 1679 was founded by Capt. William Sayle, on the S. W. bank of the Ashley River, 3 miles above its mouth. The settlers of this place had formerly lived at Beaufort or Port Royal. The present site of Charleston was then called Oyster Point, and buildings seem to have been erected there at an early date. In 1680 the authorities sanctioned the removal of the town to its present site, and the new town became the capital of the colony, most of the settlers of the two older Charles Towns removing to it. A colonial parliament was established in 1682. Charleston's history in its colonial period is interesting and eventful, and the town took a conspicuous part in the movements which led to the War of Independence. Prominent events in its history have been the attack by Clinton and Sir Peter Parker on the fort on Sullivan's Island, 1776; Prevost's attempt upon the town, 1779; its siege and capture by the British, 1780; the evacuation by the British troops, 1782; the Nullification movement of 1832; the passage here of the Ordinance of Secession, 1860; the bombardment and capture of Fort Sumter by the Confederate forces, 1861; the subsequent Federal operations against the city; and its evacuation by the Confederates in 1865. The city suffered much during the Civil War, which indeed first broke out here, and in 1861 half the town was destroyed by fire; but since 1865 a good part of the city has been rebuilt.

The population of Charleston in 1870 was 48,956, of whom 44,064 were natives of the United States; in 1880 the population was 49,984—of native birth, 46,034; foreign-born, 3950. In 1880 there were 22,699 white residents and 27,276 colored. Of the American-born residents, 43,845 were natives of South Carolina. Of the foreign-born, 1537 were Germans; 1963 were from the British Islands, and of these 1611 were Irish. There were "engaged in professional and personal services" 10,060 persons, of whom 4632 were males and 5428 females, 9521 being native-born; "the persons engaged in all classes of occupations" were 20,324 in number, 13,280 being males, 7045 females, and 18,379 Americans by birth; "engaged in trade and transportation," 4639, of whom 4349 were males, and 3754 of American birth; "engaged in manufacturing," 5134 persons, of whom 3905 were males, and 4646 were born in the United States. The census of 1880 reports for the city 11,406 families and 6552 dwellings, or 4.38 persons to a family and 7.63 persons to a dwelling. The city ranked as the thirty-sixth in the United States according to population.

CHARLESTON, the county-seat of Kanawha co., W. Va., and the permanent capital of the State, is on the right bank of the Great Kanawha River, 60 miles from

its mouth and 130 miles S. of Wheeling. Across the Kanawha, which is here over 200 yards wide, runs the Chesapeake and Ohio Railroad, with two steam-ferries from the dépôt to the city; the Ohio Central Railroad, which follows the bank of the Kanawha, enters the city by a bridge over Elk River, a branch of the former, and about a hundred yards wide. The navigation of both rivers has been improved by permanent locks and dams erected by the U. S. Government. In the Kanawha salines, which extend about 10 miles on both sides of the river above Charleston, salt water is obtained in abundance by boring at a depth varying from 500 to 2000 feet. For many years from 1,000,000 to 3,000,000 bushels of salt were made annually. Large quantities of bituminous coal are mined in the valley, but little has been done to develop the iron-field. Charleston is the commercial emporium of the valley and carries on considerable trade. Besides the railroads there are weekly packets to Cincinnati and to Pittsburg, a daily packet to Gallipolis, and numerous local packets and tow-boats ply the rivers.

Charleston presents an uninviting appearance on the river-side; there is, however, a spirit of progress and the city is steadily improving. The streets are fairly laid out, adorned in many places with rows of trees, handsome buildings, neat lawns, and gardens. The principal streets are lighted with gas. In 1882 the city council adopted the Gates pavement, so named from Virgil A. Gates, a prominent citizen, who had laid an experimental section in 1871. The State Capitol is a fine building of stone and brick, 138 feet long, 56 wide, and 140 high; the custom-house is of brick. There are two first-class hotels, besides others of less pretensions, two State banks, an opera-house and several halls, one daily and four weekly newspapers, two monthly periodicals, three public schools, a military academy, and other good private schools. There are eleven churches and chapels, comprising three Baptist, two Methodist Episcopal, one Methodist Episcopal, South, two Presbyterian, one Episcopalian, one Roman Catholic, and one Christian Bride. The industrial works are two foundries with machine-shops, two flour-mills, two planing-mills, seven saw-mills, and a boatyard and docks; also woollen, barrel, handle, pump, hub, and cigar factories. In 1882 the tax valuation of property, real and personal, was \$1,663,316.

Charleston was settled about 1786 by George Clendennin of Virginia, who built a fort of hewn logs, 40 by 30 feet and two stories in height, which remained standing till 1874. In this fort the first county court was held in 1789. The town was incorporated in 1794 by the name of Charlestown, which was afterwards changed to Charleston. Charleston was incorporated as a city of the second class in 1870. By the census of 1880 its population was 4192. In 1869 it was made the capital of the State, but in 1875 the seat of government was removed to Wheeling, there to remain for ten years, at the end of which time it is to be permanently located at Charleston. (T. S.)

CHARLESTOWN, the county-seat of Jefferson co., W. Va., is 65 miles from Washington City and 10 miles W. of Harper's Ferry, on the Winchester and Potomac division of the Baltimore and Ohio Railroad and the Shenandoah Valley Railroad. It has six churches, two hotels, two newspapers, excellent private schools, as well as free schools for white and colored pupils, commodious town-hall and other fine public buildings, thirty stores, foundry and machine-shops, sash, spoke-, and rim-factory, planing-mill, flour-mill, and gas-works. The town was named after Charles Washington, a brother of Gen. George Washington, who gave the land upon which the public buildings are erected, and its streets are principally named after the Washington family. Population, 2016.

The county was formed in 1801, but the town existed long before, and is rich in colonial and Revolutionary associations. It was a point on the march of Gen. Braddock to Fort Duquesne in 1755, and the well

which his soldiers dug is still in use. In this town John Brown and five of his followers were tried and hung Dec. 2, 1859. The records of this trial and the will of John Brown are preserved in the county clerk's office. During the Civil War this region was the scene of frequent fierce conflicts, the most noted of which occurred on Oct. 18, 1863, when the Confederate general Imboden surprised and captured the Union troops holding the town, but was driven out a few hours later.

CHARLOTTE, the county-seat of Eaton co., Mich., is at the intersection of the Chicago and Grand Trunk Railroad with the Grand River Valley branch of the Michigan Central Railroad, 19 miles S. W. of Lansing. It has a national bank, two weekly newspapers, eight churches, several schools, a public library, and a fire department. It has manufactories of tables, carriages, barrels, etc., and is the trade-centre of an agricultural and lumber region. Population, 2910.

CHARLOTTE, the county-seat of Mecklenburg co., N. C., is 11 miles N. of the South Carolina line and 162 miles W. of Raleigh, on the North Carolina Railroad. The other railroads are the Atlanta and Charlotte Air-Line, the Charlotte, Columbia, and Augusta, the Atlantic, Tennessee, and Ohio, and the Carolina Central. It has a U. S. branch mint, three hotels, three national banks, one daily and three weekly newspapers, twelve churches, three schools, and is the seat of Biddle University (Presbyterian) and a female seminary. It has two machine-shops, a cotton-mill, flour-mill, and two planing-mills. It is incorporated as a city, and has gas- and water-works. It was settled in 1756 by Scotch-Irish emigrants, and claims to be the place where the first Declaration of Independence from Great Britain was made, May 10, 1775. Its property is valued at \$2,500,000; its yearly expenses are \$20,000, and it is free of debt. Its present population, of various origin, numbers 7094.

CHARLOTTESVILLE, a town of Virginia, county-seat of Albemarle county, near the Rivanna River, and on the Virginia Midland and Chesapeake and Ohio Railroads, 97 miles by rail west-north-west of Richmond. The UNIVERSITY OF VIRGINIA (which see), one of the leading institutions of learning of the country, is situated near the town. Charlottesville has a secondary school for boys, a school for ladies, several churches, a town-hall, two national banks, three weekly newspapers, several manufactories, and an active trade. Population in 1880, 2676.

CHARNOCK, STEPHEN, D. D. (1628-1680), an English divine born in London in 1628. His father was Richard Charnock, a distinguished solicitor. Stephen Charnock was at Cambridge a pupil of Sancroft in Emanuel College, where so many of the Puritan divines were trained. It was at the university that his interest in the religious life was awakened. He became a preacher of Southwark, but in 1649 was made a fellow of New College, Oxford, and in 1652 was appointed senior proctor of the university, winning great applause for faithfulness and ability. In 1653 he went to Dublin and became chaplain to Henry Cromwell. Being deprived by the Act of Uniformity of 1660, he went to London, and thenceforward till 1675 preached to various dissenting congregations, but in the latter year assumed a pastorate. He died in London, July 27, 1680. He was distinguished for learning, dignity, amiability, and wisdom. His *Treatise on the Attributes of God* has been many times reprinted, and still takes rank among the standard works of its class. His sermons form the bulk of the *Complete Works*, of which the Edinburgh edition, in five volumes (1864), is the best. His *Life* was written by Edward Parsons.

CHARTER. In the United States the laws of incorporation at first followed closely in the precedents afforded by the English common law. All grants of charters under that law proceeded, mediately or immediately, from the king. In early English constitutional history we find the necessity of royal authority for the

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bestowal of such privileges universally conceded, but as the theories of liberal government became more and more firmly fixed in the popular heart, the principle "qui facit per alium facit per se" was applied in this branch of the royal prerogative as in many others. During colonial times corporations were frequently created, and since the Revolution the validity of their charters has been universally recognized by the courts.

It has been definitely settled as a point of constitutional law that a corporation, particularly if municipal, may exist in this country by *prescription* in the absence of any actual written charter. In this, too, the usage of English common law was followed, although the length of time necessary to establish the right of incorporation by prescription is, of course, much shorter in a country of such brief national existence as ours. As a general principle, it may be affirmed that in cases where a company can prove that it has always been recognized as a corporation, and by virtue of such recognition has acquired and enjoyed for many years corporate powers and franchises, the courts will favor the presumption of a charter, even though no such written instrument can be produced to substantiate its claim. The necessity for asserting incorporation by prescription is, however, comparatively rare.

After the establishment of the national Government the question of the authority of Congress to pass acts of incorporation became agitated, and many leading legal minds of the country took part in the discussion. The Federalist party, always the recognized champions of a strong central government, assumed the affirmative side in the argument, headed by the brilliant Hamilton, then Secretary of the Treasury. After the bill to incorporate a national bank had passed Congress, and was awaiting Washington's approval, he solicited Hamilton's opinion, as well as those of Randolph and Jefferson, Attorney-General and Secretary of State respectively, on the constitutionality and advisability of the measure. The views of the two last-named statesmen appeared before those of Hamilton, and were adverse to the bill. Hamilton's views, embodied in a document entitled "An Opinion on the Constitutionality of a National Bank," has been justly regarded by eminent legal minds as one of the most powerful intellectual efforts ever known in this country. The gist of his argument may be gathered from one of its opening sentences: "The clause [of the Constitution] which declares that the Constitution, and the laws of the United States made in pursuance of it, and all treaties made under their authority, shall be the *supreme law* of the land, is decisive to prove that its powers as to its objects are sovereign. To erect corporations is an incident of sovereign power, and consequently belongs to the United States in relation to the objects entrusted to their management" (*Life of Hamilton*, vol. iv. p. 249). This right of incorporation, the friends of the bill claimed, was *constructively*, though not *expressly*, conferred by the clause permitting national legislation on commerce and revenue.

The views of the Federalist party were subsequently sustained by the decision of the U. S. Supreme Court in the important case of *McCulloch vs. Maryland*, 4 Wheat. 424, and as a result of the same doctrine the power of conferring charters within their respective jurisdictions is recognized as belonging to the Territorial governments, inasmuch as they are created by Federal enactment and receive their authority from that source.

In the States, by a sort of undisputed usage, the legislatures have been accustomed, from Revolutionary times to the present, by special act to exercise the right of granting such corporate privileges as are not inconsistent with State or national law. Their authority has been so clear and so frequently exercised that no attempt has ever been made to call it in question, or, on the other hand, to offer any argument in its defence. Within the last quarter of a century, however, owing to a considerable abuse of this power, the tide of pop-

ular sentiment has been steadily setting against all "special legislation" in cases where the application of a general statute can effect the desired result. Thus in Arkansas, Colorado, Dakota, Florida, Illinois, Indiana, Iowa, Kansas, Maryland, Missouri, Nebraska, Nevada, New Jersey, Ohio, Oregon, Pennsylvania, and one or two other States the legislature is, either expressly or constructively, prohibited by the constitution from conferring charters except (in a few cases) for certain municipal corporations. With these trifling exceptions the power not only of conferring, but of altering or amending, charters by special acts is taken away from the legislature and vested in the State Executive or in the courts, or concurrently—usually the last—while in a few of the States not mentioned above the right is exercised concurrently by the Executive and legislature. The advantages of this policy are obvious. It tends to secure uniformity of rule and construction; to prevent the aggregation of inordinate power in the hands of any specially favored corporations; to promptly recognize and provide for the existence of real wants and the redressing of real grievances. (See Dillon on *Munic. Corp.*, § 20.) Besides this, since the power of incorporation still exists *mediately* in the legislature as the representative of paramount authority, it is able with the greater impartiality to enact general provisions for its special exercise by the courts or the Executive.

The common-law incidents of a corporation in the United States, as expressed by its charter, are usually the following: (1) To have perpetual succession; (2) to sue and be sued by the corporate name; (3) to have a common seal, alterable at pleasure; (4) to render the interests of the stockholders transferable; (5) to exempt private property from liability for corporate debts; (6) to make contracts, acquire and transfer property, possessing the same rights and subject to the same restrictions as private individuals in these respects; (7) to enact by-laws and make regulations for the management of its affairs in accordance with law. (See Field on *Corp.*, § 18.) The charter also includes particulars similar to the following: The name of the corporation and its place of business; the general nature of the business; the amount of capital stock, if any, authorized, and the times and conditions of payment for the same; the time of commencement and termination of the corporation; by what officers its affairs are to be conducted, and when they are to be elected; and the highest amount of indebtedness it may at any time contract. No *private* corporation can be compelled to accept a charter, since it is in the nature of a contract between the corporation and the State, but a corporation accepting a charter is bound by its conditions both in law and fact, nor can such acceptance be partial or conditional without vitiating the corporate privileges. No subsequent general act of the legislature can annul or impair a charter granted under one previously in force; otherwise there would ensue a violation of the important constitutional provision that "no law passed by any State shall operate *ex post facto* or impair the obligation of contracts." Any corporation, however, may, by voluntary choice, accept the provisions of the new act or constitution and apply for an amended charter thereunder.

The simultaneous existence of two or more co-ordinate laws of incorporation in a few of the States gives rise to some curious results. Thus in Pennsylvania the general Incorporation Act of 1874, with the supplement of 1876, though expressly repealing several similar acts previously in force, left an important one, that of 1849, unrepealed. In applying for a charter in this State, therefore, it is customary to specify under what act the application is made, though without such specification the application would be held under the general law.

The distinction between public and private corporations, as affecting the nature and permanence of their charters, must be carefully noted. "Private corpora-

tions . . . are not, in contemplation of the law, public simply because it may have been supposed that their establishment would promote either directly or consequentially the public interest. The assent of the private corporation is required to make the charter operative, and when assented to the legislative act is irrevocable, and it cannot, by any subsequent act of legislation, be withdrawn without the consent of the corporation, unless the right to do so was expressly reserved at the time."

Public or municipal charters, on the other hand, are valid by simple act of incorporation, without formal acceptance by the municipality, and, not being in the nature of a contract, may, in nearly all the States, be revoked at will by the legislature. Such a revocation, however, must not affect existing private rights nor impair existing obligations formed under the charter; but as the public corporation is more directly, and sometimes involuntarily, the creation of the State, so the authority of the State to remodel, amend, or entirely abrogate its charter is exercised with much greater freedom than in the case of a private corporation.

A charter may expire and the corporation which it represents may terminate in one of three ways: (1) By limitation; (2) by a voluntary disbanding of the corporation; (3) by legislative or judicial repeal. The first two of these are so easily understood as to need only a passing notice, but the third deserves attention. As we have observed, the charter of a private corporation is in the nature of a contract between it and the State. Under its provisions vast accumulations of property are sometimes made and colossal interests aggregated, the influence of whose ramifications is felt far beyond the scope of its immediate control. It was foreseen that if the State was absolutely powerless to place any check upon this undue exercise of privilege—conferred, too, as it might have been, through hasty or corrupt legislation—the public welfare, always paramount to that of an individual or body of individuals, might be seriously jeopardized. To avoid this, the constitutions of various States prohibit the creation of corporations unless subject to legislative control as to repeal or amendment; sometimes, also, the general law will have a clause to the same effect, and it has been held in *R. R. Co. vs. Tharp*, 5 Harr. (Del.), 454, that the presence of such a provision in the constitution renders one of similar import in any particular charter unnecessary. Such constitutional or statutory provision exists in Alabama, Arkansas, California, Iowa, Pennsylvania, New York, New Hampshire, New Jersey, and most of the larger States, coupled, however, with the restriction that no repealing enactment shall result in the injury of the incorporators, who in such case have their remedy in equity. Where the charter itself contains this clause of reservation, the rights conferred are mere privileges, subject to withdrawal or modification by the conferring authority. Corporations exceeding their powers render themselves liable to such legislative or legal action *ipso facto*, or they may be restrained, *pro tanto*, by injunction in equity. The law of charters has given rise to an immense amount of litigation, while the field it affords for legal research is very wide, involving as it does so many collateral branches of State and national jurisprudence. (See in general on this subject Angell and Ames on *Corporations*; Field on *Corporations*; Dillon on *Municipal Corporations*; Brice on *Ultra Vires*; and the article CORPORATION.) (E. F. S.)

CHARTER PARTY. The term *charta partita* is derived from the ancient habit of dividing the instrument and giving one-half to each party. Charter parties are of two kinds. The first and common form is a letting of certain space in the vessel to the charterer for the carriage of goods, which amounts to little more than a contract to carry, the owners being responsible as common carriers; the second is a demise of the ves-

sel to the charterer, so that he becomes owner *pro hac vice*, manning, victualling, and possessing her, during which time the real owners are relieved from all personal responsibility for the torts and contracts of the master. The former are capable of further classification, according as they are to a direct port or to a port of call for orders; *e. g.*, a vessel to proceed to Sandy Hook or Delaware Breakwater or Hampton Roads for orders to load at New York, Philadelphia, or Baltimore, or to proceed to Cork, Plymouth, or Falmouth for orders to discharge at any safe port in the United Kingdom or on the Continent between certain limits, as Havre and Hamburg.

The carrying trade between the United States and Europe is now done mostly in foreign bottoms, which come here in ballast and return with grain or oil. Merchants here are obliged to engage this tonnage in advance by chartering vessels on the other side "to arrive." The provisions in the charter concerning the capacity, rating, and forwardness of the vessel are accordingly very important, and the question frequently arises whether they are warranties or conditions precedent for the breach of which the charter may be thrown up, or whether they are mere descriptions and stipulations, the breach of which is to be compensated for in damages. This is a question of intention to be derived from a consideration of the whole instrument, but it may be said generally that no provision will be considered by the courts a condition precedent which is not expressed in language that is certain and does not require construction. An undertaking to sail on or before a given day would be held a condition precedent, while to sail "with all convenient speed" or "without delay" would not. It is often provided that if the vessel do not arrive on or before a given day, called the cancellation date, the charterer shall have the option of throwing up the charter.

The reciprocal lien between the vessel and the goods is derived from an old rule of the maritime law stated by Cleirac: "Le batel est obligé à la marchandise et la marchandise au batel." Originally, the undertakings secured by the lien were the right delivery of the cargo by the master and the payment of freight by the charterer; but it is gradually extending in the United States to cover every stipulation in the charter party. In other words, the charterer may hold the ship for the right fulfilment of all the master's covenants, and the master may hold the cargo for the charterer's. But no lien exists in favor of either unless the cargo has actually been loaded. (H. G. W.)

CHASE, PHILANDER (1775–1852), an American bishop of the Episcopal Church, was born at Cornish, N. H., Dec. 14, 1775. He graduated at Dartmouth College in 1796, and, having about this time become an Episcopalian, began to study theology. He was ordained deacon May 10, 1798, and priest Nov. 10, 1799. After spending some years in missionary labors in Western New York; he went to New Orleans in 1805 and organized an Episcopal church there. In 1811 he became rector of Christ church, Hartford, Conn., but in 1817 he removed to Ohio and again engaged in missionary labors. He was consecrated bishop of Ohio Feb. 11, 1819, and devoted his energies to building up the Church in the North-west. In 1823 he went to England, where he obtained large contributions, with which on his return he founded Kenyon College and Gambier Theological Seminary. A few years later he became involved in disputes with his clergy with regard to the application of the contributions, and relinquished his jurisdiction in September, 1831. For this he was censured in the General Convention of the following year. He continued his missionary work in the West, and March 8, 1835, he was made bishop of Illinois. On a second visit to England he collected funds for educational purposes, and on his return, in 1838, founded Jubilee College, at Robin's Nest, Ill. Here he resided until his death, Sept. 20, 1852. He was large and stout, and, though not highly learned, possessed great natural ability. His perseverance and energy, as well

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as his shrewdness and knowledge of human nature, enabled him to do a great work in establishing the Episcopal Church in the Mississippi Valley. He published *A Plea for the West* (1826), *The Star in the West; or, Kenyon College* (1828), and *Defence of Kenyon College* (1831). In 1848 he issued also two volumes of *Reminiscences*.

CHASE, PLINY EARLE, professor of philosophy in Haverford College and secretary of the American Philosophical Society, was born in Worcester, Mass., Aug. 18, 1820. He graduated at Harvard University in 1839, A. M. Harvard, 1844, LL.D. Haverford, 1876. After publishing a series of *Arithmetical Works, Sanscrit and English Analogues, Intellectual Symbolism*, and various philological papers, he began in 1863 a series of investigations upon the laws and influences of elasticity, with especial reference to photo-dynamics. Starting from the hypothesis that all physical phenomena are due to an omnipresent power, acting in ways which may be represented by harmonic undulations in an elastic medium, he found that barometric fluctuations, electric and tidal currents, the distribution of atmospheric and ocean temperatures, the polarizing influences of thermal convection and radiation, terrestrial magnetism, solar rotation, planetary revolution, cosmical and molecular aggregation and dissociation, planetary and stellar masses and positions, spectral lines, chemical affinity, nebular subsidence, and the mechanical equivalent of heat, all give evidence of rhythmic oscillations which are propagated with the velocity of light. Some of the results of his meteorological researches were embodied in the system of weather-forecasts which was adopted by the United States Signal Service Bureau, and he made predictions of nodal planetary influence which were subsequently verified by the observations of European and American astronomers. He demonstrated the mechanical control of electrical currents twelve years before the telephone was invented, and published the ratio of *vis viva* between wave-propagation and oscillating particles five years before it was announced by Maxwell. On Dec. 16, 1864, he received the Magellanic gold medal of the American Philosophical Society for discovering numerical relations between gravity and magnetism. In 1881 he showed that the law of phyllotaxy, or tendency to division in extreme and mean ratio, which Peirce and Hill had found in planets as well as in plants, also prevails in the atomic weights of chemical elements. His physical papers were originally published in the *Proceedings* of the American Philosophical Society, the Royal Society, and the French Academy, and in American and European scientific journals.

CHASE, SALMON PORTLAND (1808-1873), an American statesman, chief-justice of the supreme court of the United States, was born in Cornish, N. H., Jan. 13, 1808. He was sixth in descent from Aquila Chase, who settled in the town of Newberry, Mass., in 1640. When he was eight years old, the family removed to Keene, N. H., and he was placed at a boarding school at Windsor, Vt. The next year his father died suddenly, leaving the family in straitened circumstances; but his uncle, Bishop Philander Chase, sent for the boy to come to the West. While at the bishop's residence at Worthington, near Columbus, his time was divided between study and work on a farm. In 1822, Bishop Chase was elected president of Cincinnati College, and Salmon entered that institution, but afterward entered the junior class in Dartmouth College, and graduated in 1826. He then went to Washington, hoping to get employment in the public service, but, being disappointed, opened a "select classical school." He was admitted to the bar in 1829, and removed to Cincinnati, where he commenced practice in March, 1830. During his leisure he prepared an edition of the statutes of Ohio, with annotations and an historical introduction. This work brought him into notice, and in 1834 he was appointed solicitor of the Bank of the United States at Cincinnati. Although the business com-

munity of that city was then strongly pro-slavery, the young lawyer did not hesitate to avow his opposition to the extension of slavery, and to take a personal and professional interest in the defence of fugitive slaves and the protection of abolitionists. When a mob sacked the office of *The Philanthropist* and attempted to seize its editor, James G. Birney, Mr. Chase stood at the door of Birney's hotel and detained the mob until the abolitionist had escaped. Mr. Chase in his defence of fugitive slaves, both in the State courts and afterward in the supreme court of the United States, took the ground that the article in the Constitution regarding the return of fugitive slaves did not impose on magistrates in free States the duty of catching and returning them. He also enunciated the doctrine that slavery was local and sectional, but freedom truly national, and that any slave brought within the territory of a free State became by right free.

In 1842 occurred a case which attained national importance. A Kentucky farmer named Van Zandt liberated his slaves, removed to Ohio, settled on a farm near Cincinnati, and was ever on the alert to aid fugitive slaves in their escape. He was the original of Van Tromp in *Uncle Tom's Cabin*. One day, while carrying a wagon-load of fugitive slaves, he was stopped by a party from Kentucky, who forcibly took the slaves from him and conveyed them across the river. Van Zandt was indicted under the fugitive-slave law of 1793, and tried before the United States circuit court of Ohio, charged with "concealing and harboring." Mr. Chase acted as his counsel; but the circuit court decided against Van Zandt, and the case was carried to the supreme court, where Mr. Chase maintained that it was the "clear understanding of the framers of the Constitution, and the people who adopted it, that slavery was to be left entirely to the disposal of the several States, without sanction or support from the national government, and that the clause in the Constitution relative to persons held to service was one of compact between the States and conferred no power of legislation on Congress." The supreme court, however, decided in favor of the constitutionality of the act of 1793. Mr. Chase then carried the agitation of the slavery question into the field of politics.

In the struggle which culminated in the overthrow of that institution, Mr. Chase was most efficient in making the opposition to slavery a power in national politics. He showed the necessity of changing what had been a philanthropic sentiment into the keynote of a political organization. In December, 1841, he was a prominent member of a State anti-slavery convention which assembled at Columbus and drafted the address which it issued to the people. In 1843 he was active in the first National Liberty Convention, at Buffalo, N. Y. He originated and organized the Southern and Western Liberty Convention which was held at Cincinnati in June, 1845, with two thousand delegates, to protest against the usurpations of the slave-power. In connection with it, he prepared an address giving a history of the progress of slavery and urging the necessity of a political organization to resist its further encroachments. At the second National Liberty Convention (1847) he had opposed the making of a national nomination; but when his hopes of action by the two great parties were disappointed, he called a free-territory State convention at Columbus (1848), which led to the National Convention at Buffalo in the same year. The latter, over which Mr. Chase presided, nominated Martin Van Buren for President and Charles Francis Adams for Vice-President of the United States.

On the 22d of February, 1849, Mr. Chase was elected United States Senator from Ohio. He advocated the construction of a railroad to the Pacific, a system of cheap postage, and a reform in the public expenditures, and took, of course, a prominent part in the debates on the Fugitive-Slave law of 1850, the Nebraska bill, and other questions relating to slavery. Upon the expiration of his senatorial term, in 1855, he

was elected governor of Ohio; and when the Republican party held its first National Convention, in 1856, he was the choice of many of the delegates for the Presidential nomination, but at his own request his name was withdrawn. At the close of his first term he was renominated for governor, and elected by the largest vote ever yet cast for an incumbent of that office in Ohio.

Mr. Chase was a prominent candidate for nomination by the Republican National Convention at Chicago in 1860, but on the third ballot, when Lincoln wanted only four votes to ensure his nomination, Mr. Chase's friends gave these before the result was announced.

In March, 1861, Mr. Chase had just taken his seat for a second term in the United States Senate, when Mr. Lincoln, without consulting him, nominated him for Secretary of the Treasury. He was unwilling to accept a place in the Cabinet, and it was only the earnest solicitations of his political friends that induced him to "surrender a position every way more desirable to take charge of the finances of the country under circumstances most unpropitious and forbidding"—a position which he afterward declared filled him with "crushing responsibility." When he took office, the finances were in a state of chaos, the current revenues not being sufficient to meet the current expenses even in a time of peace. Mr. Chase had faith, however, in the boundless resources of the nation and the self-sacrificing patriotism of the people of the North. He soon infused this confidence into Congress, and, whatever difficulty there was in the conduct of the war, the finances were managed without disaster or serious embarrassment. When the war assumed gigantic proportions and a million of men had to be maintained in the field, his financial genius enabled him to raise, when necessary, three millions of dollars a day. He was the originator of the legal-tender notes of the United States popularly called "greenbacks." To him, also, is due the credit of devising the excellent system of national banks, which did much to assist the government during the war, and has since been of essential service in developing the resources of the country. (See BANKING.)

Mr. Chase resigned the secretaryship of the treasury June 30, 1864, on account of a difference of opinion with President Lincoln as to the appointment of subordinate officers. But the continuance of the President's high regard for him was shown when, on Dec. 6, 1864, Mr. Chase was nominated to be the chief-justice of the supreme court of the United States. The appointment was confirmed by the Senate unanimously and without any reference. Mr. Chase's previous training had not been in the direction of the august position which he was now called upon to fill. For more than fifteen years he had relinquished the practice of his profession; he had never before held a judicial office; his whole life had been passed amidst the strife of politics. Yet the able, impartial, and patriotic manner in which he discharged his judicial duties was a surprise to his friends, to the profession, and to his country. One of his most important duties as chief-justice was to preside over the impeachment trial of President Johnson, in 1868. This was the first time in the history of the United States that a President had been impeached, and the trial was watched with the most profound interest, not only in this country, but throughout the civilized world. Chief-Justice Chase presided over the court of impeachment with a dignity and an impartiality that form one of his noblest titles to fame.

When the National Democratic Convention met at New York on the 4th of July, 1868, Chief-Justice Chase was prominently mentioned as a candidate who could "unite the progressive Democrats and the reasonable Republicans upon a platform which should save the rights of the States without perilling any of the results of the war." But it was too early for a new

departure in politics, and the "Chase movement" of 1868 was a failure. When the nominating convention met in 1872, the chief-justice was physically incompetent, and he failed to obtain the Presidency, to which he had aspired.

Mr. Chase first showed serious symptoms of declining health in the early part of 1870. He was a man of commanding presence and splendid physique, but years of constant and tremendous labor finally undermined his great strength. When Secretary of the Treasury, it was his regular habit to spend eight hours each day at the department, rarely leaving his desk unless to attend a Cabinet meeting. He was always an early riser, and when the day was fair he took a walk before breakfast. While he was chief-justice, he was even more closely occupied. In 1870 his judicial duties, both in the supreme and in the circuit court, detained him at Washington to the end of June. With a view of restoring his health, he then took a trip to the North-west, but received no benefit. On Aug. 16, while travelling by railroad in New York, he was suddenly attacked by paralysis. By great care and the best medical treatment he recovered sufficiently to resume his seat on the bench, but nearly three years later had a second stroke of paralysis, and died at New York, May 7, 1873.

CHASE, SAMUEL (1741-1811), an American jurist and statesman, born in Somerset county, Md., April 17, 1741. He was admitted to the bar at Annapolis, Md., in 1761, and his talents and industry, aided by his fine presence and oratorical powers, soon obtained for him a prominent place in his profession. He was a member of the colonial legislature for twenty years, distinguishing himself especially by his opposition to the Stamp Act. In 1774 he was a delegate to the Continental Congress, and in 1776, on behalf of that body, went to Canada, in company with Dr. Franklin and Charles Carroll, to obtain assistance from that province in the struggle with England. Having returned, he secured from the legislature of Maryland authority to vote for the Declaration of Independence, and afterward was one of the signers of that document. At the close of the war he was sent by Maryland to London to recover funds which that State had many years previously deposited in the Bank of England. His negotiations were successful in procuring eventually the return of six hundred and fifty thousand dollars. In 1788, having removed to Baltimore, he was appointed chief-justice of a newly-established criminal court, and in 1791 was promoted to be chief-justice of Maryland. In the Maryland Convention, in April, 1788, he had made ineffectual opposition to the ratification of the Federal Constitution, yet he afterward became one of the staunchest supporters of that instrument. In 1796, Washington appointed him an associate justice of the United States supreme court, and in this capacity he was called to enforce obedience to the Constitution in cases which have become legal landmarks. In the circuit court held by him in Pennsylvania, John Fries and two others were in April, 1800, convicted of treason for the forcible rescue of prisoners from the United States marshal. (These criminals, however—the only Americans who have ever been convicted of treason—were pardoned by President Adams.) Another noted case was that of Callender, a printer, who was convicted at Richmond, Va., of violating the Sedition Act. In both these cases, which were chiefly political, Judge Chase's conduct was so domineering that the lawyers for the defence withdrew from the court.

After Jefferson had succeeded to the Presidency, Congress made great changes in the Federal judiciary, which led Judge Chase to say, in his address to the grand jury at Baltimore, May 2, 1803, that the new laws were rapidly destroying protection to property and to personal liberty. Jefferson at once suggested to the leaders of his party that this harangue was ground for impeachment, and in the next year the House of Rep-

representatives, under the lead of John Randolph, framed eight articles of impeachment against him, which were presented to the Senate Jan. 2, 1805. Of these articles, one related to the Fries trial, five to that of Callender, one to Chase's treatment of a Delaware grand jury, and, finally, one to the real occasion of the whole proceeding. The trial lasted from Feb. 9 to March 5, 1805, and resulted in his acquittal on five of the articles, while on the other three a bare majority, instead of the requisite two-thirds, sustained the charge. The highest vote against him (nineteen to fifteen) was on the last article. He was therefore discharged, and resumed his place on the bench, which he retained till his death, June 19, 1811.

CHASE, THOMAS, LL.D., an American educator, was born at Worcester, Mass., June 16, 1827. He graduated at Harvard College in 1848, and in 1850 became an instructor there. In 1853 he visited Europe, travelling extensively in Italy and Greece and studying at the University of Berlin. Returning in 1855, he was made professor of Greek and Latin literature at Haverford College, Pa. In 1875 he became president of this institution, which is conducted by the Society of Friends. He was one of the American Committee of Revision of the English translation of the New Testament. Among his publications are—*Hellas*, a narrative of his journey in Greece, school editions of *Vergil*, *Horace*, *Livy*, *Juvenal*, and the *First Book of Cicero's Tusculan Disputations*, and a *Latin Grammar* (1882). His text-books have had a wide circulation, and he has also contributed to reviews, encyclopædias, etc.

CHASLES, MICHEL (1793–1880), a French mathematician, born at Épernon (Eure-et-Loir), Nov. 15, 1793. He was educated at the Polytechnic School of Paris, which he quitted in 1814. He acquired a high reputation as a geometrician, and displayed great erudition in numerous contributions to the *Comptes Rendus* of the Academy of Science and other scientific journals. He discovered new methods, by which he resolved, without the aid of algebra, the most difficult questions of geometry. In 1841 he was appointed professor of geodesy and machinery in the Polytechnic School, and in 1846 he obtained the chair of higher geometry in the Faculty of Sciences, Paris. He became a member of the Institute in 1851. A memorable event in his career was his defence in 1867–69 of the forged documents by which an attempt was made to transfer to Pascal the credit of Sir Isaac Newton's mathematical discoveries. He died Dec. 19, 1880. His principal works are *Aperçu historique sur l'origine et le développement des méthodes en géométrie* (1875), *Sur l'Attraction des ellipsoïdes* (1835), *Traité de Géométrie Supérieure* (1852), *Traité des sections Coniques* (1865), and *Rapport sur les progrès de la géométrie* (1871). He is regarded as the founder of the new or higher geometry.

CHASTELLUX, FRANÇOIS JEAN, MARQUIS DE (1734–1788), a French general and author, was born at Paris in 1734. He entered the army at an early age, served in Germany as colonel during the Seven Years' War, and in 1780 came to America as major-general in Count Rochambeau's army. He had already gained an honorable position as a writer by his work *De la Félicité publique*, published in 1772, which was pronounced by Voltaire superior to Montesquieu's *De l'Esprit des Lois*. In 1786 he printed a few copies of his *Voyages dans l'Amérique Septentrionale*, consisting of his journal while serving in this country, and containing interesting sketches of prominent men and events of the Revolutionary War. An English translation by George Grieve was published soon after in London. In the same year he translated into French the poetical *Address to the Armies of the United States of America* by Col. David Humphreys, which was well received at the French court. He also published in 1787 *Discours sur les Avantages et les Désavantages qui résultent pour l'Europe de la Découverte de l'Amérique*. In this he

decided that Europe had gained more than it had lost by the discovery of America. In 1787 he married Miss Plunket, a young lady of Irish birth. He died at Paris, Oct. 28, 1788.

CHAT, a name applied to several different birds, even of distinct families: I. In Europe to species of shrikes, family *Laniidæ*, genus *Euneoctonus*, as the wood chat, *E. rufus*; II. In Europe and America to any of the birds of the sub-family *Saxicolinæ*, genus *Saxicola* and its subdivisions; one of these, the stone chat or wheat-ear (*S. ænanthe*), also occurring in North America; III. In the United States to the species of the genus *Icteria* (*I. virens* and var. *longicauda*), now usually classed in a sub-family, *Icteriinæ*, of the family *Sylvicolidæ*, though not without some relationship with the vireos (*Vireonidæ*). The yellow-breasted chat (*I. virens*) is the largest of the *Sylvicolidæ*, being 7 inches or more in length, the wing and tail about 3, both rounded; the bill stout, high, compressed, with curved culmen, unnotched top, and unbristled rictus; the upper parts uniform olive-green, the under golden-yellow, white from the breast backward; wings and tail colored like the upper parts; under eyelid, superciliary and maxillary lines, white. It inhabits the United States, chiefly E. of the Mississippi and N. to New England, being replaced in the W. by var. *longicauda*. It is an insectivorous bird, of rather delicate nature, migratory, usually appearing late in April or in May, spending the summer with us, and retiring beyond our limits in September. It is an abundant inhabitant of shrubbery and low tangle of any kind, but is very shy and secretive, and oftener heard than seen, excepting in the pairing season, when it mounts high on wing and performs the most extravagant aerial antics, singing the while with great volubility. The song is loud and almost endlessly varied; it has also a peculiar ventriloquial quality, serving to strangely mislead the hearer as to the whereabouts of the musician. The nest is built in a bush near the ground: the eggs are four or five in number, white, speckled, and dashed with reddish-brown. The Western variety is very similar, but rather grayish-olive above, and with a rather longer tail; its habits are the same. (E. C.)

CHATTANOOGA, a city of Tennessee, and county-seat of Hamilton county, is situated on the south bank of the Tennessee River, 152 miles south of Nashville, and within four miles of the boundary-line of the State of Georgia. It is compactly built at the foot of Look-out Mountain, from whose summit can be seen the site of the contest popularly known as the "Battle Above the Clouds," the mountains of five different States, the beautiful landscape of "Moccasin Bend," and the battle-fields of Missionary Ridge and Chickamauga, together with the Federal and Confederate cemeteries. In 1870 the population was 6093; in 1880, 13,000; and in 1883 it had reached 20,000, of which 7000 were colored. Six railways terminate in the city—the Western and Atlantic, the Nashville and Chattanooga, the East Tennessee, Virginia, and Georgia, the Memphis and Charleston, the Alabama Great Southern, and the Cincinnati Southern. River navigation is open by steamboats to Knoxville on the east and to Decatur on the west for about eight months of the year, and to boats of light draught the entire year. As soon as the Muscle Shoals Canals are completed (which will be in 1885) the city will have water-communication with all points on the Mississippi and Ohio rivers and their tributaries.

The manufacture of articles of iron and wood constitutes the chief industry. There are rolling-mills for the making of iron and steel rails, merchant bar-iron, cotton-ties, bolts, railroad-spikes, and nails. There are also two large blast-furnaces, one of the largest oak-bark tanneries in the world, and factories for the manufacture of railway-cars, engines, and boilers, stoves, scales, iron and wooden pipes, pumps, furniture, sash and blinds, cotton yarns, mineral paints, ploughs, fire-brick, handles, and spokes. There are also saw-mills

and planing-mills. The city is supplied with gas from two companies, with the electric light, and with water, and has street-railways, telephone and telegraphic communications. It has a healthy climate and a good system of sewerage. There are two banks, four hotels, eighteen churches, an Iron and Coal Association, a Board of Trade, an opera-house, a university (Methodist), ten well-arranged schoolhouses, with an excellent system of public schools, an orphans' home, one daily and three weekly newspapers.

Between the city and Missionary Ridge rises a beautiful knoll, occupied by the National cemetery, where are buried fourteen thousand Federal soldiers. Nearer the bank of the river rises the Confederate monument, around which sleep the dead of that army—about seven thousand. The National cemetery is cared for by the national government, and the Confederate cemetery by an association of ladies. The battle-field of Missionary Ridge is now converted into peach-orchards and vineyards, and the slopes are devoted to the cultivation of strawberries, which are shipped to the North in large quantities. The mountains that surround the city are rich in iron-ore and coal, and are covered with the best of manufacturing woods. They are also becoming noted as health resorts, because of their coolness in summer and their warmth in winter.

In 1838 the city was laid out. In 1843 it missed being the capital of the State by only two votes in the Senate. During the war it was an important strategic point. It was first known as Ross's Landing, but received its present name in 1838.

CHATTANOOGA, BATTLE OF. Immediately after the battle of CHICKAMAUGA (*q. v.*), which was fought on the 19th and 20th of September, 1863, Gen. Rosecrans had strongly fortified Chattanooga to withstand the Confederate siege from the east and the south, which was at once laid by Bragg. By an order from Washington of October 16 he was relieved from his post, and on the same date Gen. Grant was appointed to the command of the Military Division of the Mississippi, comprising the three departments of the Tennessee, the Cumberland, and the Ohio. At his suggestion Thomas was placed in charge of the Department of the Cumberland in place of Rosecrans, Sherman taking that of the Tennessee, and Burnside (soon to be relieved by J. G. Foster) that of the Ohio. Sherman was ordered to bring his army as rapidly as possible from the Mississippi to Chattanooga. He collected his scattered detachments and set out by the Memphis and Charleston Railroad for a portion of the way, and thence in a straight line for Bridgeport, below Chattanooga. Sherman preceded his troops in person to meet Grant. On the 19th of October, Grant, learning that the town was in great straits, had telegraphed to Thomas to hold out to the last extremity, and had received an answer that he would "until he starved." On the 23d, Grant was at Chattanooga, where he found a worse condition of things than he had expected. The Union army lay posted outside the town, with its flanks upon the Tennessee, near the mouth of Chattanooga and Citico creeks. The enemy lay in an immense irregular circle all along the western slope of Missionary Ridge, thence across the Chattanooga Valley and river to the "nose" of Lookout Mountain, the upper terraces of which were likewise fortified and armed with cannon and mortars. Lookout Valley was occupied by Confederate troops guarding the roads to the river, and all along the south bank of the river below were strong picket-lines commanding Brown's Ferry, six miles below Chattanooga, and completely closing river-communication with Bridgeport, thirty miles below. The only way the Union army could obtain supplies was over the Anderson road across Waldron's Ridge from Stevenson, making more than seventy miles of wagoning. One large supply-train, with quantities of ammunition besides, had been destroyed by Gen. Wheeler's cavalry. The constant rains had rendered the roads very difficult. Everything that attempted to pass into the town

was shelled from Lookout. The animals—cavalry and artillery horses and mule-teams—were dying for want of food. It is estimated that during this dearth ten thousand of them perished. The artillery was almost useless, for want of horses. The troops were on half rations, with prospect of less. They must have supplies, or retreat; and retreat without supplies meant annihilation.

Grant's appearance was the first gleam of hope. Troops would not be wanting; Sherman was coming. Hooker, with a strong detachment of the Army of the Potomac (20,000), was on his way, marching upon Bridgeport with the purpose to proceed up the river and seize the wagon-road between Bridgeport and Brown's Ferry. Palmer, following Hooker with the Fourteenth Corps, was to march on the north bank to a point opposite Whitesides. To facilitate these movements, which certainly would have been contested by the enemy, the following stratagem was resorted to with success. Gen. W. F. Smith (Baldy), of the Engineers, was ordered to take 4000 picked men to be thus used: With 1800, under Gen. Hazen, he was to drop down the river at night and in silence around the great loop or bend from south to north to Brown's Ferry, six miles below. This was done in sixty ponton-boats on the night of October 27 without their having been discerned by the enemy. This force at once seized the range of hills three miles below Lookout Mountain, covering the roads to the enemy's position. In the mean time, the remainder of the 4000 (2800) had marched by the north bank of the river to the same point, where, with great celerity, they laid down a ponton-bridge nine hundred feet long, and crossed. On the 28th, Hooker came up from below, with Howard's Eleventh Corps and Gurney's division of Slocum's Twelfth, crossed to the south side, and boldly marched up Lookout Valley as far as Wauhatchie. Palmer soon followed with the Fourteenth Corps. Thus at a dash two roads were secured—one from Bridgeport to Brown's Ferry, and the other from Brown's to Kelly's. The wagoning of supplies was at once reduced from seventy miles to eight, and, although it took a little time to supply the great deficiency, there was a decided change in the situation.

The Confederate general, who had been sanguine that the Union army would be starved out, was thus rudely awakened. Longstreet, who occupied Lookout, threw himself with great impetuosity upon the right of Hooker in the valley. At first Geary's division was in great danger, but Howard came up to his support, and not only drove him back, but advanced and seized the remaining crest west of Lookout Creek. Two steamers captured from the enemy, and a third from Chattanooga, rapidly repaired, were bringing up supplies as fast as possible, and Grant could now proceed to carry out his plans for dislodging the enemy.

Just at this time Bragg made the inexcusable blunder of detaching a large force in the face of a vigilant enemy. Hearing that Burnside was about to occupy Knoxville, he ordered Longstreet to proceed thither and destroy him. In spite of more timid suggestions from Washington, Grant sent orders to Burnside to hold Knoxville to the last extremity. Sherman was hurrying up with the Fifteenth Corps and one division of the Sixteenth, all under Gen. Frank Blair. On the 14th of November he arrived, marching from Bridgeport by way of Whitesides; thence he proceeded to take up his post on the north bank of the river, near the mouth of the South Chickamauga, forming the left of the Union line, to watch the enemy at the northern end of Missionary Ridge. Thomas, keeping open communication with him, was to attack their centre on the Ridge. The most of Howard's corps was held in reserve on the north bank. A cavalry force was sent to the right and rear of the enemy to cut the railroad between Cleveland and Dalton.

Deserters coming in reported that Bragg was falling back, and some color was given to this statement by a

letter which he had sent to Grant on the 20th of November, advising him to send all non-combatants out of the devoted town. In order to test the question rather than to bring on a general action, for which he was not yet quite prepared, Grant ordered Thomas to make a general reconnoissance in his front on the morning of the 23d. To this end Wood's division was ordered forward, and supported successively by divisions from the corps of Palmer and Howard, Sheridan's division of the latter corps playing a conspicuous part in the movement. These troops, moving out from Fort Wood in two lines and in full sight, manœuvred in so orderly a manner that the enemy thought it was a grand drill or review. The west side of Missionary Ridge is steep and rugged, and the crest is from 400 to 600 feet high; at its foot were rifle-pits. Midway between it and Fort Wood lies a slight eminence called Orchard Knob. The Union lines moved forward, quickening their pace until they had charged upon Orchard Knob and run up some guns; they entrenched themselves there, and waited for the developments of Sherman and Hooker.

Sherman began his movement on the same day, the 23d. One brigade was with the pontons in North Chickamauga Creek, west of the Tennessee. At dark they drifted down, landed a regiment just above the South Chickamauga, to capture the Confederate pickets; thence falling below, they laid two ponton-bridges, one, of 1400 feet, across the Tennessee, and another, for cavalry, across the South Chickamauga. By daylight Sherman had 8000 men across; by three in the afternoon his whole army was over and entrenched near the railroad tunnel. Col. Long, of the cavalry, moving rapidly around the Confederate right, destroyed Tyner's Station, on the railroad from Chattanooga to Cleveland, also the dépôt at Cleveland and a gun-cap factory. He took numerous prisoners and destroyed many wagons. Bragg thought this movement threatening his right was to be the real attack, and acted accordingly.

Sherman and Thomas being now in position, where was Hooker? On the 24th of November he climbed the west slope of Lookout Mountain, driving the enemy before him and taking numerous prisoners; thus the very last of the blockade came to an end. Henceforth there was no wagoning of supplies at all. Steamers plied unmolested from Bridgeport to Chattanooga, and there was plenty in all the camps. Leaving a small force on the mountain, he marched his column round the "nose," or northern slope, into and across the Chattanooga Valley and river, where he was delayed for three hours by a broken bridge. Then he marched upon Missionary Ridge to make an additional diversion in favor of Thomas, who was impatiently waiting for his appearance.

Meantime, there was going on a harmless artillery duel at Orchard Knob, while Bragg, rather neglecting Thomas and Hooker, directed his principal attention to Sherman, who lay in the most exposed position, and whose part in the great battle was rather to bear than to do. In front of his position lay a valley, then beyond a hill, commanded by another and higher hill in rear. Grant saw from his advanced position on Orchard Knob that Bragg was massing his troops in front of Sherman, and at one time he ordered Baird's division to reinforce him, but, finding that Sherman could hold his own without aid, Baird was retained and placed between Wood and the troops of Howard. The Confederates, to make up for a manifest deficiency in numbers, were strongly entrenched on the Ridge, their right commanded by Hardee and their left by Breckenridge.

Thus matters stood when Bragg committed his next great mistake. He weakened his centre to strengthen his right and overwhelm Sherman. Like Napoleon at Austerlitz, Grant profited by the error. All eyes were now upon the Rossville road, by which the arrival of Hooker was expected. Six discharges of field-pieces were to be the signal of his coming, and the first boom was heard at twenty minutes to four P. M. At once everything was in wild movement. Wood, Baird, and

Johnston poured upon the rifle-pits at the foot of the Ridge. There they were to have stopped and waited for orders; but, as they saw the enemy swarming out of the pits, they rushed forward without orders, followed soon, however, by an aid-de-camp shouting, "Take the Ridge if you can." As they moved, the Union artillery, thundering over their heads, swept open a path in their front. The men seemed to strain every nerve in the upward race; at sunset they were on the top. Hooker, coming up on the right, met but little resistance. The attacks on Sherman had ceased. The entire Confederate force, rushing down the eastern slope in disgraceful panic, sought safety in rapid flight. Night put an end to the contest. There was no general pursuit. Bragg abandoned all his positions and took post at Ringold and Dalton, but not before he had lost 6000 prisoners, 40 guns, and 7000 stand of small-arms. The next morning a strong reconnoissance was made by Sherman with troops from Hooker and Palmer; this was so fiercely resisted by the Confederate general Cleburne at White Oak Ridge that there were no further demonstrations.

The Federal army was about 80,000 strong; that of Bragg, about 50,000. The losses of the former did not exceed 5000; those of the Confederates were greater, and their loss in prisoners very great. (H. C.)

CHATTEL, in law, every species of property of less dignity and importance than a freehold estate in land. The term is derived from the Latin *catalla*, primarily signifying beasts of husbandry only, but in its secondary sense is applied to all movables in general. Chattels are of two kinds—viz., chattels real and chattels personal. Chattels real are those interests in land which are regarded by the common law as of less dignity than freehold interests therein. They comprise estates for years, from year to year, at will, at sufferance, and by *elegit*.

Chattels personal are properly things movable which may be transported at the caprice of the owner from place to place; such are animals, household stuffs, corn, jewels, garments, books, furniture, and the like. They also comprise all incorporeal rights arising from and out of things movable, such as an interest in a mercantile partnership or a mortgage of furniture, or the like.

Whether stock in a railroad or canal corporation owning necessarily large pieces of real estate is to be regarded as a chattel or as realty was originally much disputed. In England it is generally deemed realty unless the contrary is provided by statute. In the United States, on the contrary, it is almost universally regarded as a chattel. In the United States, prior to the War of the Rebellion, slaves were generally regarded as chattels personal, and in case of intestacy passed to the executor or administrator as such. In Louisiana and Kentucky they were, however, regarded as real estate. In those States where slaves were considered as chattels they were in consequence liable to be sold, mortgaged, or leased absolutely, at the will of their masters; they could be taken into execution and sold like other chattels for payment of debts or legacies; an action on the case lay for an injury to them as for an injury to other personal property; and, finally, the ownership of their offspring was governed by the laws applicable to brute beasts. (L. L., JR.)

CHATTEL MORTGAGE, a mortgage upon chattel property—usually, in practice, upon personal chattels or movable articles. When chattel interests in real property or choses in action are to be used as security, an assignment, either expressed to be conditional and for the payment of the debt, or absolute in form, but accompanied by some counter-engagement for a return upon payment, is ordinarily employed, and is spoken of as "an assignment for collateral security." There may, however, undoubtedly be a mortgage of a chattel real—of a lease for years, for example. A chattel mortgage differs from a pledge or pawn in this—viz., that in the former the title to the property mortgaged passes in law at once to the mortgagee upon failure of the mort-

gagor to comply with the conditions of the mortgage. In the latter the title to the thing pawned does not so pass to the pawnee immediately upon the default of the pawnor. It remains vested in the pawnor until such time as the chattel is sold by the pawnee; and even then the pawnor remains entitled to all that portion of the purchase-money which exceeds his debt with interest.

A chattel mortgage differs from a conditional sale in this—viz., that at the time of the execution there is always a debt from the mortgagor to the mortgagee, either due or actually in prospect, upon failure to pay which within a stipulated time the title is to rest in the mortgagee. In the case of a conditional sale no question of a debt due from the vendor to the vendee is involved. The vendor simply retains the right, within a stipulated time and upon stipulated terms, to reclaim his property.

As in the case of mortgages of real estate, a chattel mortgage will be decreed to be such by the courts, even though it may be in the guise of an absolute or conditional sale. The true intent of the parties will always be regarded in such cases. As a rule, the retention of possession of mortgaged chattels by the mortgagor constitutes evidence of fraud as against subsequent *bonâ fide* purchasers and mortgagees, which must be submitted to a jury. In Pennsylvania and Illinois the courts go further, holding that in such cases the retention of possession constitutes an irrebuttable presumption of fraud. In those States, accordingly, a chattel mortgage unaccompanied by delivery of possession is regarded as void except as to parties to the contract.

In almost all the United States, however, statutes have been enacted for the purpose of enabling mortgagors to retain possession of mortgaged chattels, and at the same time to give mortgages which shall secure their creditors as effectually as though possession of the property had actually been transferred. This purpose is accomplished by substituting a record or filing of mortgages in place of a delivery of possession of the mortgaged property. The statutes, in effect, make a recording or filing of the instrument equivalent to a change in the possession of the property.

The provisions of these statutes differ materially in the various States. They generally stipulate that the mortgage shall be filed in the town or county constituting the residence of the mortgagor. In some States it is provided that in case the mortgagor be a non-resident the mortgage shall be recorded in the city or town where the property is situate at the time the mortgage is executed. Such is the law in Illinois, Kansas, Maine, Massachusetts, Michigan, Nebraska, New Hampshire, New Jersey, New York, North Carolina, Ohio, Rhode Island, South Carolina, Tennessee, Texas, Wisconsin, and Vermont.

In other States it is provided that a mortgage of chattels shall be recorded both where the mortgagor resides and where the property is located. Such is the law in Alabama, Arizona, California, Georgia, Idaho, and Minnesota. In Colorado, Connecticut, Dakota, Delaware, Florida, Kentucky, Mississippi, New Mexico, Virginia, West Virginia, Washington Territory, and Wyoming a chattel mortgage need only be recorded in the county where the property is situate at the time the mortgage is made.

In some States, where the property is removed during the continuance of the mortgage, the record thereof must also be transferred to render it effectual. Such is the case in Alabama, California, Mississippi, and Wyoming. In some States a record ceases to be of any effect after a limited period from the original filing of the mortgage, as in Colorado, Minnesota, Montana, Nebraska, Wyoming, and Illinois. But provision is made in several States for a refiling of the mortgage, as in Arkansas, Kansas, Michigan, New Jersey, New Mexico, New York, Ohio, Oregon, Wisconsin, and Dakota.

In Louisiana and Nevada there are no laws authorizing the recording of chattel mortgages. In Pennsyl-

vania the statutes sanction the recording of chattels real in the county where the realty is situate.

The foreclosure of chattel mortgages is effected by a sale of the property mortgaged by the mortgagee, after due notice to the mortgagor both of the amount due and of the intended sale. In some States peculiar forms of foreclosure are provided by statute.

(L. L., JR.)

CHAUNCEY, ISAAC (1772–1840), an American naval officer, was born at Black Rock, Conn., Feb. 20, 1772: He first served in merchant-vessels, but when the navy was reorganized in 1779 he became a lieutenant, and in 1802 was acting captain of the frigate *Chesapeake*. During the operations against Tripoli he served actively under Commodores Preble and Rodgers. In 1804 he was appointed master-commandant, and in 1806 captain. During the peace which followed the Algerine war he was stationed at the navy-yard at New York. On the outbreak of the war of 1812 he was placed in command of all the lakes except Champlain. Arriving at Sackett's Harbor Oct. 6, 1812, he used great exertions to prepare a fleet, guarding also against an attack by the enemy. Late in April, 1813, he carried Gen. Dearborn's army to York (now Toronto), hoping at the same time to capture some vessels and gain the mastery of the lake. York was taken, the Government buildings fired, and three days later the American troops re-embarked and were taken to Niagara. Little had been gained by this expedition, and the British had offset it by an attack on Sackett's Harbor, then almost defenceless, and, though repulsed, caused the loss of an immense amount of military stores. In October, Chauncey encountered a British fleet of seven vessels, five of which he captured. In 1814, while the land-forces carried on the war in Upper Canada, he was inactive until August, when he appeared off Kingston, and blockaded the fleet of Sir James Yeo for six weeks. Peace was concluded before operations could be resumed, and Chauncey returned to his command of the navy-yard at New York. He was afterwards one of the navy commissioners, and in 1833 was made president of the board, which position he held till his death, at Washington, Jan. 27, 1840.

CHAUTAUQUA. Chautauqua, on Chautauqua Lake, in Chautauqua co., Western New York, is the centre of an educational movement which has acquired considerable prominence during the past nine years. It is a practical answer to the several important problems which present themselves again and again to thoughtful students of our American society and institutions.

The place is very beautiful for situation. It is on a point that projects into the lake, giving a fair prospect up and down and across its blue waters for miles, and affording easy landing-places for steam and sail craft. The ground rises gradually from the pebbly beach to the height of 125 feet, making it one of the highest retreats on the lake. Here is built a summer city in the midst of the original forest, cleared out, trimmed, and fitted for the purpose. Five hundred cottages (some of them costing as much as \$5000), stores, markets, parks, fountains, statuary, flowers, ferneries, swings, museums, and lawn-tennis grounds, docks, avenues, railway-stations, public buildings which have cost \$150,000, together with a hotel costing \$100,000,—help to fill up the 136 acres enclosed in the grounds. Every part is illuminated with the electric light. The departments of streets, police, and water-supply are well organized and efficient. The sewage and sanitary arrangements are not excelled, if equalled, by any city in the United States. The water-supply is taken from the bottom of the lake, directly from its purest sources, and forced through pipes to all parts of the grounds.

The Chautauqua movement began in 1874, through the joint suggestions and plans and labors of Lewis Miller, Esq., of Akron, Ohio, and Rev. Dr. J. H. Vincent of the city of New York. Its original intention was to utilize the summer recreative instinct, necessity, and habit in the interest of worthier ends than those which usually control "summer resorts." The founders,

having been for years especially interested in Sunday-school work, proposed to turn the leisure of summer tourists into opportunity for biblical, educational, and especially Sunday-school work. Innocent recreations, music, fireworks, brilliantly illustrated scientific lectures, stereoscopic displays, etc., were employed the first year, in connection with a series of lectures on biblical, social, and other general subjects.

The success of the first year encouraged the projectors of the institution to widen its scope, without losing sight of the original intention of the Chautauqua Assembly. One of the great problems of the day is how to interest our young people in worthier lines of reading and conversation during the week. The Sabbath-school, at its maximum of an hour and a half on the Sabbath, is unable to neutralize, without especial effort in that direction, the dissipating, if not demoralizing, influences which are at work through the whole week. It was believed that these week-day forces might be controlled in the interest of moral and intellectual improvement. In pursuance of plans projected long before the beginning of the Assembly, a literary and scientific circle was organized in 1878, the design of which was to promote habits of reading and study in nature, art, science, and in secular and sacred literature, in connection with the routine of our daily life, especially among those whose educational advantages have been limited, so as to secure to them the college student's general outlook upon the world of thought and life, and to develop the habit of close, connected, and persistent thinking. William Cullen Bryant was consulted in regard to the details of this plan, and gave it his unqualified indorsement in a long letter written to Dr. J. H. Vincent a few weeks before the poet's death. The course of study adopted by the "Chautauqua Literary and Scientific Circle" covers four years, requiring from each member an average of forty minutes' reading a day. The Circle becomes, in fact, a home-college for old and young, and discharges manifold ministries of incentive and inspiration. More than 25,000 names are now enrolled. Local circles have been organized in all parts of the country, in Canada, in the Sandwich Islands, in India, in Japan, etc. The first commencement of the "C. L. S. C." was held Aug. 12, 1882, when more than 1600 graduates were rewarded with diplomas. Eight hundred of these were present, one of them being a lady eighty years of age.

The Chautauqua meetings are held for six weeks during the summer. They embrace sessions of the "School of Languages," for the study of the languages, especially the modern languages, chiefly after the natural method; the "Chautauqua Teachers' Retreat," for the benefit of secular educators; the "Chautauqua Missionary Institute," for the quickening of all the churches in the home and foreign missionary work; the "Chautauqua Sunday-school Assembly," for the increase of biblical and Sunday-school knowledge and ability; the "Chautauqua Literary and Scientific Circle," annually meeting for reports, lectures, etc. The exercises for the six weeks are very interesting. Able lectures from men of renown, magnificent concerts, class-drills, children's meetings, brilliant illuminations, bonfires, fireworks, innocent recreations, the model of Palestine (over 300 feet long), the sectional model of the Egyptian Pyramid, the model of the Oriental House, the Children's Temple, the Art and Archæological Museum,—all of these attract to Chautauqua every summer tens of thousands of persons interested in its work. The expenses of the platform only for the season of 1882 were \$15,500.

But the principal charm in the work of Chautauqua is the ministry which it exercises at the homes of the people from January to December. The meetings for the summer give quickening, but the work is wrought in thousands of homes all over the land through the entire year—a work in which religious and scientific culture, cheerful home-life, broad views, and lofty ideals are promoted. Rev. Dr. J. H. Vincent continues to direct its management. (J. H. V.)

CHAUVEAU, PIERRE J. O., a Canadian statesman and author, was born at Quebec, May 30, 1820. He was the son of a merchant, and was educated at the seminary of Quebec. While studying law he began to contribute political articles to *Le Canadian* and to the *Courier des États Unis* of New York, and soon became noted as a writer. He was elected to Parliament from Quebec in 1844 and in 1848, and filled various public offices. When the Dominion of Canada was formed in 1867, Chauveau became the first minister of the government of Quebec, and so remained until 1873, when he was made speaker of the Senate of Canada. His literary reputation rests chiefly on his novel *Charles Guérin* (1850), which faithfully depicts French-Canadian life.

CHAUVENET, WILLIAM, LL.D. (1819–1870), an American mathematician, born in Milford, Pennsylvania, May 24, 1819. He graduated at Yale College in 1840; was for a time employed at Girard College in taking magnetic observations in association with A. D. Bache; became in 1841 mathematical instructor in the United States Naval Asylum; held the professorship of astronomy and mathematics 1845–59 in the United States Naval Academy, of which he was one of the founders; he was at the same time director of the observatory; was appointed in 1859 professor of mathematics in Washington University, St. Louis, Mo., and 1862 assumed in addition the duties of chancellor of the university. He resigned these positions in 1869, and died at St. Paul, Minn., Dec. 13, 1870. Among his works are treatises on *The Binomial Theorem and Logarithms* (1843), *Plane and Spherical Trigonometry* (1850), *New Method of correcting Lunar Distances* (1850), *The Great-Circle Protractor* (1855), *Manual of Spherical and Practical Astronomy* (1863), and *Elementary Geometry*. He was the originator of remarkable improvements in mathematical methods, and in the practical application of scientific principles.

CHEBOYGAN, the county-seat of Cheboygan co., Mich., is on Lake Huron, near the Straits of Mackinaw and at the mouth of the Cheboygan River. It is on the Jackson, Lansing, and Saginaw Railroad, 160 miles N. of Bay City and 250 miles N. N. W. of Detroit. It has a bank, two weekly newspapers, five churches, and a union school. Its chief industry is the manufacture of lumber; it has several large saw-mills and three foundries, and ships large quantities of timber, tan-bark, and fish. It has a system of water-works. It is assessed at \$1,200,000, and its public debt is small. By means of slack-water, navigation is opened to a chain of inland lakes and to Petoskey, 45 miles distant. Population, chiefly of American birth, 2269.

CHECK, or CHEQUE, a bill of exchange or draft drawn on a bank or banker, payable on demand. The law relating to cheques both in England and this country is in general the same as that relating to bills of exchange except so far as it has been modified by usage. These modifications, briefly stated, are—1. A cheque requires no acceptance, the bank being bound to pay it if there are funds of the drawer in its hands. If the bank marks or certifies the cheque to be "good," that amounts to an acceptance, and the bank becomes liable as an acceptor. 2. The drawer of a cheque is a principal debtor, and not, like the drawer of a bill of exchange, a surety. The effect of a cheque is to appropriate to the holder a specific sum of money in the hands of the bank. The holder may draw the money whenever it pleases him, but he runs the risk of the bank's failure or of the deposits of the drawer being drawn out if he does not present it for payment promptly. If the bank should fail before the presentation of the cheque, provided there was time to present it, the holder must bear the loss. If there are no funds of the drawer in the bank with which to pay the cheque, then the holder can look to the drawer for the money. 3. The death of the drawer countermands his cheques, although the bank would not be held liable for paying them before they

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received notice of his death. 4. The bank is responsible for the payment of a forged cheque if the forgery is that of the name of its depositor, for it cannot in that case charge the money to him; and if the bank pay a cheque fraudulently increased in amount, or "raised," it can only charge to the depositor the amount for which it was originally drawn. (S. W.)

CHEESE, CHEESE-MAKING. See DAIRY.

CHEEVER, GEORGE BARRELL, D. D., a Congregationalist minister and author, was born at Hallowell, Me., April 7, 1807. He graduated at Bowdoin College in 1825, studied theology at Andover, and was ordained pastor of a Congregational church at Salem, Mass., in 1831. He had already frequently contributed literary articles to the *North American Review* and other periodicals, as well as taken part in the Unitarian controversy, defending the orthodoxy of Cudworth. He had also published some volumes of selections and *Studies in Poetry, with Biographical Sketches of the Poets* (1830). In 1835 he gained celebrity by publishing in a Salem newspaper a satirical allegory called *Deacon Giles's Distillery*, which was soon circulated as a broadside with rude cuts that helped to point the moral. The author was charged with having made a libellous attack on a citizen of Salem, was riotously assaulted in the street, then tried before a court, convicted, and sent to jail for thirty days. Nothing daunted by these proceedings, he soon published a similar tract called *Deacon Jones's Brewery*. The next year Mr. Cheever went to Europe, where he travelled two years and a half, and wrote regularly for the *New York Observer*. In 1838 he took charge of the Allen Street Presbyterian Church in New York, and in 1841 published a volume entitled *God's Hand in America*, with an introductory essay by Rev. Dr. Skinner. After making a second visit to Europe, he became the editor for one or two years of the *New York Evangelist*. In 1844 appeared his *Lectures on Bunyan's Pilgrim's Progress*, which were very popular in this country, and have been issued in several editions in England. His own experience seems to have quickened his sympathy with Bunyan, and made this his best work. It was followed by his *Lectures on the Hierarchical Despotism* and a volume in *Defence of Capital Punishment for Murder*, with the notes of a public discussion on the argument. In 1846 he gave the results of his last visit to Europe in his *Wanderings of a Pilgrim in the Shadow of Mont Blanc*, and in the same year he became pastor of the Congregational Church of the Puritans, which had been built by his personal friends. In 1848 he edited and published *The Journal of the Pilgrims at Plymouth in New England*, with twenty-four chapters of historical illustrations. When the *Independent* was established at New York in 1848 he became a regular contributor to that paper, treating of religious, literary, and political topics. He wrote some allegories on the Christian life, which were published, with other miscellanies, in a volume entitled *The Hill Difficulty*. This was followed by a similar work, *The Windings of the River of the Water of Life* (1849). Nearly every year, besides his labors in the pulpit, he added a volume to his list of publications: *The Voices of Nature to the Soul of Man* (1852), *A Voyage to the Celestial Country* (1853), *The Right of the Bible in our Common Schools* (1854), *Lectures on Cowper* (1856), and in the same year a volume on *The Powers of the World to Come*. He took a prominent part in the anti-slavery agitation, and published *God against Slavery* (1857) and *The Guilt of Slavery and the Crime of Slaveholding Denounced from the Hebrew and Greek Scriptures* (1860). He also contributed to the *Bibliotheca Sacra* and other periodicals, and prepared a course of *Lectures on Bunyan's Holy War*. When the lease of the ground on Union Square, where the Church of the Puritans was originally built, expired in 1867, the congregation removed, and after some time united with a Presbyterian church in One Hundred and Twenty-ninth Street, adopting the same title, "The Church of the Puritans." In *Faith, Doubt, and Evidence* (1881) he

discusses the manuscripts of Dr. Benjamin Franklin's *Autobiography*, and brings illustrations from them bearing on the demonstration of the integrity of the New-Testament Scriptures. Dr. Cheever has resided for some years at Englewood, N. J.

CHELIUS, MAXIMILIAN JOSEPH (1794-1876), a German physician and surgeon, was born at Mannheim (Baden) in 1794. He received his education in that city and in the University of Heidelberg, from which he graduated as M. D. at the age of eighteen. He became physician to the hospital of Ingolstadt (Bavaria), and afterward visited the hospitals and universities of Vienna, Göttingen, Berlin, and Paris. After this preliminary experience he received, in 1817, the appointment of assistant professor of medicine at Heidelberg. Two years later he became full professor there, and in 1826 received the title of councillor of the court of Baden. He founded at Heidelberg a clinic of ophthalmic surgery. His most important work is *Handbuch der Chirurgie* (Heidelberg, 2 vols., 7th ed. 1851), which is widely used in Germany and has been translated into several languages. An English version (*A Manual of Surgery*) was published in London in 2 vols. (1847). He also wrote *Ueber die Heilweg der Blasen-Schneiden Fisteln durch Cauterisation* (Heidelberg, 1844), *Zur Lehre von den Staphyloomen des Auges* (1858), and many articles in the *Annals of Medicine*, a journal edited by himself. He died at Heidelberg, Aug. 17, 1876.

CHELMSFORD, FREDERICK AUGUSTUS THESIGER, second BARON, an English general, was born May 31, 1827. He entered the army in 1845 as an ensign in the grenadier guards. He served in the Crimea as aid-de-camp to Major-Gen. Markham and took part in the Sepoy war, and in 1868 rendered distinguished service in the Abyssinian expedition. For the next six years he was adjutant-general of the Bengal army, but in 1876 he returned to England, and soon after was promoted to a major-generalship. In 1878 he was appointed to the command of the British troops in South Africa. He completed the subjugation of the Kaffirs, but was called to what proved a more serious contest with the Zulus, who, under the lead of Cetewayo, were striving to resist British aggression. In October, 1878, by the death of his father, Gen. Thesiger succeeded to the title Lord Chelmsford. His army, consisting of 18,000 men, of whom over 6000 were Europeans, invaded Zululand in four divisions Jan. 11, 1879. On the 22d, while Lord Chelmsford had gone forward with the main body of his troops, the garrison of his camp at Isandlana was surprised and massacred. The other divisions narrowly escaped the same fate, and the British army was thrown on the defensive until reinforcements should arrive from England. These were quickly sent, to the number of 10,000 men, and, though there was a loud demand for the recall of the general, he was retained in command. On March 29 he renewed the invasion, marching first to relieve Col. Pearson, who, though he had defeated the Zulus on Jan. 23, had entrenched himself at Ekowe (or Etchowe) on learning of the defeat at Isandlana. On April 2, at Ginghilova, 12 miles from Ekowe, Lord Chelmsford defeated the entire army of the Zulus, and joined Col. Pearson. On July 4, at Ulundi, where Cetewayo's royal kraal was situated, Lord Chelmsford again defeated the main army of the Zulus, amounting to 20,000 men. The Zulus now dispersed, and, though Cetewayo had not yet been captured, Lord Chelmsford sent his resignation to Sir Garnet Wolseley, who had been appointed civil and military governor of Natal and the Transvaal. After his return to England, Lord Chelmsford, both in the House of Lords and through the press, discussed the events of the war and defended his own action.

CHELONIAN. See REPTILES.

CHEMICAL ANALYSIS. As chemistry treats of the composition of material substances, the chemist must devote great attention to analysis—that is, the

methods of ascertaining whether a particular substance be simple or complex, and, if complex, of determining its constituents.

As general chemistry is divided into *inorganic* and *organic*, so analytical chemistry is divided into *inorganic analysis* and *organic analysis*; and both of these are again divided into *qualitative* and *quantitative* analysis. The first of these latter branches ascertains the elemental chemical composition of any substance or mixture, and the second the relative proportion in which these constituents are present. Of course the successful application of the second method of analysis presupposes an acquaintance with the results of the first in any particular case.

Quantitative chemical analysis is classified, moreover, under the headings of *gravimetric* analysis, in which the material to be analyzed is weighed, and its component parts are likewise determined by weight; *volumetric* analysis, in which the composition of a substance is determined by measuring the volumes of solutions of known strength which are used in the reactions incident to the analysis; and *eudiometric*, or *volumetric*, *gas* analysis, which determines both the qualitative and the quantitative composition of gaseous mixtures. Organic quantitative analysis, lastly, is divided into *proximate* and *ultimate* analysis, according as the complex vegetable or animal compound is resolved into simpler compounds only, or at once into the few chemical elements which in organic compounds unite in so many different forms of molecular combination. The methods of ultimate analysis dealing with some three or four elements only are quite simple, while proximate analysis involves the use of many reagents and methods, as the various organic principles contained in plant and animal tissues have very different physical and chemical properties.

The space at our disposal will allow of only a cursory view of the most important of these several branches of chemical analysis. The methods of inorganic qualitative analysis will first be passed in review; of the two branches of inorganic quantitative analysis, gravimetric and volumetric, as the methods of the former correspond in principle almost uniformly with those of qualitative analysis, they will not be noted here, and for a description of the latter the reader is referred to manuals on the subject; eudiometric, or gas, analysis will then be noted, especially in its application to industrial gases. The subject of ORGANIC ANALYSIS will be treated under that title.

INORGANIC QUALITATIVE ANALYSIS.—In qualitative analysis the student attempts to determine the composition of the different forms of matter by applying to them *reagents*—bodies of known properties which when applied properly give him information in the form of *reactions*. The reactions yield new products, with accompanying changes in appearance and properties. When the reaction takes place between two liquids, a not infrequent result is the formation of an insoluble compound, a *precipitate*. Or the result of the reaction may be the escape of a gas with what is called *effervescence*. According to the action of reagents we can divide the metals or basic elements into six groups, the members of which are in many respects similarly affected by reagents. These six groups are:

I. Potassium, Sodium, Ammonium, Lithium, etc.	III. Zinc, Manganese, Cobalt, Nickel, etc.	V. Arsenic, Antimony, Tin, Gold, Platinum, etc.
II. Barium, Strontium, Calcium, Magnesium.	IV. Iron, Aluminium, Chromium, Beryllium, Uranium, etc., etc.	VI. Mercury, Lead, Bismuth, Cadmium, Copper, etc.

Before treating of the differences of the several groups, certain preliminary analytical operations which are in constant use will be mentioned.

1. *Solution*. Some solids, when brought in contact with water or other liquid, gradually pass into the liquid state, or dissolve; such are said to be "soluble." The liquid which effects the solution is "the solvent," and the liquid obtained is termed the "solution." If the substance can be recovered without material alteration, the solution is said to be "simple;" but if a chemical change has taken place, the product is a "chemical solution." 2. *Evaporation* is the driving off of the solvent by boiling. 3. *Precipitation* occurs when, on mixing two perfectly clear liquids, turbidity ensues, an insoluble substance called a "precipitate" being formed. Precipitates differ greatly in appearance and properties, being described as flocculent, crystalline, gelatinous, etc. 4. *Filtration* consists in separating a precipitate from the liquid in which it is produced. This is accomplished by the use of filtering paper, a soft bibulous variety analogous to but looser in texture than blotting-pad paper; which paper is fitted inside of a glass funnel. In the filtration of strong acids, etc. asbestos fibre or spun-glass is substituted for paper. 5. *Decantation* is resorted to in some cases where the insoluble compound is rather heavy and separates rapidly. The liquid is removed by pouring it off with the aid of a glass rod held against the edge of the vessel, or by the use of a syphon. Precipitates are usually washed upon the filter upon which they are collected by directing a jet of distilled water upon them and continuing until the water running through the funnel is found to leave no residue on evaporation. If washed by decantation, the process is continued until the water poured off answers the same test. When it is desired to dry a precipitate, the funnel with filter can be placed on a support over a sand-bath or hot iron plate, or in a drying-oven. If it is to be ignited, it can be placed in a crucible and heated over a lamp, at first slowly, and finally to a red heat. The ash of the filter must be allowed for, of course, if the ignited precipitate is to be weighed.

The First Group.—We have no group reagent for the alkali metals, but special tests enable us to recognize them without difficulty. Any salts of *ammonium*, when heated in a dry test-tube, will volatilize, condensing again, in most cases, upon the cooler portion of the tube. When, in concentrated solution, in the presence of a little free hydrochloric acid, platinic chloride is added, a yellow crystalline precipitate is formed of the composition $(\text{NH}_4)_2\text{PtCl}_6$. This double chloride is insoluble in alcohol; it resembles that of potassium and platinum, but can be distinguished by the fact that upon ignition it leaves only spongy platinum. On warming ammonium salts with potassium hydrate or lime-water, ammonia gas is liberated, and is at once recognized by its pungent odor. The most delicate test for ammonium salts is their action with Nessler's solution (a potassium hydrate solution of potassio-mercuric iodide). This reagent produces in dilute solutions a yellowish coloration, and in concentrated solutions a reddish-brown precipitate. *Potassium* salts require an intense heat for volatilization. Their concentrated solutions, in the presence of a little free acid, yield with platinic chloride a double salt, K_2PtCl_6 , analogous to that of ammonium and resembling it. This salt is somewhat soluble in water, but insoluble in alcohol. On ignition it leaves metallic platinum and potassium chloride. A ready test for potassium compounds is to dip a clean platinum wire into the solution, and then to hold it in the flame of a Bunsen burner, when we have a violet-colored flame. Sodium salts obscure the violet of the potassium; but if a piece of blue glass or a prism filled with an indigo solution be held between the eye and the flame, the yellow of the sodium flame is absorbed, and the violet color due to potassium becomes visible. The intense yellow color imparted to flame by *sodium* compounds is the best means of identifying sodium. When to a solution of sodium chloride

platinic chloride is added and the solution allowed to evaporate, a double chloride, Na_2PtCl_6 , results, which separates in aurora-red needles. This color and its solubility in water and alcohol distinguish it from the corresponding potassium and ammonium salts. Potassium pyroantimoniate ($\text{K}_2\text{H}_2\text{Sb}_2\text{O}_7$), in concentrated neutral solutions of sodium salts, throws down a crystalline white precipitate of $\text{Na}_2\text{H}_2\text{Sb}_2\text{O}_7$. The double chloride of *platinum and lithium*, like that of sodium, is soluble. In concentrated lithium solutions sodium carbonate produces, after some time, a white granular precipitate of lithium carbonate. With hydro-sodium phosphate, HNa_2PO_4 , no precipitate is obtained in the cold; but when the liquid is boiled, there separates a white crystalline compound, lithium phosphate, soluble in hydrochloric acid, but not reprecipitated from a cold solution on the addition of ammonium hydrate. Lithium salts give to the colorless gas or alcoholic flame a rich carmine color.

The Second Group is known as the group of the alkaline earths; its reagent is ammonium carbonate. Magnesium may be considered as a separate section of this group, being distinguished from the other members by the insolubility of its hydrate, the ready solubility of its sulphate, and the non-precipitation of its carbonate, in the presence of ammoniacal salts. Again, the alkaline hydrates have no effect upon barium, strontium, or calcium salts, but precipitate magnesium hydrate from the solutions of that metal. Sulphuric acid or soluble sulphates precipitate barium readily, strontium more slowly, and calcium only in concentrated solutions or upon addition of alcohol. The three sulphates are all white in color, and differ chiefly in relative solubility. The best precipitant for calcium is ammonium oxalate. Both bichromate and neutral chromate of potassium precipitate barium chromate, insoluble in acetic acid, but do not precipitate strontium chromate from either acid or neutral solutions. All the carbonates are white and soluble in dilute acids; the sulphates of strontium and calcium are soluble in dilute acids, but that of barium is not. Barium salts impart a yellowish-green color to flame, calcium salts an orange-red, and strontium salts a crimson color. Magnesium solutions, in the presence of ammoniacal salts, are precipitated on the addition of hydro-sodium phosphate, yielding a white crystalline precipitate of MgNH_4PO_4 . When this is ignited, it loses water and ammonia and leaves $\text{Mg}_2\text{P}_2\text{O}_7$, pyrophosphate of magnesia. From solutions of magnesium free from ammoniacal salts a concentrated solution of ammonium carbonate will, after standing some time, precipitate a double carbonate, $(\text{NH}_4)_2\text{CO}_3 \cdot \text{MgCO}_3$. This furnishes a means of separating magnesium from the alkalies. Or if the magnesium solution be free from ammonium salts, it can be boiled with barium hydrate, and magnesium hydrate will be precipitated. The excess of barium hydrate can then be removed by adding dilute sulphuric acid, and the filtrate from the barium sulphate which separates will contain only the alkalies. The following method is used in separating the members of this group when together in solution: First add some NH_4Cl , and then the group reagent, $(\text{NH}_4)_2\text{CO}_3$. A precipitate forms, which is filtered, and to the filtrate add HNa_2PO_4 , when, if magnesium be present, a precipitate of MgNH_4PO_4 is obtained. Dissolve the original carbonate precipitate in dilute HCl , evaporate the solution to dryness, and treat the dry residue with alcohol. If insoluble in alcohol, dissolve in water, adding H_2SO_4 , when, if barium be present, insoluble BaSO_4 will be found; but if soluble, boil off the alcohol, add ammonium carbonate, filter, and dissolve the precipitate in HNO_3 . Evaporate to dryness, and treat the dry residue with alcohol. If soluble, expel the alcohol, add ammonium oxalate, and calcium oxalate will be precipitated; but if insoluble, test in the Bunsen flame, when the intense red color will prove the presence of strontium.

The Third Group includes manganese, zinc, nickel, and cobalt, and has as a group reagent ammonium

sulphide. The fixed alkalies, as KOH , precipitate from manganese solutions white manganous hydrate, $\text{Mn}(\text{OH})_2$, rapidly turning brown, owing to oxidation. With zinc the hydrate is white in color and readily soluble in an excess of the reagent; with nickel the hydrate is apple-green; with cobalt is formed a blue basic hydrate which changes on boiling to a pink. Both nickel and cobalt hydrates are insoluble in excess of the reagent. The fixed alkaline carbonates precipitate the entire group; ammonium hydrate and carbonate only precipitate manganese completely. With the group reagent, ammonium sulphide, manganese yields a flesh-colored sulphide soluble in acetic and the mineral acids; while nickel and cobalt furnish black sulphides insoluble in the dilute mineral acids, but soluble in concentrated nitric acid or *aqua regia*. Of these four sulphides, nickel is the only one appreciably soluble in the group reagent. Its solubility is shown by the dark color of the supernatant liquid. Concentrating the solution and adding acetic acid will cause it to separate out. With a bead or globule of fused borax three of the four elements in this group give characteristic color—manganese, an amethyst color; nickel, a reddish-brown; and cobalt, a deep blue. Manganese compounds, also, when heated on platinum foil with sodium carbonate and nitrate, yield a bright-green mass of manganate of soda. The different effect of potassium cyanide upon nickel and cobalt solutions gives us a means of separating these elements. Potassium cyanide precipitates from nickel a dirty-green cyanide of nickel, which dissolves in excess of cyanide of potassium. From this solution the nickel may be precipitated as cyanide by careful neutralization with hydrochloric acid or as hydrated sesquioxide on addition of a hypochlorite. Boiling does not alter the double nickel salt. From cobalt solutions potassium cyanide precipitates a chocolate-colored cyanide also soluble in excess. But by boiling the solution the potassio-cobaltous cyanide is oxidized to potassio-cobaltic cyanide, which is no longer precipitable. From cobalt solutions nitrite of potash precipitates, in the presence of acetic acid, a yellow crystalline precipitate of double nitrite of cobalt and potash, while nickel gives no such result. If the four elements of this group be precipitated together as sulphides, this mixture, after washing, is to be treated with warm dilute HCl , which will dissolve MnS and ZnS , but leave CoS and NiS . On adding excess of sodium hydrate to the solution containing manganese and zinc the former only is precipitated, the latter remaining in solution. The mixture of insoluble NiS and CoS is dissolved in concentrated HNO_3 evaporated to dryness and the two elements separated by the nitrite-of-potash method given above.

The Fourth Group includes aluminium, chromium, and iron, and has for its reagent ammonium hydrate, NH_4OH . This reagent precipitates them as hydrates, that of aluminium being white and gelatinous, only slightly soluble in excess of precipitate; that of chromium, bluish-green, soluble in excess of ammonium hydrate. With iron in the ferric condition is gotten a reddish-brown precipitate insoluble in excess of the ammonium hydrate. Ferrous solutions, if pure, yield a white precipitate of ferrous hydrate, but this very speedily oxidizes and becomes dirty-green or brown in color. The fixed alkalies precipitate the entire group, the hydrates of aluminium and chromium dissolving in excess of the reagent. Boiling will, however, cause the reprecipitation of the chromium hydrate. The alkaline carbonates behave like their hydrates except in the case of ferrous salts, where white ferrous carbonate is precipitated. The group reagent of the preceding group, $(\text{NH}_4)_2\text{S}$, precipitates aluminium and chromium as hydrates, and iron as black ferrous sulphide, FeS . The blow-pipe tests are among the most characteristic with the metals of this group. Aluminium compounds heated upon charcoal, and then moistened with cobaltous nitrate and reheated, show a blue color. Chromium compounds impart a beautiful emerald-green color to

the borax glass, and, fused with sodium carbonate and nitrate on platinum foil, yield a yellow mass of sodium chromate. Iron imparts to the borax glass a color yellowish while hot and light-green when cold. The ferric salts are distinguished from ferrous by the following reactions: With ferric salts, the addition of H_2S or $(\text{NH}_4)_2\text{S}$ reduces them to ferrous salts with separation of sulphur, the latter reagent then precipitating FeS . Ferrocyanide (yellow prussiate) of potash with ferric salts yields a deep-blue precipitate of ferric ferrocyanide (Prussian blue), with ferrous salts a greenish-white precipitate of ferrous ferrocyanide. With ferricyanide (red prussiate) of potash ferrous salts yield Turnbull's blue, very similar to Prussian blue in appearance, while ferric salts yield only a green-brown coloration, but no precipitate. Potassium sulphocyanate gives a deep blood-red color with ferric salts even in dilute solution, and no color at all with ferrous salts. Salicylic acid is also a very sensitive reagent for ferric salts, yielding a fine purple color. Ferrous compounds are converted into ferric by heating the solutions with a little nitric acid. The reduction of ferric to ferrous compounds is best effected by the aid of hydrogen sulphide or sulphurous acid. The original solution is to be tested as to whether the iron existed in the ferrous or ferric condition, as after precipitation by the group reagent it is always in the ferric state. The members of this group, if precipitated together, may be identified as follows: The well-washed precipitate is placed in a porcelain dish with sodium hydrate and some bromine water, and then warmed. The chromium and aluminium are dissolved, while the ferric hydrate remains insoluble. This latter is filtered off, dissolved in HCl , and tested with potassium ferrocyanide. The filtrate containing aluminium and chromium is tested with excess of NH_4Cl and warmed until ammonia no longer escapes. Aluminium, if present, would have been thrown down. The filtrate from the latter or the liquid free from aluminium is acidified with hydrochloric acid, hydrogen sulphide gas conducted through the solution to reduce the chromic oxide, which is afterward precipitated by ammonia hydrate.

It should be said that ammonium hydrate, in addition to the hydrates of this group, precipitates the phosphates of this group and the phosphates, oxalates, borates, and fluorides of the alkaline earths.

The Fifth Group, consisting of tin, arsenic, antimony, gold, and platinum, yield insoluble sulphides when treated with hydrogen sulphide in acid solution. It is true that the succeeding, or sixth, group show the same behavior, but from the latter the fifth group is distinguished by the solubility of its sulphides in ammonium or potassium sulphides or the fixed alkaline hydrates. Tin, the first element of the group, may exist in either the stannous or the stannic state. Stannous salts form purple of Cassius with chloride of gold, reduce mercuric salts to mercurous, and ultimately separate fine gray metallic mercury, form a brownish-black sulphide, not very soluble in alkaline hydrates, but easily in alkaline sulphides, with which it forms double sulphides. From this solution, however, dilute acids precipitate yellow stannic sulphide. Any tin compound heated on charcoal together with sodium carbonate and some potassium cyanide is reduced to the metallic condition.

Antimony is characterized by the following tests: On adding water to the acid solution of its chloride, a white precipitate of oxychloride forms, soluble in tartaric acid. The group reagent precipitates orange-yellow antimony trisulphide. Antimony compounds, placed in an apparatus in which hydrogen is being generated, yield stibine, H_3Sb . If this gas be conducted through a glass tube, narrowed at intervals, and heat be applied to the tube near the narrowed portions, mirror-like deposits of metallic antimony will be formed; the escaping gas, when ignited, burns, and on holding a cold object in the flame a black spot of metallic antimony deposits. This metallic deposit is not soluble in sodium hypochlorite (chlorinated soda), and can in this

way be distinguished from the deposit of metallic arsenic. Compounds of antimony heated on charcoal with sodium carbonate and potassium cyanide in the reducing-flame yield a white and brittle globule of metal, while a white coating of antimonious oxide forms on the charcoal.

Arsenic, similarly, forms a hydride, H_3As , which serves for the detection of minute traces of this element (Marsh's test). The metallic mirror or spot gotten in this case, however, is more lustrous than that of antimony, is readily soluble in sodium hypochlorite, and if evaporated with ammonium sulphide leaves a yellowish residue. Arsenic compounds heated on charcoal give off whitish fumes of arsenious oxide, accompanied by a garlic-like odor. The group reagent precipitates from acid solution of *arsenious* compounds yellow trisulphide; from *arsenic* acid solutions sulphur separates, and finally the solution is reduced to the arsenious state, when the yellow trisulphide separates. Silver nitrate precipitates yellow silver arsenite or chocolate-brown silver arseniate, according to the nature of the solution. A dry alkaline acetate heated with arsenious oxide (white arsenic) gives rise to a very disagreeable-smelling compound, alkarsine.

Platinum is recognized by the yellow precipitate gotten in hydrochloric acid solution with potassium or ammonium chlorides. The precipitate in the latter case, when ignited, leaves spongy platinum as the only residue.

Gold salts in solution are precipitated on the addition of ferrous sulphate. Stannous chloride containing some stannic salt produces a purple precipitate (purple of Cassius) even in dilute gold solutions.

The group precipitate, consisting usually of stannic sulphide, antimony sulphide, and arsenic sulphide, may be separated as follows: Treat in a dish with concentrated HCl containing some bromine. Everything except some sulphur will be dissolved. Filter, if necessary, and to cold filtrate add an excess of concentrated sodium hydrate and one-fifth its volume of alcohol. A white flocculent precipitate will indicate antimony. Filter it off, dissolve in HCl , apply some confirmatory test. The filtrate from the antimoniate is boiled, to expel alcohol. Tartaric acid is then added to acid reaction, magnesium chloride, and finally ammonium hydrate to alkaline reaction. Arsenic, if present, will be precipitated as ammonium magnesium arseniate. Filter; acidify with HCl , and add hydrogen sulphide, which will precipitate any tin as yellow sulphide.

The Sixth Group includes mercury, silver, lead, copper, cadmium, and bismuth. A subdivision of this group into two sections is found convenient, as silver, lead, and mercurous chlorides are relatively insoluble in water, and hence are precipitated on acidifying the solution with hydrochloric acid, while mercuric, copper, cadmium, and bismuth salts remain in solution. The sulphides of this group are precipitated by H_2S in acid solution, but differ from the sulphides of the fifth group in being insoluble in alkaline sulphides.

Silver with NaOH precipitates brown oxide; with ammonium hydrate, the same precipitate, soluble in excess of the reagent. Hydrogen sulphide forms black silver sulphide insoluble in dilute acids; hydrochloric acid or chlorides form a white curdy precipitate (AgCl) soluble in ammonium hydrate. Silver compounds heated with sodium carbonate on charcoal before the blowpipe are reduced to metal yielding a white ductile globule. Lead salts with NaOH yield a white hydrate soluble in excess of reagent. Sodium carbonate precipitates a basic carbonate. Hydrochloric acid and chlorides throw down a white curdy precipitate of lead chloride soluble in large quantity of water when heated. H_2S precipitates black-lead sulphide soluble in warm nitric acid. Sulphuric acid produces a white precipitate of lead sulphate readily soluble in a solution of ammonium acetate. Lead compounds heated on charcoal with sodium carbonate yield soft malleable globules of metal, the charcoal at the same time receiving a slight yellow incrustation of lead oxide.

The salts of mercury must be distinguished as mer-

curous or mercuric. Mercurous salts with sodium hydrate yield black mercurous oxide, while with ammonium hydrate a black mercur-ammonium compound is produced. With H_2S a black sulphide is at once produced, insoluble in nitric acid; with potassium iodide a green iodide is formed; with hydrochloric acid a white curdy precipitate of mercurous chloride (calomel) is formed. Mercuric salts with sodium hydrate yield a reddish-brown precipitate, which becomes yellow if the reagent is added in excess; with ammonium hydrate a white mercur-ammonium compound (white precipitate) is formed. H_2S produces a precipitate turning from white to yellowish, brownish, and with excess of the reagent to black, color. Stannous chloride reduces the mercuric to mercurous salt and then precipitates calomel, an excess of the reagent reducing the latter to metallic mercury. Potassium iodide added to mercuric solutions produces a precipitate of scarlet mercuric iodide. Mercury compounds in general, when heated with sodium carbonate in a narrow glass tube, give a sublimate of metallic mercury. A piece of clean copper immersed in a mercury-salt solution becomes coated with gray mercury, which, rubbed, yields a bright amalgam surface. Bismuth solutions yield with alkaline hydrates a white hydrate insoluble in excess, and with sodium carbonate a basic carbonate. A characteristic reaction for bismuth is the decomposition of its salts by water; this is most sensitive with the chloride, which, poured into water, yields a white precipitate of oxychloride of bismuth. This oxychloride, unlike that of antimony, is not soluble in tartaric acid. Hydrogen sulphide precipitates black sulphide of bismuth. Before the blowpipe bismuth compounds mixed with sodium carbonate yield brittle reddish-white globules of metal. The incrustation of oxide is orange while hot and yellow when cold. Copper salts yield a bluish hydrate with potassium hydrate, turning black on boiling; ammonium hydrate gives a greenish-blue precipitate soluble in excess of the reagent with azure-blue color. Hydrogen sulphide gives a brownish-black precipitate of sulphide soluble in warm nitric acid. A piece of bright metallic iron immersed in copper solutions is rapidly coated with red copper. Copper compounds heated on charcoal with sodium carbonate yield a button of metallic copper. Borax glass is colored by copper compounds, when heated in the oxidizing flame, green while hot, blue when cold. Cadmium salts are precipitated white by sodium or ammonium hydrates; the precipitate in the first case is not soluble, but in the second case is soluble in excess. Hydrogen sulphide precipitates a yellow sulphide soluble in warm nitric acid and in boiling HCl and H_2SO_4 , thus distinguishing it from copper. When cadmium compounds are heated with sodium carbonate on charcoal, the latter becomes covered with reddish-brown cadmium oxide. Acids do not admit of the same exact classification as bases, as there are no general group-reagents which serve to distinguish them with much accuracy. For individual tests the reader must consult the manuals of analysis.

GAS ANALYSIS.—In the analysis of gaseous mixtures volumes only can be determined, as the weights of the gases concerned are relatively small, and the experimental difficulties connected with the weighing would be so great as almost certainly to vitiate the results. In measuring the volumes, on the other hand, after allowing for the change in volume due to the varying conditions of temperature and pressure, the measurements can be made with reasonable accuracy. No uniform course of procedure can be laid down for all cases of gas analysis, as the mixtures that arise in practice are of very different character, and the procedure must be based largely upon the physical and chemical properties of the gases concerned. Thus we have to deal with quite a complex mixture in illuminating gas, where hydrogen, carbonous oxide, numerous hydrocarbons, and free nitrogen are all to be determined; with a much simpler mixture of some of these constituents in the

gases of the blast-furnace and the Siemens' regenerator and gas-stove; with an entirely different set in the gases of the lead-chamber in the sulphuric-acid process and the gases liberated in the different stages of the alkali process.

In general, the determination of the several constituents in a gaseous mixture is made in one of two ways—

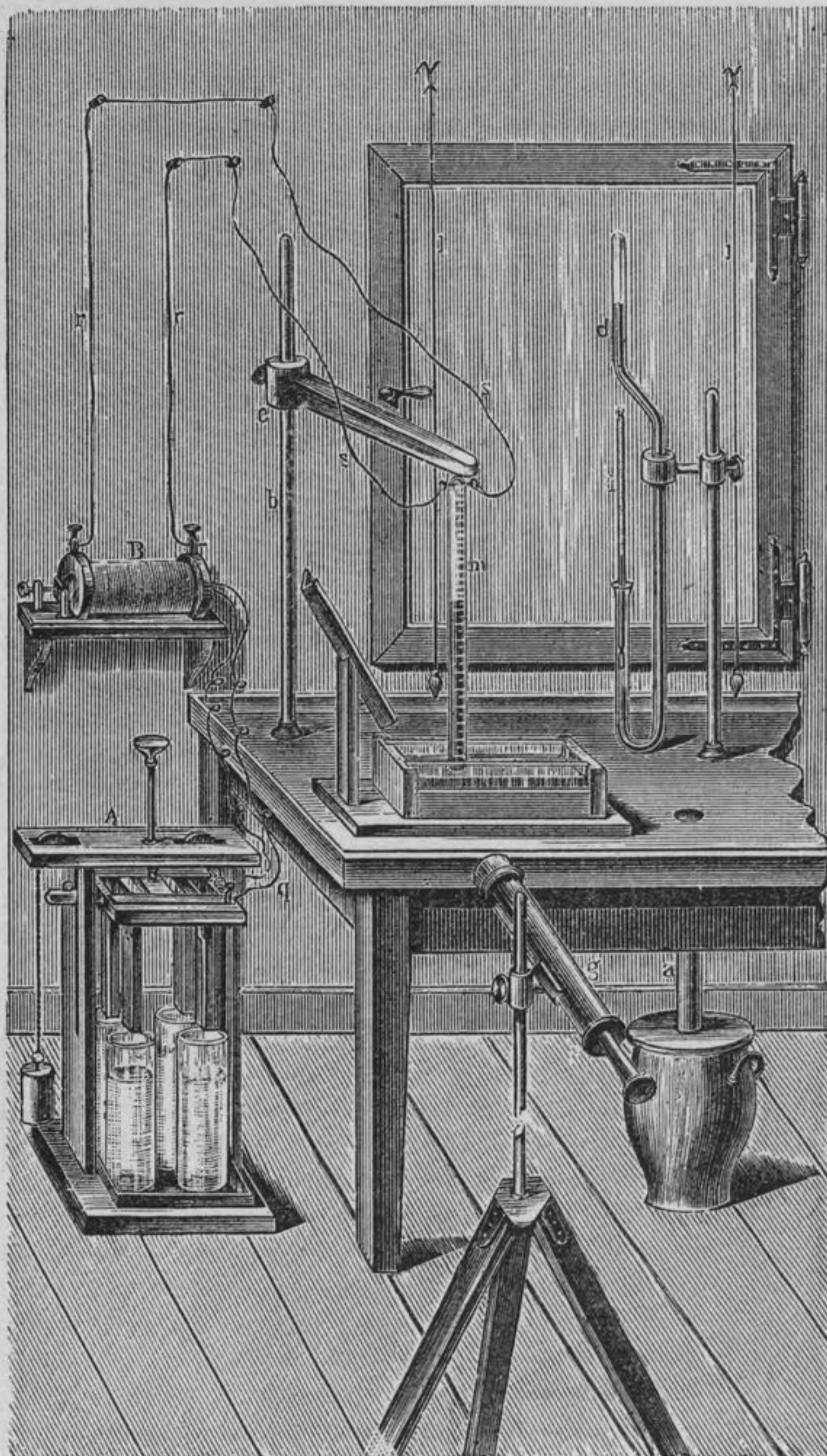


FIG. 1.—Bunsen's Apparatus.

either by absorption, with the aid of some reagent introduced into the tube containing the gaseous mixture, or by what is termed "combustion," which may be a slow chemical combination of the combustible gas with oxygen or air, or an instantaneous one brought about by the aid of an electric spark caused to flash through the tube containing the gas. We shall mention briefly the methods most generally practised, and show how they are applied to the case of the most commonly-occurring mixtures.

The first carefully-elaborated method, and one still in many respects the most perfect, is that of Bunsen, in which the gases are measured in closed tubes over mercury, the absorption reagents are as far as possible used in the solid form, and the combination of the combustible gas with oxygen effected by the passage of the electric spark between platinum wires fused in the upper end of the tubes. Observations of the thermometer and barometer are made with each reading of gaseous volume, in order to apply to the reading of volume the corrections for varying temperature and pressure. These readings are all made through a telescope, called a "cathetometer," placed on the opposite side of the room, so that the heat of the body may not affect the confined gas or gases, as it would if the observer came sufficiently close to make the reading with the unaided eye. Fig. 1 shows the arrangement of the apparatus

in the case of an analysis by Bunsen's method; *m* is here the eudiometer-tube in which the volume of gas is being measured, the tube being supported firmly in an erect position in a mercury-trough; *d* is a syphon-barometer, and *i* is a thermometer; *ss* represents the wires from an induction-coil, *B*, which are made to terminate in two platinum wires fused in the top of the eudiometer-tube from opposite sides. These platinum wires do not join, but are separated by an interval of a fraction of an inch, through which interval the spark must flash. All the readings are made, as before stated, through the cathetometer, *g*, placed at some distance. The chief objection to Bunsen's method is the great length of time occupied in the absorptions and combustions, as after each handling of the tube some time must be given for the apparatus to take the temperature of the room before a reading can be made that will be accurate. To obviate this difficulty, a number of methods have been proposed, and several introduced into practice, in which the absorption is effected by liquid reagents, which, of course, act much more rapidly as the surface of contact with the gases is much greater; and the residual gas is then measured either at once in the absorption-tube or after transferral to another tube. The first of these liquid-absorption methods was proposed by Doyère, and subsequently improved by Regnault and Reiset, by Frankland and Ward, and by Russell. All these methods involve the use of apparatus made with accuracy, and can be used for exact scientific investigation. Much simpler in construction are what are called "gas-burettes," which serve for the analysis of industrial gases. Apparatus of this kind has been devised by Stammer, Winckler, Raoult, and Bunte. These gas-burettes allow of the absorption of one gaseous constituent of a mixture after another by using successively the appropriate absorption reagent solutions and after each absorption measuring residual gases. The most convenient form of absorption apparatus for the analysis of furnace-gases and all similar mixtures is that of Orsat, which, after several modifications, has assumed the shape shown in fig. 2. In the apparatus figured here the measuring-tube *M*, surrounded by a cold-water mantle, communicates at its lower end with a flask of acidulated water *A*, by the raising or lowering of which the gas is drawn into or expelled from the tube. At the other end it is connected by a capillary tube with a very narrow tube of block tin, which in turn connects by means of the metallic stopcocks *a*, *b*, and *c* with the three absorption-vessels *N*, *P*, and *K*. It also connects by means of a three-way cock *d* with the rubber tubes *S* and *J*. Through the former the gas to be analyzed is drawn into the measuring-tube *M* by lowering the bottle *A*, the stopcocks *a*, *b*, and *c* being closed and the tube *M* full of water; through the latter, by means of the rubber compression-bulb, the connecting tubes are emptied of air, and the absorption-liquid is drawn up to the same level, *m'*, *m''*, *m'''*, in all three of the absorption-vessels before the gas to be analyzed is drawn in. The absorption-vessels consist of wide tubes filled with fragments of narrower glass tubes, so as to furnish a large surface for absorption, and connecting by a narrow-drawn-out portion with the liquid in the tubulated bottles below. The tubulures of these absorption-vessels and of the flask *A* are of course open during the analysis and closed with corks when not in use. This form of apparatus permits of the absorption of three gaseous constituents one after the other, and the measuring of the residual gas after such absorption.

The method of analysis of a gaseous mixture may now be indicated. With the more complete apparatus of Bunsen (see fig. 1) the analysis of quite complex mixtures may be made. If we take the case of illuminating gas, which contains a number of constituent gases to be determined, we proceed first to the absorptions. A portion of the gas is first measured in the eudiometer over mercury corrections reducing the observed temperature and pressure to 0° C. and 760 mm. re-

spectively, and allowing for the tension of aqueous vapor in the gas being noted. To absorb the carbon dioxide, the first constituent to be removed, a small pellet of fused potassium hydrate cast on the end of a platinum wire is introduced and allowed to remain in the gas for several hours. After its withdrawal, and after the tube has taken the temperature of the room, a reading is made of the residual gas, reckoned as dry, inasmuch as the potassium hydrate has absorbed moisture as well as carbon dioxide. A small coke-ball saturated with fuming sulphuric acid is next introduced, to absorb the olefines or illuminating constituents of the gas. After its withdrawal and the reading of the residual gas, a similar ball soaked with alkaline solution of pyrogallous acid is introduced, to absorb the free oxygen. This is then followed in proper time by the introduction of a coke-ball saturated with an acid solution of cuprous chloride, which absorbs the carbon monoxide. With this absorption the withdrawal of constitu-

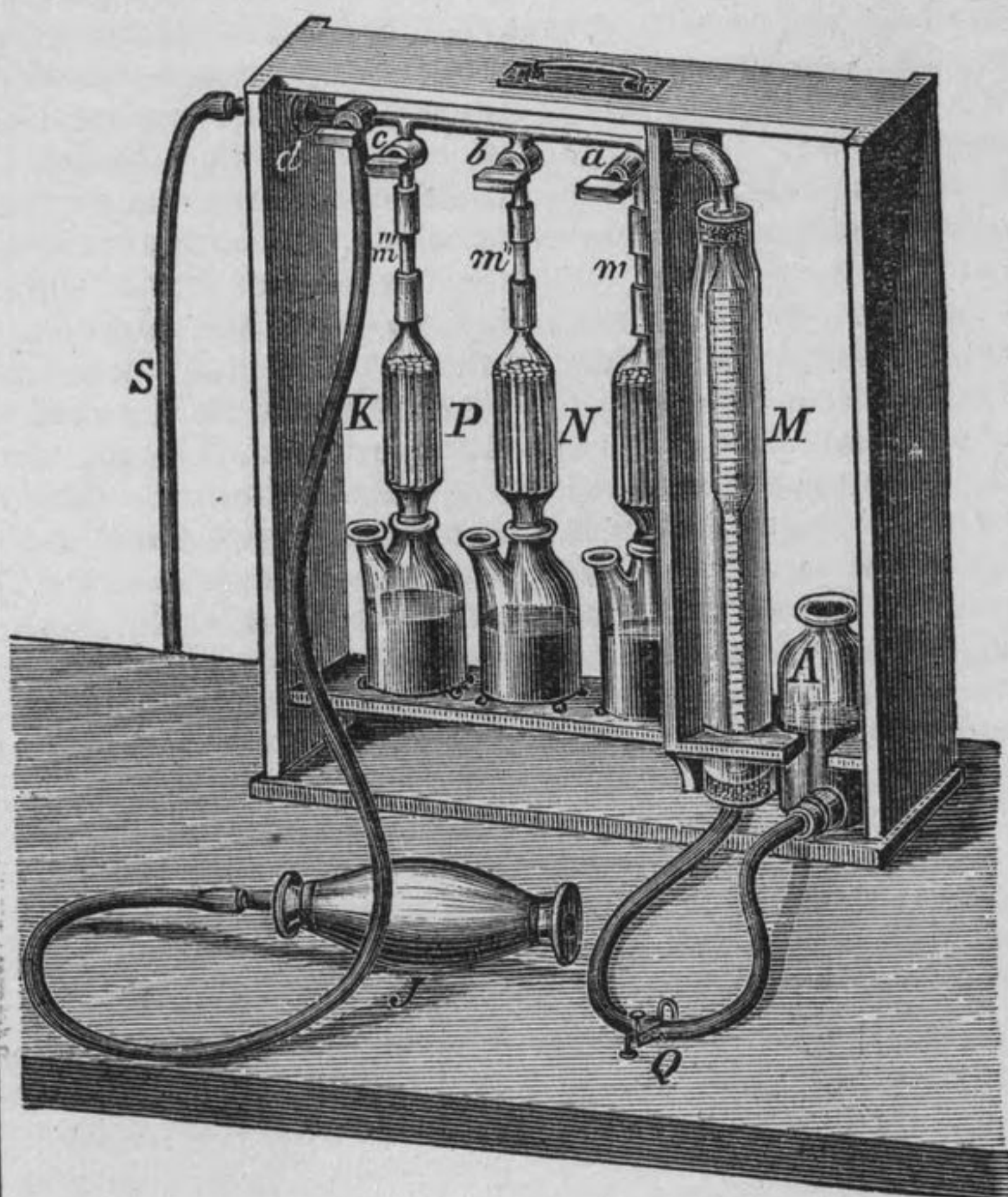


FIG. 2.—Orsat's Apparatus.

ents is complete so far as reagents can effect it, and the residual gas, which contains hydrogen, marsh-gas, and nitrogen, is ready for the combustion, which is effected as shown in the cut. Before passing the spark there must be added a quantity of pure oxygen, the volume of which is measured, and of air, which is likewise measured. The oxygen is to unite with the hydrogen to form water, and with the carbon of the marsh-gas to form carbon dioxide; the air is to dilute the explosive mixture and lessen the violence of the combination. After the spark has passed a decided contraction of volume ensues, which, when the temperature has become constant, is measured. This contraction gives the volume of aqueous vapor formed, allowance being made for the tension of aqueous vapor. A fused ball of potassium hydrate is then introduced, to absorb the carbon dioxide, the other product of the combustion. After its absorption and the reading of the residual gas, the only constituent of the original gas remaining is the nitrogen. To determine it, a measured amount of pure hydrogen, sufficient to combine with the oxygen which remains after the previous combustion, is introduced, and then the spark passed again. After this combustion the contraction is read, and then the residue can be only nitrogen and the excess of hydrogen just before introduced. This excess is, of course, known after the reading of the contraction last ensuing; so

that the nitrogen of the original mixture is now determined. As before stated, all readings are made through the cathetometer, and all volumes corrected for observed temperature and pressure. The method is accurate, but slow.

In the analysis of furnace or other industrial gases by Orsat's apparatus the case is always much simpler, the gases to be determined being usually carbon dioxide, carbon monoxide, and oxygen. In Orsat's apparatus (fig. 2), by raising the bottle *A* suitably, the water is made to fill the measuring-tube *M* up to a zero-mark on the neck, and then, by exhausting the air with the aid of the compression-bulb *J*, the absorption-liquids are drawn up in the vessels *N*, *P*, and *K* to the marks *m'*, *m''*, *m'''*, when the stopcocks *a*, *b*, and *c* are closed. The tube *S* having been exhausted also by the same means through the three-way cock, *d*, the gas to be analyzed is drawn over into the tube *M* by lowering *A*. The gas having been measured, the cock *a* is opened, and the gas is sent over into *N* by raising *A*. Here the gas is brought into contact with a strong solution of potassium hydrate, which absorbs the carbon dioxide. When this constituent has been absorbed, the gas is drawn back into *M* and measured. The stopcock *a* having now been closed, *b* is opened, and the gas is drawn into the absorption-vessel *P*, where an alkaline pyrogallic-acid solution absorbs the oxygen. After withdrawal and reading, the gas is sent over into *K*, where an ammoniacal solution of cuprous chloride absorbs the carbon monoxide. After this absorption the gas, consisting only of atmospheric nitrogen, is finally measured and the results calculated. Gaseous mixtures of the character just indicated can be analyzed with an accuracy sufficing for technical purposes in perhaps one-tenth of the time required for the execution of the same analysis by Bunsen's method.

For detailed information on these methods of gas-analysis, the reader is referred to *Gasometrische Methoden*, von Robert Bunsen, 2^{te} Auflage (Braunschweig, Friedrich Vieweg und Sohn, 1877), or *Gas Analysis*, by Robert Bunsen, first edition, translated by H. E. Roscoe (Manchester, 1858), and *Anleitung zur Chemischen Untersuchung der Industrie Gase*, von Clemens Winckler (Freiberg, Engelhardt'sche Buchhandlung, 1877). (S. P. S.)

CHERBULIEZ, VICTOR, a distinguished French novelist and critic, born at Geneva, in July, 1829, was descended from a Huguenot family driven from its native land by the Revocation of the Edict of Nantes. His father, André Cherbuliez (1795-1874), was professor of Greek and Latin in the academy at Geneva, and published a valuable treatise on *Roman Satire*, an essay on the *Book of Job*, and a dissertation on the orator Aristides of Smyrna, all of which are still of interest to students of ancient literature. Other members of the family were distinguished for their attainments and labors in various departments of literature. Victor pursued his studies at Paris, Bonn, and Berlin, and was for a time engaged in classical instruction in his native city. On his return from a visit to Greece in 1859 he achieved fame as an art-critic by his work *Un Cheval de Phidias: Causeries athéniennes* (1860). He was engaged as a contributor to the *Revue des Deux Mondes*, and has published in it most of his romances. The first of these was *Le Comte Kostia* (1863), and its success justified the author in adopting this form of literature. Among his other novels are—*Paul Méré* (1864), in which the story is carried on by letters; *Roman d'une Honnête Femme* (1866), the heroine of which has been considered one of the most delicate female characters of modern romance; and *Meta Holdenis* (1873), his greatest work. In this he set forth with wonderful skill an accomplished and charming female hypocrite; and as the story passed through the pages of the *Revue* such interest in her fate was excited that the author received numerous letters beseeching him to save the girl at last. Cherbuliez has since published *Le Fiancé de Mlle. Saint-Maur* (1876), *Samuel Brohl et Cie.* (1877), *L'Idée de Jean*

Téterol (1878). While composing these novels he had been engaged constantly as a critic, and in 1873 he gathered a number of his articles under the title *Études de Littérature et d'Art*. His most important political writings are comprised in the two volumes *L'Allemagne politique* (1870) and *L'Espagne politique* (1874), and in contributions to the *Revue des Deux Mondes* under the pseudonym of "G. Valbert." He was naturalized as a Frenchman in 1880, and elected a member of the French Academy Nov. 8, 1881. His public reception took place May 25, 1882, when M. Renan delivered an eloquent speech of welcome.

CHEROKEE INDIANS, a North American tribe usually grouped with the Appalachian tribes, whom they resembled in the degree and kind of their native civilization, and with whom they were associated as neighbors. Their language, however, has few points in common with those of the true Appalachian stock. Gallatin entertained the supposition (derived from the fact that all its syllables end either in a vowel or in a nasal sound) that the Cherokee tongue has a remote affinity with the Iroquois, but this is hardly to be conceded. Two dialects are spoken, and a third is lost. (See the *Cherokee Grammar* of Von Gabelentz.) The Cherokees are to-day the first of the Indian tribes of the United States in intelligence, prosperity, and social and moral progress. This number of Cherokees upon their own reservation in 1882 was 20,336. Besides these, there were reported, in 1881, 2200 Cherokees in North and South Carolina, Georgia, Alabama, and Tennessee. Some 19,000 Cherokees in Indian Territory wear citizen's dress, and 16,000, it is said, can speak the English language. There are among them over 60 churches and some 33 missionaries. In 1882 there were 2000 white intruders upon the Cherokee reserve. Of the 5,031,351 acres (7861 square miles) of that reserve, less than half is tillable, and only 90,000 acres are actually tilled; about 200,000 acres are fenced. The tribe in that year raised 65,000 bushels of wheat, 750,000 of maize, 55,000 of oats and barley, 44,500 of vegetables, 750,000 pounds of cotton, and 12,000 tons of hay. They own 12,000 horses, 1300 mules, 75,000 neat-cattle, 110,000 swine, and 15,000 sheep. Besides the above reserve, there are large areas of "unoccupied Cherokee lands" far to the west and south-west of their present territory. The Cherokee reserve in Jackson, Swain, Cherokee, Graham, and Macon counties, in North Carolina, comprises 65,211 acres, of which some 5000 are tilled. Their only noteworthy crop is that of maize, which is given at 25,000 bushels. A considerable migration of these Indians to the main nation is going on at the expense of the United States government.

The history of the Cherokees since 1540, when De Soto visited them (he called them *Achalaque*, which is a fair presentation of the native pronunciation of their tribal name), is a long and involved one. Their country lay on either side of the Appalachian range, in the upper valley of the Tennessee, and in the Carolinas, extending far south into Georgia and Alabama. In early colonial times they generally adhered to the English, and they made a commendable degree of progress in the arts of peace. Disputes with white settlers led to the bloody war of 1759-63, in which the Cherokees were terribly punished. True to their traditional policy, they assisted the English to some extent during the Revolutionary war, in which they lost much territory to the whites. There was for a long time a division into Western, or hunting, Cherokees, and Eastern, or farming, Indians. A portion of the former went west of the Mississippi in 1790, or earlier, and settled in what is now Arkansas. In 1809, President Jefferson gave his sanction to a plan for removing the remainder of the Western Cherokees, but it was not till 1818 that any large migration took place. Meanwhile, the Eastern Cherokees kept ceding their lands under strong pressure from the whites, treaty

after treaty being made by the United States, yet all treaties were alike inoperative. Most of the tribe after 1818 lived in Northern Georgia, upon a comparatively small remnant of their ancient domain. There were two parties among the Indians—the Ridgeites, who were willing to leave the country, and the Rossites, who insisted on some measure of their rights. (These two factions—the former now about two-thirds as numerous as the latter—have continued to exist down to the present.) The country and the politicians generally seemed willing to sustain the claims of the Cherokees, but the State of Georgia, single-handed, set the authority of the United States at defiance, and successfully insisted that the Cherokees must go. The general government yielded; a treaty was executed in 1835 with Major and John Ridge, representing some 600 Cherokees, by which it was agreed that the whole tribe (about 26,000 strong) was to be removed. In 1838 Gen. Winfield Scott was sent to them with a small military force to compel their expatriation. Scott succeeded in effecting his object without bloodshed. After the arrival of the Eastern Cherokees in their new country, the old feud between the Ridge party and the Ross party still continued to distract the tribal councils; but in 1839 the two Ridges and Boudinot were murdered by friends of the Ross party. John Ross became the head-chief, and his party was triumphant. A third faction was composed of those Western Cherokees who wished to live in primitive Indian fashion. This party so far yielded to Ross that in 1837 the hunting Cherokees agreed to form a part of the reunited nation, and since that time they have lost power and numbers; but there are still a few Cherokees who cling to the use of the old costume and the old way of living. During the civil war the Cherokees, being slaveholders, at first took sides with the South, but the majority, under Ross and Downing, their chiefs, finally joined the Unionists; many of the Ridgeites, however, clung to the Confederate cause throughout. In the war of 1861–65 the Cherokee country was devastated, and the people suffered great losses; but the tribe is now more prosperous than ever before. Cattle-breeding is the leading element of material prosperity. In 1882 there were a large number of freedmen among the Cherokees, and, according to the treaty of 1866, they are entitled to all the rights of native Cherokees; but in point of fact these rights are denied them, although one party among the Indians has strongly asserted the duty of maintaining their treaty obligations.

The Cherokee government is in the main modelled after that of the various States, there being executive, legislative, and judicial departments of the government. The public-school system is good, and there are two large seminaries or advanced boarding-schools, a manual-labor school, and an orphan asylum. The other public institutions are an asylum for the blind, deaf-mutes, and insane, the Capitol building at Tahlequah, the public printing-house, and a jail or prison. The Cherokees have a well-conducted newspaper, printed partly in their own language. Their laws are published in book-form. Manufactures have not been extensively naturalized. Domestic stuffs of several sorts are spun and woven by the women. Lands are not held in severalty, but the acquisition of wealth by individuals is permitted. Most of the expenses of government are paid by the avails of funds in the care of the United States government. Some Delaware and Shawnee Indians and many whites and negroes have been adopted into this tribe, sharing in full the rights and privileges of true Cherokees.

The recent progress of the Cherokees, though great, has been much retarded by contention between the Ross and Downing factions. This strife has at times led to bloodshed, and the aid of the United States military has been occasionally required with a view to the maintenance of order. The Cherokees are mostly Christianized, the work having been accomplished chiefly by Baptist, Methodist, Presbyterian, and Mora-

vian missionaries. Even those in the North Carolina mountains can generally read their own language, although living among white people who are usually unable to read. The Cherokees have a translation of the New Testament and of parts of the Old. (c. w. g.)

CHERRY. The cherries of the Old World have found a home in the more temperate regions of the United States. Hundreds of thousands of young trees are raised annually in American nurseries. The seeds are mostly collected from the naturalized trees which abound in many parts of the older States, and which are known as "mazzards." Mahaleb seeds, imported from Europe, the product of the *Cerasus Mahaleb*, are also in extensive use. The plants are set out in nursery-rows when one year old, budded the succeeding summer, and sold when one or two years old from the bud. Many improved varieties have been raised in America, notably by Dr. Kirtland of Cleveland, O., during the middle of the present century, and these, with many of the best varieties of the Old World, comprise the list of kinds grown in American orchards. The best cherry regions are those along the great lakes, and the trees grow well on the Pacific coast. There are few diseases of the cherry, the worst being the "black-knot," produced by a minute fungus. It affects principally the morello class, and is much worse at some times than others. An infected district may again be free for many years. The most troublesome insects are the black aphid and the plum-weevil, which last deposits its eggs in the fruit, as in the plum, generally inducing rotting before mature. Birds are the worst enemies of the cherry-grower. In the Eastern United States, the cedar-bird, *Ampelis cedrorum*, is so destructive as often to be called the "cherry bird." The cat-bird, *Mimus Caroliniensis*, and the robin, *Turdus migratorius*, eat cherries voraciously when they have a chance, and make no scruple of taking every fruit, if they have the opportunity, as their share for the good they otherwise do in keeping down noxious insects. Large numbers of cherries are divested of stones by machines, and when dried enter largely into commercial account.

The varieties of *C. sylvestris*, the tall, strong-growing species, have been distributed by birds from gardens, and the Cherry is now very common as a wild tree in many parts of the United States, especially in Eastern Pennsylvania. Some of these wild trees are now of immense size. One measured by the writer recently was 9 feet 6 inches round at 4 feet from the ground, and it is believed trees of this size are not uncommon. The timber is excellent, and it is believed that if care were taken to train orchard trees up with tall straight stems the double object of profitable fruit and profitable timber might be secured together. It also makes an excellent fire-wood.

The American species, *Cerasus serotina*, furnishes the best variety for timber purposes. It is a remarkably rapid grower, and generally has a clean, smooth stem 20, or even 30 or 40, feet high. Its usual growth is about 60 feet, though sometimes 80, and trees nine or ten feet in girth are not uncommon. Though a native of most parts of the Atlantic States, it attains its best dimensions in Ohio, Pennsylvania, and Virginia. The timber is very solid, dark red, takes a fine polish, and when judiciously selected compares favorably with mahogany. It is remarkably heavy. When green it takes only 363.7 cubic feet to make a ton of 2000 pounds, just about the same as oak requires. White pine and hemlock take 571.4 feet to make the same weight. If well seasoned before using, posts have been known to remain sound for nearly a quarter of a century, but its great value will always be for elegant furniture. The bark makes the well-known "wild-cherry tonic," and an infusion of the berries with brandy and some sugar makes "wild-cherry biters." It is not found west of the Mississippi, though when under culture it thrives well even on the Pacific

coast. Its distinctive names are "Wild Black Cherry" and "Choke Cherry." The dwarf Choke Cherry, *Cerasus Virginiana*, seldom growing more than ten or fifteen feet high, is of no known use in the arts. It has interest to cultivators as being the species which probably introduced the black-knot. These two are replaced at the Rocky Mountains and westward to the Pacific by another dwarf species, *Cerasus demissa*, the berries of which form a popular Indian food. They are dried in the sun, then mixed with meat, which is then pounded to a jelly, dried, and used for a sort of broth. They also make a tea of the bark, probably for medicinal uses. The Indians of the Indian Territory also use the fruit of the Sand Cherry, *Cerasus pumila*, in a similar way. At the season when the fruit is ripe, old and young turn out for a general cherry-gathering. The Sand Cherry has shining, willowy leaves, and seldom grows higher than five or six feet. In the Southern United States there is an evergreen species, *Cerasus Caroliniensis*, known as "Cherry Laurel," "Wild Orange," and "Almond Cherry." It is popular as an ornamental tree, but of no commercial value. In this it resembles the Cherry tree of Eastern Asia. In the poetry of China and Japan cherry-blossoms play a prominent part; but Japanese visitors to the United States find it hard to convince their countrymen that in America Cherries are accounted a delicious fruit.

The Cherry which most nearly approaches the Cherry of the Old World is the "Wild Red Cherry," *Cerasus Pennsylvanica*. The small red fruit is borne in bunches, much as the cultivated kinds are. The smooth bark is also of a reddish-brown tint, so that its name is wholly appropriate. It inhabits chiefly the Northern United States, extending westward to the Mackenzie River. The fruit is used for culinary purposes, but is small and harsh. The tree is too small to have much value in forestry. Specimens in Northern Pennsylvania are found from 25 to 30 feet high. It springs up often in vast quantities after mountain-fires. Some of the hills in the vicinity of Mount Washington that have been burned over now have dense growths almost wholly of this small Cherry. (T. M.)

CHESAPEAKE BAY is a large land-locked arm of the Atlantic Ocean included within the States of Maryland and Virginia. It was first explored, in great part, by Capt. John Smith, one of the band of adventurers on board the ships under the command of Capt. Christopher Newport, who entered the bay in the year 1607, commissioned by the London Company, under whose auspices this the first permanent settlement of the English race on this continent was made. The name Chesapeake seems to have been derived from that of a tribe of Indians or from their abode near Elizabeth River, at the south end of the bay. Its general direction in length is north and south, the entrance between Cape Charles and Cape Henry (lat. 37° N.), and the upper extremity, at the mouth of the Susquehanna River (lat. 39° 35' N.), being both nearly on the meridian of 76° W. long. The length by the main channel is about 200 miles. The lower half of the bay follows a meridional line, varying in width from about 11 miles (15 miles at the entrance) to a maximum of 20 miles, while the upper half bends in a gentle curve, 20 miles at most, convex to the westward, the width diminishing northwardly from about 10 to 3 miles.

The bay is set among tertiary and alluvial formations, and hence the shores are flat and in some places swampy, and much indented by small bays or coves, particularly on the eastern shore, the largest of which are known as Tangier Sound and Pocomoke Sound. The western shore receives several large rivers whose general course is from the north-west. The more important of these rivers, reckoning northward, are the James (with its southern affluents, Elizabeth River and the Nansemond), the York, Rappahannock, Potomac, Patuxent, Severn, and Patapsco rivers. The Susquehanna River comes in from the north at the head of the bay, and to this succeed, on the eastern shore, the North-East

River, the Elk, Sassafras, Chester, Choptank, Nanticoke, and Pocomoke rivers. There are several groups of small islands in the bay on the eastern side, the principal of which are Tangier, Smith's, and (the largest of all) Kent Island.

The main channel of Chesapeake Bay is accessible to the largest sea-going vessels, and every part is well lighted and buoyed. Around its shores are several seaports—Norfolk, with its United States Navy-Yard, on Elizabeth River, at the outlet of the Dismal Swamp Canal and the Albemarle and Chesapeake Canal; Newport News, recently established and rising into importance, at the mouth of the James River, near Old Point Comfort, the site of Fortress Monroe, and adjacent to Hampton Roads; and, farther up the bay, the large city of Baltimore. All these are the termini of great railroad systems from the interior. Besides these two canals, there is the Chesapeake and Delaware Canal, built many years ago eastward from the upper part of the bay, and another, of larger capacity, is now proposed in the same direction.

Immense draughts of fish are taken along the shores of this great bay and from its tributary rivers, of which the principal may be named: From salt water, the blue-fish, Spanish mackerel, mullet, gray trout, spotted (or salmon) trout, sheepshead, sea-bass, and whiting; and from the rivers, the herring (more properly known as the alewife), shad, sturgeon, black and striped bass, perch, and catfish. Some of these fish are found in both salt and fresh water. Large quantities of menhaden are captured, and used for the production of oil and fertilizers. The oysters of Chesapeake Bay are world-famous, and, while supplying the markets of the neighboring cities, form also an important consignment to the interior and to foreign countries, affording employment to large numbers of persons in their take, canning, and carriage. Among other products of these waters are clams and crabs and the terrapin, a species of tortoise, a notable delicacy of the Maryland cuisine. Nor should be forgotten the flocks of various species of wild-fowls which congregate here in countless myriads during the winter; among these is the canvas-back duck, so esteemed for its delicate flavor, acquired by feeding on the wild-celery found here in abundance.

The proper regulation of the fisheries is carefully looked after by commissioners on the part of Maryland and Virginia, in co-operation with the United States commissioner of fish and fisheries, who also give much attention to the artificial propagation as well as to the distribution of the eggs and live fish for transplanting in other waters. The importance of these fisheries is shown by the following abstract, made up from the reports of these commissioners furnished for the United States census of 1880: Number of persons employed, 44,872 (of these, 11,064 are factory-hands engaged in the packing, etc.); number of fishing-vessels 2896, and boats 9443; value of capital employed in fishing-vessels and boats, apparatus, and factories, \$8,256,562; value (to fishermen) of the product of fish (including oysters), \$8,346,159. But this, the first value, is estimated to be enhanced from two to three fold before reaching the consumer. Of this latter item, \$5,221,715 are contributed by Maryland, and \$3,124,444 by Virginia. The estimate of the quantity of oysters taken during the census year is, for Maryland, 10,600,000 bushels; for Virginia, 6,837,320 bushels.

(W. L. N.)

CHESS, CHEAT, in botany *Bromus secalinus*, or the rye-like brome grass. It is a native of Europe, but was early introduced into America with agricultural seeds from the Old World, and under the name of Chess or Cheat, has become one of the most noted weeds in American agriculture. It is a very common weed among the crops of wheat and rye in the west of England, where it is called *drank*, according to Withering, though *drake* is also given as one of the common names of the darnel, *Lolium temulentum*, by other

authors. The last named is believed to be the "tares" mentioned in Matthew xiii., though some have suspected the plant we call "Chess" may have been intended, or indeed any other bad weed appearing among wheat. Webster notes that in searching for the derivation of the word *chess*, we have to compare it with the Persian word *lhas*, which means any bad weed. The name as applied to this plant does not appear to be in common use in England, though the transmutative belief with which the plant is connected here had its origin in the Old World. The popular English idea is that grain has all been derived from some original type. Wheat, for instance, changes to rye, rye to barley, barley to brome grass, and brome grass to oats. In America the prevalent belief is that wheat changes directly to Chess or Cheat; and the belief is so widespread that even intelligent pens are yet often employed in the advocacy of the supposed change. The belief that one form of plant may be evolved or may spring from another parent form is widely held by naturalists of the present day; but the laws of morphology are now so well understood that, whatever an evolutionist might be willing to concede any given variety of wheat might turn to, he would pronounce such a change as from wheat to Chess an impossibility. The belief in the transmutation seems to arise from the fact that chess-seed is almost always in company with wheat, or is in the soil from former seedings, ready to spring into vigorous growth whenever circumstances favor. Sometimes wheat is winter-killed, and the Chess, having sole possession of the ground, grows so vigorously as to seem like the crop originally sown. Only for its interference with the wheat crop it has some agricultural value. It has been grown as green feed, and found to be preferred to green oats by horses. It makes excellent hay. Many years ago it was introduced into the United States under the name of "Willard's Grass" as a variety of great value, and very high prices paid for the seed until it was discovered to be the veritable Chess already wild here. The seeds are said to have the same effect as darnel when ground up with wheat as flour for bread; that is, they give it bitterness and a narcotic effect. There is, however, reason to believe, from some recent experiments in Scotland, which seem to have been carefully made, that there is no ground for this reputation in darnel, and probably none for Chess either. Chess is an annual plant, and very easily eradicated by keeping the ground infested by it under hoed crops for two years. (T. M.)

CHESTER, the county-seat of Randolph co., Ill., is on the Mississippi River, at the mouth of the Kaskaskia, 80 miles below St. Louis, and is the terminus of the Wabash, Chester, and Western Railroad. It is lighted with electric light, has six hotels, a bank, two weekly newspapers, seven churches, and three schools. There are also two flour-mills, two grain-elevators, an iron-foundry and machine-shop, and manufactures of barrels and soda. The Southern Illinois penitentiary is in the city, and the convicts are employed in boot- and shoe-making. Chester was settled in 1832, and incorporated as a city in 1855. Its property is valued at \$1,800,000, though assessed at less than one-third of this amount. Its public debt is \$66,400, and its expenses for the year ending April, 1882, were \$11,500. The site is elevated and the surrounding country picturesque. There are coal-fields and iron-mines in the vicinity. One-half of the inhabitants are of German birth. Population, 2580.

CHESTER, JOSEPH LEMUEL, LL. D., D. C. L. (1821-1882), an American author and antiquary, was born at Norwich, Conn., April 30, 1821. After a residence for some years in Philadelphia, he went to London in 1858 as an agent for the manufacturers of the Snider rifle. Henceforth his residence was in London, and he contributed to both American and English periodicals. Having long supposed himself to be a descendant of John Rogers, the first martyr of the English Reformation, he entered upon an

extensive investigation of original records, which, to his disappointment, proved this claim unfounded. But he availed himself of his researches to publish the first complete biography of Rogers and his family. He also investigated in the same way the genealogy of Washington, and disproved some mythical statements on the subject, though failing to obtain a satisfactory account. Having now devoted himself to antiquarian pursuits, he procured a written copy of the parish register of every church in England, and carefully indexed the whole. In his researches at Westminster Abbey he was cordially assisted by Dean Stanley, and in 1876 he published *The Marriage, Baptism, and Burial Registers of the Collegiate Church or Abbey of St. Peter, Westminster*, which was dedicated to Queen Victoria. The remarkable merits of this laborious work have been acknowledged by the highest authorities in English history and biography. Col. Chester was one of the founders of the Harleian Society in 1869, and was a member of several historical societies. He was honored with the degree of LL. D. from Columbia College, and in 1881 received the degree of D. C. L. from the University of Oxford. He died in London, May 26, 1882. He was a man of fine personal appearance, a fluent and pleasing writer, and as an antiquary accurate and indefatigable. His established reputation for fidelity procured for him access to family records guarded with scrupulous care. He was an expert in the handwriting of the past six centuries, but unfortunately much of his investigation has not been given to the world. Among his early publications were *Greenwood Cemetery, and Other Poems* (1843), and a *Treatise on the Law of Repulsion* (1853). In London he published *John Rogers, the Compiler of the First Authorized English Bible, the Pioneer of the English Reformation, with his Writings and a Genealogy of his Family* (1861). Besides the *Registers of Westminster Abbey*, he edited several valuable records for the Harleian Society.

CHESTER, a city of Pennsylvania, on the west bank of the Delaware River, at the mouth of Chester creek, 10 miles south-west of Philadelphia. It is on the Philadelphia, Wilmington, and Baltimore Railroad, and on the Philadelphia and Chester branch of the Reading Railroad. From the southern suburb of Lamokin a branch railroad extends to the westward. Chester was settled in 1643 by the Swedes, who called it Upland; and this was doubtless the first European settlement within the present limits of Pennsylvania. It is now an important manufacturing centre. Its industries include cotton goods, printing, dyeing, oil-refining, and the production of castings, steel, machinery, brass goods, edge-tools, pipes, tubes, yarns, cotton and woollen jeans, cassimeres, dyes, oil-cloths, doors, window-sash, bricks, pottery, carriages, drain-tiles, belting, shoes, morocco, etc. One of its shipyards for the construction of iron vessels has a world-wide reputation. Chester became a city in 1866. It has one private and two national banks, two daily and four weekly newspapers, a system of graded public schools (including high schools), and a military academy of high grade. Near the city is the Crozer Theological Seminary (Baptist). The population in 1880 was 14,997, and it has since much increased.

CHESTERTOWN, the county-seat of Kent co., Md., is on the W. bank of the navigable Chester River, 3 miles from its entrance into Chesapeake Bay and 30 miles directly E. of Baltimore, with which it has daily communication by steamer. It is the terminus of the Kent County Railroad. It has a courthouse, national bank, two weekly newspapers, and six churches, and is the seat of Washington College, founded in 1782. It is surrounded by a peach- and grain-growing country, and has manufactories of carriages, agricultural implements, straw-paper board, and artificial fertilizers. It is one of the oldest towns in Maryland, and in colonial times carried on a large trade with England. Population, 2359.

CHESTNUT. The Chestnut is believed to be only naturalized in Europe, and that it was gradually introduced or spread by degrees from Asia Minor, through Greece, to Italy, and from thence over Europe. There appears to have been large forests of Chestnuts in Italy during the time of the Roman emperors. It is believed that the Latin name, *Castanea*, is derived from Castanum, an ancient town in Thessaly. It exists in Japan, and during the American Centennial Exposition a collection of Japanese woods was on exhibition, among them Chestnut-wood under the native name of "Kuri." The Japanese form, the American form, and the form now known in Europe are all very closely allied, and, though in some works known as *Castanea Japonica*, *C. Americana*, and *C. vesca* respectively, are all united by Alph. de Candolle under the name of *Castanea vulgaris*, or "Common Chestnut." Some authors, however, contend for the indigenous character of the Chestnut in Europe, but the well-known comparisons between the flora of the Atlantic United States and the flora of Japan, and the greater resemblance of the European to the Japanese rather than to the American form, favor the idea that the latter is an Asiatic immigrant since the time when the peculiar characteristics of the American were formed. The chief of these characteristics is the smaller size of the leaf-buds, leaves, and fruit in the American species, though the trees themselves under equally favorable circumstances grow nearly as large. In Europe some enormous specimens have been recorded, though the figures concerning them vary. For instance, there is, or was recently, a large one on Mount Etna, which is given as 160 feet, 190 feet, and 204 feet round by three several authorities. Trees of 50 feet in circumference have often been recorded in Europe; 20 to 30 feet are common measurements there, and are not unusual in America wherever the trees grow by themselves in fairly good soil. The height is from 70 to 80 feet, though some have been known to reach 100. They are supposed to be long-lived, and this is unquestionable as regards European trees; but in America the writer knows of numbers of very large specimens, certainly about 100 years old, that are beginning to decay; and this may be taken as the average age of the tree. It is found throughout the whole of the Atlantic portion of the United States east of the Mississippi River, except the extreme north-eastern portion, reaching elevations of over 2000 feet. Naturally, it seems to thrive best in the hilly regions. In low lands it is sometimes found very vigorous, though attempts at culture on the prairies have not been very successful. In the hilly districts it often suffers in very dry seasons. The injury does not show till the following year, when large, chiefly the uppermost, branches either die or grow in a sickly manner. This has often given rise to the impression reported in American works on forestry that the tree is unaccountably dying out in some locations. But young trees soon come up to replace the older ones injured by the drouth.

It is one of the most useful trees in American forests. For railroad purposes it is not used where oak can be freely obtained; but Professor Augur reports that it is used in Connecticut for railroad ties, and very acceptably. It is the great fence-timber of the United States. Chestnut posts and rails bring higher prices than those from any other tree. Chestnut shingles for roofing, and Chestnut barrels for flour and other dry materials, are also popular. It is not good fuel, the dry wood having only a heating capacity of .53, as against 1.00 for hickory. It weighs about 41 pounds to the cubic foot when well seasoned. Though this indicates light wood, it seems to want the power to absorb moisture when well seasoned, and this gives it its great value for posts, which generally last 30 or 40 years. It is employed to a considerable extent in shipbuilding, being used for frames and for the upper works of steamers and coasting vessels.

The Chestnut is also highly esteemed for its nuts. In Europe the fruit is larger than that borne by the

American form, and, when boiled, enters largely into the food of the poorer classes in Spain and adjacent countries. The American Chestnut is rarely more than half the size of the European, but is sweeter and is eaten freely as gathered from the tree. The nuts are often attacked by the chestnut weevil, the larva of which feeds on the kernel in the form of a small white maggot or "worm," which soon after the fruit is ripe eats its way out and finishes its transformation in the ground. Dr. Packard, however, believes that a few remain in the nuts till spring. The weevil is known to entomologists as *Balaninus caryatryphes*. A small-growing species, *Castanea pumila*, is known as Chinquepin, and is found in poor soils on mountain-slopes throughout the whole Alleghany range. It usually grows from 6 to 12 feet high, but occasional specimens have been known to reach 40 feet and a circumference of 3 feet.

The California Chestnut is not a true *Castanea*, but is known as *Castanopsis chrysophylla*. Sometimes it is not more than 2 or 3 feet high, but occasionally rises to 60 or 70 feet. (T. M.)

CHEVALIER, MICHEL (1806-1879), a French political economist, was born at Limoges, Jan. 13, 1806. He was the eldest son of a merchant, and was admitted at the age of eighteen to the Polytechnic School, his course in which was followed by one in the School of Mines. He became imbued with the doctrines of St. Simonianism, and published in the *Organisateur* several articles on this subject, which attracted attention. He afterwards became editor of the *Globe*, a journal just acquired by the sect as the organ of their peculiar views. He conducted this journal for two years, but a division taking place between the leaders of the sect, he followed M. Enfantin to Ménilmontant, where a sort of monastic community was founded, M. Enfantin being the abbot or *père suprême*, and Chevalier one of the *cardinals*. But the Government soon put an end to the eccentricities of this new Church, and Chevalier, as editor of the *Globe*, was condemned to a year's imprisonment (July, 1832). After the expiration of his term of sentence, which the Government had reduced one-half, he retracted in the *Globe* all that he had written against the Christian religion, and was sent by M. Thiers on a special mission to the United States in 1832 to study the American system of water and railway communication. He gave two years to this purpose, travelling over the United States, Mexico, and Cuba, and published in the *Journal des Débats* a series of letters which attracted great attention. These letters were afterwards amplified and published in a separate work, entitled *Lettres sur l'Amérique du Nord* (2 vols., 1836; 3d ed. 1838). Humboldt considered this brilliant work as "a treatise on the civilization of the Western peoples." It was followed in 1838 by a work received with equal favor, *Des Intérêts Matériels en France*, etc., a brilliant sketch of the internal improvements planned by M. Mole. He became master of requests and councillor of state (1838), a member of the superior council of commerce and professor of political economy in the College of France (1840), and chief engineer of mines (1841). His lectures at the College of France were very popular, and he continued his contributions to the *Journal des Débats*, in which he sustained conservative views. He was elected to the Chamber of Deputies in 1845, but failed to obtain a re-election in 1846 in consequence of his views concerning free trade, of which he had now become an ardent advocate. He earnestly but vainly sought in 1847, with F. Bastiat, to organize in France a reform league on the basis of the Anti-Corn-Law League which had just triumphed in England. After the Revolution of 1848 he vigorously opposed the doctrines of Louis Blanc in papers published in the *Revue des Deux-Mondes*, entitled *Question des Travailleurs*, complemented in the *Débats* by *Lettres sur l'Organisation du Travail*. On account of the anti-revolutionary sympathies which he displayed in this contest he was dis-

missed from his chair at the College of France, but was reinstated before the end of the year. In 1851 he was elected a member of the Academy of Moral and Political Sciences, and in 1852 his sympathy with the *coup d'état* of Napoleon brought him the nomination of councillor of state. He was made a member of the commission to organize the French Exposition of 1855. He continued vigorously to advocate his free-trade views, and was in 1860 one of the promoters of the treaty of commerce between France and England, which he aided Cobden in negotiating. In the same year he was made a member of the Senate, where he took part in several important discussions on financial and industrial questions. In 1862 he was elected president of the French section of the international jury on prizes at the second London World's Fair. In the second French Exposition of 1867 the publication of the official report was entrusted to him, and he prepared an *Introduction aux Rapports du Jury international*, in which the whole subject of modern industry was philosophically treated. This was published in separate form in 1868, in which year he was made a member of the committee to investigate the state of agriculture. He was frequently a member of the imperial council of public instruction. He was made grand officer of the Legion of Honor in 1861, and has received a great number of foreign orders. After a journey to England the prince of Wales sent him the medal created by Prince Albert for promoters of industrial and commercial progress (1875). He died Nov. 29, 1879.

In addition to the works mentioned he published an *Histoire et Description des Voies de Communication aux États-Unis* (2 vols., with folio chart, 1840), which described the American railroads of that time with reference to their influence on social intercourse; *Cours de Économie politique* (3 vols., 1842-50); *Essais de Politique industrielle* (1843); *L'Isthme de Panama*, etc. (1844); *La Liberté aux États-Unis* (1849); *Examen au Système protecteur* (1851); *Questions politiques et sociales* (1852); *La Question de l'Or* (1853); *De la Saisse probable de l'Or* (1859); *L'Expédition du Mexique* (1862); *Le Mexique ancien et moderne* (1863); *Le Monopole et la Liberté* (1867); *Comment une Nation rétablit sa Prospérité* (1871); *Des Moyens pour un État de refaire ses Finances* (1875), etc.

CHEVERUS, JEAN LOUIS ANNE MADELEINE LEFEBVRE DE (1768-1836), first Roman Catholic bishop of Boston, French prelate and cardinal, was born at Mayenne, France, Jan. 28, 1768. When a boy he devoted himself to the Church, receiving the tonsure at the age of twelve. He was appointed prior of Torbechet with a revenue that enabled him to pursue his studies with ease, but afterwards, on account of a lawsuit, he resigned. He was made a deacon in October, 1790, and ordained Dec. 8 in the same year, this being the last ordination in Paris before the Revolution. He assisted his uncle, the curate of Mayenne, and was afterwards appointed to succeed him. Meantime, he had refused to take the oath required by the French Assembly, but was able for a time to exercise his ministry in his own house. At last he was driven out and imprisoned in Paris, but escaped in June, 1792, and fled to England. Here he speedily acquired the language, and began to teach French and mathematics in a school. Within a year he had gathered a congregation in London, with the approval of the bishop, and preached in English. On account of his zeal he was appointed by the bishop of Dol his grand vicar, and at the same time his friend, Abbé Matignon, having gone to Boston, invited him to assist in introducing Catholicism. He arrived there April 3, 1796, charmed the people with his manners and overcame their prejudices. He soon began to preach with such simplicity, earnestness, and eloquence, that crowds were attracted to hear him. Archbishop Carroll invited him to take charge of St. Mary's Church at Philadelphia, but his love for his friend prevented. He spent three months in visiting the Indian tribes in

Maine, but was recalled to Boston, where the yellow fever was raging with violence. The courage, benevolence, and faithfulness which he displayed in ministering to the sick and dying, without regard to sect or creed, endeared him to all classes of people. Channing confessed that no minister in the city would care to challenge a comparison between himself and Father Cheverus. When a public dinner was given to President Adams on his visit to Boston, the two highest seats were reserved for the President and the priest. When the legislature of Massachusetts revised the oath to be taken by citizens, the form prepared by Father Cheverus was adopted. When he began to collect subscriptions to build a Roman Catholic church, President Adams headed the list, and Protestants subscribed freely. The Church of the Holy Cross, thus erected, was consecrated Sept. 29, 1803. Meantime, Catholicism having been restored to France, he was entreated to return, but resolved to share the lot of his little flock. He was highly honored by Protestants, and his advice eagerly sought on important matters. His tact and humor, as well as his greater qualities, proved valuable in his peculiar position in a Puritan community. He was one of the founders of the Boston Athenæum, and was engaged in other works of general utility. In 1810 four new dioceses were formed in the United States, and Father Cheverus was consecrated bishop of Boston by Archbishop Carroll, at Baltimore, Nov. 1, 1810. He continued with unabated zeal to carry on the work in which he had been engaged. He preached several times in churches of other denominations, and held public controversies on Catholic doctrines and practice. He was active in promoting education, and established the Ursuline convent at Boston for young ladies. When his friend, Father Matignon, died, Bishop Cheverus with his clergy went in solemn funeral procession through the streets. At last his incessant labors and the severity of the climate began to tell upon his health. His physicians advised him to return to his native land, and King Louis XVIII. invited him to become bishop of Montauban. He left Boston as poor as when he entered it, having bestowed all his possessions on his friends, the clergy, and the poor. Escorted by 300 carriages, he set out for New York, where he embarked Oct. 1, 1823. At Montauban he devoted all his energies to his diocese, but his reputation spread all over France. In 1826, when a disastrous freshet swept through the valley, he took 300 destitute people into his palace. In the same year he was appointed bishop of Bordeaux, being consecrated in November. In his new diocese he established many religious institutions, especially one for the relief of aged and infirm priests, promoted uniformity in the ritual, secured able and efficient pastors for the people. Being now a peer of France, he went at times to Paris, where he was often consulted by King Charles X. with reference to religious liberty. When the Revolution of 1830 took place, Bishop Cheverus assisted in maintaining public order, but declined to attend the Chamber of Peers. During the prevalence of the cholera he opened a hospital in his palace and placed over the door the inscription, "Maison de Secours." At the request of King Louis Philippe, and with the approval of all classes, he was proclaimed cardinal by Pope Pius VII. on Feb. 1, 1836. He had had a stroke of apoplexy in 1834, and his unremitting activity hastened his death, which took place at Bordeaux, July 19, 1836.

CHEVES, LANGDON (1776-1857), an American statesman, born at Rocky River, S. C., Sept. 17, 1776. After service in the legislature, and acting for a short time as attorney-general, he was elected to Congress in 1811, and zealously supported the declaration of war against Great Britain. In 1812 he was chairman of the committee on the navy, and in 1813 of that on ways and means. In 1814 he succeeded Henry Clay as speaker of the House, and in 1815 the bill for the recharter of the United States Bank was lost by his vote in opposition. But in 1819, the directors of the

bank, having succeeded in obtaining a new charter in 1816, and wishing to increase its favor with the public, elected him president. In order to maintain specie payments he greatly contracted the bank circulation, and thus produced temporary distress in the country. In 1822 he was made chief commissioner to carry out the provisions of the Treaty of Ghent, after which service he held no public office. He was an early advocate of a Southern confederacy, but in 1832 he opposed the nullification movement in South Carolina as inexpedient. In 1850 he was a delegate to the Nashville Commercial Convention, but in 1852, in the South Carolina Convention, he opposed secession by that State alone. He died at Columbia, S. C., June 25, 1857. His only publications were essays and reviews, among which those on the United States Bank were the most noted.

CHEWINK (*onomat.*), a name frequently applied to the **TOWHEE BUNTING** (*Pipilo erythrophthalmus*), which see.

CHEYENNE, the capital of Wyoming Territory and county-seat of Laramie co., is in the south-eastern part of the Territory, on Crow Creek and on the eastern slope of the Laramie Mountains. It is 106 miles N. of Denver and 516 miles W. of Omaha. The Union Pacific Railway passes through the city, and has two branches to Denver, the Kansas Pacific and the Colorado Central. Besides several costly private residences, the city has a fine city-hall, a court-house, an opera-house costing \$45,000, a school-house costing \$50,000, and a county hospital. It has five hotels, three banks (two national), two daily newspapers, which also issue weekly editions, six churches, and a large graded school. A school of mines has been established, as well as the Wyoming Academy of Sciences and Arts, and a Territorial library. An electric-light company has been formed, a telephone line put in operation, and water-works are in construction, in aid of which the city has issued bonds. The principal industrial works are the machine-shops of the Union Pacific Railroad; there are also a brewery and manufactures of saddles, wagons, carriages, sashes, doors, etc. Cheyenne was settled in 1867 and incorporated in 1869. Its property is assessed at \$1,500,000; its public debt is \$15,000, and its expenses for 1881 were \$13,000. It is the headquarters of extensive cattle-raising interests, and carries on a large trade. Near the city coal and iron are found, and twenty miles out there are silver- and copper-mines. Camp Carlin and Fort Russell are within two miles. Population, 3456.

CHEYENNES, a tribe of American Indians by most authorities classed with the Algonkin tribes, of which they form one of the most westerly sections. Some authorities, however, class them with the Dakotas. They seem to have been first located in the vicinity of the Red River of the North, whence they were driven by invading Sioux, and retreated beyond the Missouri. They first became known to the whites in this location in 1803, when the exploring expedition of Lewis and Clarke found them situated on the Cheyenne River near the Black Hills. They are a nomadic race, tall in stature and courageous in disposition, are fine horsemen, and of warlike habits. Their relations with neighboring tribes have usually been hostile, their raids sometimes extending as far as New Mexico.

The history of the Cheyennes presents one of the strongest examples of the flagrant injustice of the dealings of the white race with the Indians—the intrusion upon their territory of lawless frontiersmen, the base speculations of agents, the feebleness and inefficiency of the Government in preserving them from insult and injury, and the unquestioning haste of military commanders to take up every quarrel instigated by intrusive and turbulent pioneers. The first treaty made with the Cheyennes was in the year 1825. It was agreed that friendly relations should exist between them and the whites, but no limit was fixed to their range of free movement. They were then at war with sev-

eral surrounding tribes. The next important point in their history was a division of the tribe into two sections. One of these remained on their old hunting-grounds, and aided the Sioux in a war with the Crows, which ended in the repulse of the latter, who were driven westward from their original seat. The other section migrated to the region of the Arkansas River, where they joined the Arapahoes, with whom they have been since in close alliance. In 1847 their numbers were estimated at 5300. In 1851 a new treaty was made with them, and several others have been made since, each conflicting with the terms of the others, and each but half comprehended by the Indians, while the Government has failed to observe or enforce its own obligations under these treaties. In consequence of this diversity and confusion of requirements and lack of good faith much distrust arose in the Indian mind, and many serious troubles followed. The treaty of 1861, whose provisions remained a dead letter, deepened the hostile irritation of the Cheyennes, but the first outbreak took place in April, 1864, brought about by an inconsiderate movement of United States troops. A ranchman named Ripley complained that some of his stock had been stolen by Indians. The officers, to whom he was unknown, demanded no proof of his story, but at once set out with troops, and attempted to disarm a party of Cheyennes, some of whose horses the ranchman claimed as his. This effort was resisted, and a fight ensued. In the following month a body of Colorado troops attacked and burned a Cheyenne village, killing 26 and wounding 30 of its inhabitants. After further troubles the chiefs applied for peace, declaring that the war had been forced upon them. During the negotiations for the settlement of the difficulty the neighboring Indians were ordered to move nearer the fort, that they might be protected. They complied to the number of 500, forming their camp at Sand Creek in the vicinity of Fort Lyons. While they were thus situated their camp was suddenly surrounded by a body of Colorado soldiery under Col. Chivington, who commenced a ruthless assault which soon became a remorseless massacre. Women, fleeing or praying for mercy, were brutally shot down; children were killed and derisively scalped; men were tortured and mutilated; in all, more than 100 were slain. This unprovoked massacre, which no action of the whites in the whole history of Indian wars has surpassed in brutality, had its natural consequences. The Cheyennes flew to arms. A fierce war ensued which cost the Government \$30,000,000; 15 or 20 Indians were killed, while hundreds of soldiers were killed, many settlers butchered, and much property destroyed. It was finally ended by a treaty, which was followed by another treaty in 1867 inconsistent with the first. Then in 1867 a report of some excesses by the Cheyennes came to Gen. Hancock. He immediately advanced with a strong force against a large village of the Dog-Soldier band of the Cheyennes. The chiefs tried to induce him to pause in his advance, but when he persisted the men, women, and children fled from the village, so that on reaching it he found it deserted. He immediately burned the village with all the property of the tribe which it contained. Then the Indians, outlawed and forced to war, waged it determinedly. Many soldiers and settlers were killed, valuable trains captured, stations destroyed, hundreds of horses and mules taken, while the entire loss to the Cheyennes after the burning of their village is said by the Indian commissioner to have been only six men killed. In 1868 another difficulty arose, which seems to have originated in injudicious action on the part of the Government. The peace commissioners had made a treaty with the Cheyennes and Arapahoes, in which they agreed to surrender the reservation given them by treaty in 1865 and accept a new reservation. It was stipulated that no whites should settle on their old reservation within three years from October, 1867. Unwise delays occurred in carrying out the provisions

of this treaty. Whites intruded on the old reservation, and no effort was made to check them. The annuities of the Indians were needlessly delayed, and they were left destitute and half starving. They were practically left landless, except their right to hunting-grounds south of the Arkansas. The nomadic tendencies of the Indians were intensified by this treatment. Some troubles followed, and it was decided that they were hostile and must be punished. No allowance was made for the fact that partial starvation, through bad treatment, had caused such excesses as they had committed, and that these might have been hindered and new ones prevented more easily and cheaply by justice than by the sword. A winter campaign and a severe blow upon the Cheyennes was determined on. Gen. Custer led the assailing-party through the snows of a Western winter, surprised the camp of the chief Black Kettle on the Washita, killed 103 warriors, and took their women and children prisoners. The southern Cheyennes are now established on their reservation in the Indian Territory, the Government having finally succeeded in fixing its location and limits. The Arapahoes are now largely engaged in agriculture, and are peaceful and of good habits, but the more turbulent Cheyennes are less disposed to yield their old habits of life.

During these troubles with the southern Cheyennes the northern band continued peaceful, though urged by the Dakotas to join them in the hostile outbreaks of the latter tribe. In the treaty concluded with the Dakotas in 1868 the northern Cheyennes and Arapahoes were overlooked, and no reservation was provided for them. There was nothing left for them but to continue their old habits of nomadic hunting. In consequence they were regarded as hostile. Efforts were subsequently made to induce them to join the southern Cheyennes on their reservation, but they preferred to remain on the reservation of the Sioux, on which they were domiciled in 1876. A party of them became involved in the Sioux war which subsequently broke out. It was decided to punish them for this participation, and a large force of troops was led against a Cheyenne village in the Big Horn Mountains, though there was no proof that any of its inhabitants had taken part in the hostilities. The village, which contained 1200 inhabitants, was surprised and burned, many Indians were killed, and all their property and their winter store of provisions destroyed.

In 1877 the decision to remove them to the Indian Territory was put into effect. Much dissatisfaction with this movement was felt by the Cheyennes, who were wild horsemen and had never been under the discipline of an agency. In the succeeding year this dissatisfaction culminated in the escape of a party of 300 Indians from the reservation and their rapid flight towards their old home. The fugitives were hotly pursued, and after a running fight were captured and confined in Fort Robinson. From this place they made a second escape, and were again pursued, surrounded, and after a hard fight were all killed or wounded. Very few returned to the agency.

The story of the Cheyennes forms one of the most striking instances of Government vacillation in its dealings with the Indians, of the unjust dealings of Indian agents, and of that blind haste to punish first and investigate afterwards, which have been so many times exemplified in the history of Indian wars.

In Col. Wynkoop's statement to the Government respecting the dealings with the southern Cheyennes he pointedly declares that a few thousand dollars applied to the subsistence of the starving Indians at the right time would have saved millions to the treasury, have preserved the lives of many of the whites, have obviated the necessity of hunting and destroying the innocent for the faults of the guilty, and of driving into misery great numbers of helpless women and children. The Cheyennes now number about 3600. Their reservation is in the western part

of the Indian Territory, and, in common with that of the Arapahoes, includes 6715 square miles. As yet they have shown little inclination to conform to the new conditions of life offered them.

CHICAGO, the largest city of Illinois, and the county-seat of Cook county, is the fourth city in population in the United States, while in commercial importance it is second only to New York. It is on the southwestern shore of Lake Michigan, 18 miles from its southern extremity, 87° 37' W. long. Dearborn observatory, which is 3½ miles south and ¾ mile east of the court-house, is in lat. 41° 50' 1'' N. and long. W. from Greenwich 87° 37', and W. from Washington 10° 33' 40.'' The shore-line of the lake at the city is nearly due north and south. Chicago is 715 miles west by north from New York City on an air-line, 260 north-north-east from St. Louis. It extends north and south along the lake about 9 miles and west 5 miles, having an area of about 40 square miles. It is 592 feet above the sea-level, and was originally but a few feet above the level of the lake; but the grade was raised in 1867 from 5 to 10 feet, making the present level of the city 14 feet above the lake at the East Side and 28 feet at the West—a sufficient grade for drainage. The bayou called the Chicago River divides the city into three unequal parts, called the North, South and West Sides; the larger part of the trade is on the South Side. This bayou is about 100 yards wide at its mouth, and has been made very deep by dredging, banking, etc. About five-eighths of a mile directly west it separates into two parts, called the North Branch and the South Branch, the direction of each indicated by its name, and both running nearly parallel with the shore-line of the lake. This bayou, its branches, and numerous artificial "slips" furnish a harbor-frontage of 38 miles, nearly all of which is improved. This does not include the harbor proper of the lake. Along this river are located the large grain-elevators, lumber-yards, etc., and most of the railways have connection with it. Originally the site of the city possessed few natural advantages, no beauty, and was far from healthful; but the city, State and national governments have by artificial improvements so changed all these conditions that few cities of its size have superior advantages.

Name and History.—The name, Chicago, is pronounced by some to be an Indian word for "wild-onion," a plant which originally grew in great abundance along the borders of the river. By others, with more dignity if not with more accuracy, it is traced to a corruption of the word *checaqua*, a term given by the aboriginal Illini tribe of Indians to a long line of chiefs, and by early geographers to the territory of the Mississippi Valley from the source of the river to the Gulf; the meaning of the word *checaqua* is "strong." The first white men known to have visited the site of Chicago were Fathers Marquette and Joliet, Jesuit missionaries, who in 1662-63 passed up the river through the South Branch, through Mud Lake to the Des Plaines River, and on to the Mississippi River. All this territory was then claimed by France, but it became the property of Great Britain in 1759, and was lost to that country in the Revolution. Illinois was organized as a county of Virginia in 1778, ceded to Ohio in 1784, attached to Indiana in 1800, and organized by Congress into the "Territory of Illinois" in 1809, with Ninian Edwards as governor. A State government was formed in 1818. The first resident of Chicago was a negro, a refugee from San Domingo, named Jean Baptiste Point au Sable, who built a rude log cabin on the north bank of the main river in 1790. His object, seems to have been to ingratiate himself with the Illini Indians, who inhabited all the neighboring territory, for the purpose of founding a retreat for others like himself. He did not succeed, and stayed but three years. He was followed by Le Mai, a Frenchman, who stayed but a short time. He sold out to John Kinzie, an employé of the American Fur Com-

pany, who enlarged the hut of Baptiste and became the first permanent white settler. An Indian trading-business was soon established, of such importance that in 1804 the general government erected a log stockade named Fort Dearborn. During the war of 1812 this fort was completely destroyed by the Indian allies of England, and until the rebuilding of the fort, in 1816, the place was entirely deserted by all save the Indians. The second Fort Dearborn remained until 1837, when it was abandoned, the Indians having all removed westward, and there was no further necessity of the garrison; it remained standing until 1856, when it was demolished to make way for commerce. The first noticeable impetus given to Chicago was in the project and construction of the Illinois and Michigan Canal, connecting the South Branch of the river with the Illinois River at La Salle, a distance of 96 miles. The building of this canal was first agitated in 1814, but not until 1823 was a board of canal commissioners appointed; and the ground was not broken until July 4, 1836. The canal was completed in 1848, at a cost of about \$6,500,000. The highest point of this canal was originally 12 feet above the lake, but in 1876-80 the city deepened it, at a cost of \$3,251,621, and its highest point is now 8½ feet below the level of the lake. This change of depth was of immense advantage, dispensed with locks, gave a constant current sufficient to keep the channel clean, and to carry off the sewage of the city at the rate of one mile per hour. The canal leads into rich coal-fields, fine building-stone and fertile agricultural regions, and the traffic in these branches of business is no insignificant part of the whole business of the city. In 1829 the first survey was made and the first census taken; the latter showed less than ten families outside the walls of the fort. The prospect of a speedy completion of the canal attracted settlers, about four hundred coming in September, 1831. The year 1832 witnessed further gains in immigrants; the opening of the first school, with twelve pupils; the first Sunday-school, with thirteen in attendance; and the establishing of the first pork-packing house—a business in which Chicago has now no rival in the world. In 1832, Congress appropriated \$30,000 for improving the lake harbor, which money was received and applied to its purpose the same year; this was accompanied by the erection of about one hundred and fifty frame houses, with a family for each, and the establishment of a post-office with a weekly mail service. Chicago was incorporated as a city in March, 1837, and its rapid growth in population and wealth since that time is shown by the following table:

Year.	Population.	Personal and Real Estate.	Amount Tax.	Debt.
1837	4,170	\$ 236,842	\$ 5,905	\$ 9,996
1840	4,479	94,437	4,721	6,559
1850	28,269	7,220,249	25,270	93,395
1860	109,206	37,053,512	373,315	2,336,000
1870	306,605	275,986,550	4,139,798	11,041,000
1880	503,298	117,133,643	3,899,120	12,752,000
1882	560,693	125,358,537	4,227,402	12,752,000
1883	600,000	133,230,504	4,287,493	12,751,500

In 1880 the occupations of the people were as follows:

Occupations.	Males.	Females.	Total.
Agricultural pursuits.	1,123	67	1,190
Professions and personal services.	39,966	18,679	58,645
Trade and transportation.	53,056	1,957	55,013
Manufacturing and mechanical pursuits.	62,013	14,899	76,912
Total.	156,158	35,602	191,760

In 1875 a "State Board of Equalization" was established by the legislature, and is still in existence. The figures given above are the city's estimates until 1880,

when they show the reduced valuations made by the State board. As to nationality, the population is divided as follows: Native Americans, 200,000; Germans, 130,000; Irish, 120,000; Scandinavians, 50,000; Bohemians and Poles, 40,000; British and Canadians, 40,000; French, Italians, and Spanish, 10,000; colored, 9500; Chinese, 700.

One of the greatest conflagrations of modern times commenced in Chicago at 9.30 P. M. on Sunday, Oct. 9, 1871, and continued until the following Tuesday evening. It began in the south-west part of the city, and was carried by a strong south-west wind directly through the finest and wealthiest parts of the city. The total area burned over was 2100 acres, or nearly 3½ square miles; the number of buildings destroyed was 17,450; persons rendered homeless, 98,500; killed, nearly 200. The total loss on buildings was \$50,000,000; on personal property and merchandise, \$140,000,000; total, \$190,000,000, of which about \$44,000,000 was recovered on insurance. Contributions for the relief of the fire-sufferers came in from all parts of the world, and one month after the fire \$3,500,000 was subscribed and \$2,050,000 of this paid in. About \$7,000,000 was contributed from outside sources. The burnt district was not suffered to lie idle. Buildings began to arise before the ashes were cold, and three years afterward but a rare trace of the fire could be found. The new city is much better built than the old, and its rapid recovery from the stupefying effects of its great conflagration and its marvellous growth for the last twenty years are the wonder of the century.

Railways, etc.—Nothing has contributed more to the growth of Chicago than its railways, and nothing adds more to its power, its business facilities, and its wealth. The first road to reach the city was the Lake Shore and Michigan Southern, in February, 1852; the Michigan Central reached the city in May of the same year. The first road built from the city was begun in 1847, on a line toward Galena; there were 42 miles of this in 1850. Now there are nearly forty different roads meeting in the city, making it the greatest railway centre in the world. The principal roads are the Chicago and Alton; Pittsburg, Fort Wayne, and Chicago; Chicago, Milwaukee, and St. Paul; Pittsburg, Cincinnati, and St. Louis; Chicago, Burlington, and Quincy; Illinois Central; Michigan Central; Chicago, Rock Island, and Pacific; Lake Shore and Michigan Southern; Chicago and Grand Trunk; Chicago and Eastern Illinois; Wabash, St. Louis, and Pacific; Baltimore and Ohio; Chicago and North-western; Chicago and Atlantic. The entire railway system embraces more than 25,000 miles of track. With their connections they reach every city and town of importance in the country, from ocean to ocean, and from the farthest North to the Gulf of Mexico. About nine hundred trains arrive and depart daily, making 1800 arrivals and departures, carrying 50,000 passengers and 120,000 tons of freight. The traffic of these roads is immense, representing gross receipts of about \$500,000,000, with net profits of over \$50,000,000. The principal dépôts are the Central, on the West Side, near Madison Street, into which come the Pittsburg, Fort Wayne, and Chicago and the Pittsburg, Cincinnati, and St. Louis from the east, the Chicago, Milwaukee, and St. Paul from the north and the north-west, the Chicago, Burlington, and Quincy from the west and the south-west, the Chicago, Alton, and St. Louis from the south and the south-west. The great North-western system has its dépôt on the North Side, near Fifth Avenue. The Lake Shore and Michigan Southern and the Chicago, Rock Island, and Pacific occupy one dépôt on the South Side. The Illinois Central dépôt is on the lake, at the foot of Lake Street. Street-cars run everywhere through the city, on nearly each alternate street. There are three companies—the Chicago City Railway, operating principally on the South Side (this company introduced in 1882 the endless-cable power of propelling its cars, and several of its lines are run by this motor with great success); the

North Chicago City Railway Company, operating chiefly on the North Side, though running to the South; and the West Division Railway, confined to the West Side largely, and crossing on Madison Street to the South. Some of these lines are 7 miles long, making the round trip 14 miles.

The following table shows the arrivals and clearances at the port of Chicago in 1883:

	Arrived.		Cleared.	
	Vessels.	Tonnage.	Vessels.	Tonnage.
Coasting-vessels	11,814	3,758,272	11,731	3,885,101
Foreign vessels.....	93	35,912	100	38,295
American vessels from foreign ports.....	60	18,280	184	57,477
Total.....	11,967	3,812,464	12,015	3,980,873

General Business.—In the general volume of business transacted, Chicago stands second only to New York, and it is first in the trade in lumber, live-stock, and grain; in these three commodities it leads all the cities in the world. Since the establishment of a clearing-house in 1865 the amount of business transacted annually has been accurately ascertained. With the exception of the years 1875–78, during which time there was a general financial depression, there has been a steady and marked increase in the volume of business. This increase was 141 per cent. between the years 1873 and 1883, and about sixfold increase between 1866 and 1883. The increase of 1883 over 1880 was 46 per cent. The following table exhibits the amounts as given in the clearing-house reports for the years named:

1865 (9 mos.)	\$319,606,000.00	1875.....	\$1,212,817,207.54
1866.....	453,798,648.11	1876.....	1,110,093,624.37
1867.....	580,727,331.43	1877.....	1,044,678,475.70
1868.....	723,293,144.91	1878.....	967,184,093.07
1869.....	734,664,949.91	1879.....	1,257,756,124.35
1870.....	810,676,036.28	1880.....	1,725,684,894.85
1871.....	868,936,754.20	1881.....	2,249,097,450.60
1872.....	993,060,503.47	1882.....	2,366,536,855.00
1873.....	1,047,027,828.33	1883.....	2,525,622,994.00
1874.....	1,101,347,948.41		

The duties collected on the foreign trade were as follows:

1874.....	\$1,358,496.22	1879.....	\$1,807,052.71
1875.....	1,609,157.21	1880.....	2,548,406.87
1876.....	1,454,725.85	1881.....	2,931,030.61
1877.....	1,448,705.01	1882.....	3,696,711.09
1878.....	1,451,535.87	1883.....	4,075,166.85

The grain-trade of Chicago is larger than that of any other city in the world. A review of it shows a most wonderful development and a present status that almost challenges belief. In 1838 the receipts in grain were 78 bushels; in 1840, 10,000 bushels were marketed; five years later the receipts had grown to 1,025,620 bushels; and in 1850 there were marketed, of all sorts of grain, 1,830,968 bushels. From 1850 the growth in the grain-trade was very rapid, and the receipts of all kinds of grain and flour, reduced to the equivalent of wheat, in 1860, were 31,108,759, and in 1870, 54,745,903 bushels.

The following table exhibits the aggregate receipts and shipments of flour (reduced to bushels) and all kinds of grain at Chicago since 1870:

Year.	Bushels.	Year.	Bushels.
1871 (received)...	83,518,202	1871 (shipped)....	71,800,789
1872.....	88,426,842	1872.....	83,364,224
1873.....	98,935,413	1873.....	91,597,092
1874.....	95,611,713	1874.....	84,020,691
1875.....	81,087,302	1875.....	72,369,194
1876.....	97,735,482	1876.....	87,241,306
1877.....	94,416,399	1877.....	90,706,076
1878.....	134,086,595	1878.....	118,675,269
1879.....	138,154,571	1879.....	125,528,379
1880.....	165,855,370	1880.....	154,377,115
1881.....	145,020,829	1881.....	140,307,597
1882.....	126,155,483	1882.....	114,864,933
1883.....	164,924,732	1883.....	141,720,259

The shrinkage for 1882 was caused by a shortage of corn to the extent of over 500,000,000 bushels,

the loss falling more heavily on Chicago because of its closer relation to the corn-belt than upon other cities. In 1883 the business regained almost its highest point. The following exhibit shows the enormous transactions in grain at this mart:

	1883.	1882.	1881.
Received.			
Flour, bbls.,	4,295,515	4,378,864	4,942,911
Wheat, bush.,	20,364,155	22,326,680	15,077,051
Corn, "	74,412,319	49,224,522	78,276,422
Oats, "	36,502,283	26,975,137	24,941,397
Rye, "	3,838,554	2,052,214	1,460,102
Barley, "	4,643,011	2,066,633	6,551,520
Total in bushels	164,924,732	122,350,074	148,549,591
Shipped.			
Flour, bbls.,	3,999,431	3,995,332	4,639,388
Wheat, bush.,	11,728,754	19,905,319	17,474,541
Corn, "	71,666,508	49,264,167	74,213,837
Oats, "	31,845,993	23,975,177	23,250,297
Rye, "	3,838,554	1,928,874	1,177,464
Barley, "	4,643,011	4,130,069	3,057,655
Total in bushels	141,720,259	117,182,590	140,051,010

The direct export of wheat to Europe in 1882 amounted to 2,270,586 bushels, and of corn to 1,260,908, and in 1883 wheat 2,124,441 bushels, corn 2,893,870. The capacity of the elevators of the city is 24,450,000 bushels. There are twenty-four elevators, ranging from the Fulton, with a capacity of 300,000 bushels, to elevator D of the Chicago, Burlington, and Quincy Railroad, with a capacity of 1,800,000 bushels. Six others have a capacity of 1,500,000 bushels each. Besides these, the steamers and lake-craft laid up in this port for winter provide additional storage of about 10,000,000 bushels, and these are generally filled each year.

As a live-stock market Chicago has no rival in the world as a primary receiving-point. The centre of the trade, both in live-stock and in packing, is at the Union stock-yards, which are situated in the south-western part of the city, about six miles from the court-house. These yards are the most extensive and complete in the world; all railroads entering and leaving the city have connection with them. They comprise 345 acres and have a capacity for 21,000 cattle, 75,000 hogs, 25,000 sheep, and 500 horses, or about 150,000 daily. There are in the yards 31 miles of drainage, 7 miles of streets, 3 miles of water-troughs, 10 miles of feed-troughs, 1500 open and 800 covered pens for stock. They were opened for business Dec. 25, 1865, and the cost of building was \$3,000,000. The water is supplied from an Artesian well 1100 feet deep. The following shows the receipts and shipments for the past three years:

Year.	Cattle.	Hogs.	Sheep.
1881. Received,	1,498,550	6,474,844	493,624
" Shipped,	938,712	1,289,679	253,938
1882. Received,	1,582,530	5,817,504	628,887
" Shipped,	921,153	1,787,918	314,200
1883. Received,	1,878,944	5,697,163	749,917
" Shipped,	966,758	1,363,759	374,463

The estimated value of all the stock sold in this market during the year 1883 is \$201,252,772. The value of the hogs alone was \$84,609,375; of cattle, \$110,550,550; of sheep, \$3,000,100; and of calves, \$423,122. The number of hogs received in 1857 was 244,345; in 1862 it reached 1,348,890, fell off in 1865 to 849,311, reached 1,286,326 in 1866, 2,652,549 in 1871, and 3,488,528 in 1872. The receipts of cattle were 48,524 in 1857, and increased steadily every year, reaching, in 1872, 684,075. Until recently the cattle received have been largely shipped to the Eastern market, while the hogs have been dressed and packed; but during the year 1882, of the 1,582,530 cattle received, 345,000 head were made into canned goods and 300,000 fell into the hands of dressed-beef shippers. In 1883 the number of cattle packed was 697,000.

The pork-packing interest is a vast one. The number of houses engaged is twenty-three, with a capacity of 71,250 hogs per day. Owing to the failure of the corn-crop there was in 1882 a falling off of 1,100,000 hogs packed, as compared with the previous year.

This serves to show the intimate relations of the corn-crop with this interest. The aggregate packing for the year 1883 was 4,222,780 head, as against 5,697,163 received, leaving nearly 1,500,000 for further shipment. The number of hogs packed in 1851-52 was 22,036; in 1860-61 it was 271,805; in 1870-71, 919,197; in 1871-72, 1,225,236; in 1872-73, 1,456,650. There were twenty-seven packing firms in 1872, besides several smaller houses; one firm alone packed 373,725 hogs during that season. The packing of beef-products reached 51,606 head in 1860, and 92,459 in 1865. Since that time it has been declining, partly on account of the erection of packing-houses farther west, and partly because the use of refrigerator-cars allows the shipment East and to foreign markets without packing. The following table shows the amount of hog-products handled for the last three years:

Received.	1881.	1882.	1883.
Cured meats, lbs.,	138,787,745	106,944,533	139,971,942
Pork, bbls.,	52,298	79,266	53,636
Lard, lbs.,	61,403,671	48,233,342	72,010,072
Shipped.	1881.	1882.	1883.
Cured meats, lbs.,	782,993,729	620,928,579	643,994,263
Pork, bbls.,	319,999	431,361	340,307
Lard, lbs.,	278,531,733	240,661,733	255,226,039

In the lumber-trade, Chicago is the great distributing-point of the West. During the year 1883 it received by lake and rail 1,909,910,000 feet of lumber, the cost (including transportation, assorting, piling, dockage, etc.) being \$4,400,000. For the shipment of 1,065,000,000 feet during the same period the railroads received \$4,000,000, and the receipts of vessel-owners were \$3,000,000. A large part of this lumber is dressed and manufactured here, giving employment and support to over 50,000 persons and aggregating over \$12,000,000 annually. The receipts of lumber, exclusive of shingles, were, in 1852, 147,816,292 feet; in 1860 they were 262,494,626 feet; in 1870, 1,018,998,685 feet. The number of shingles received during the same years was, respectively, 77,080,500, 127,894,000, 652,091,000.

In summing up the general business of the city the following table, taken from the report of the secretary of the Board of Trade, shows the estimated value of the various articles shipped during the years 1882 and 1883, with a comparison of totals for preceding years:

	1882.	1883.
Flour and grain.....	\$ 90,388,000	\$ 90,631,000
Live-stock	100,939,000	93,208,000
Meats, lard, tallow, etc.....	117,592,000	116,160,000
Butter and cheese.....	17,114,000	19,340,000
Wool and hides.....	24,778,000	23,654,000
Seeds and broom-corn.....	9,358,000	9,260,000
Distilled spirits.....	2,451,000	
Miscellaneous	9,924,000	13,510,000
Total,	\$372,544,000	\$365,763,000
Total, 1881.....	\$340,675,000	
Total, 1880.....	305,400,000	
Total, 1879.....	252,152,000	

Manufactures.—According to the census of 1880, in Chicago, there were 3519 manufacturing establishments with a capital of \$68,836,885, employing 79,414 hands, of whom 62,431 were males above sixteen years of age. The total amount paid in wages during the previous year was \$34,653,462; the value of the materials used was \$179,209,610, and the value of the products \$249,022,948. The development of manufacturing industry has not kept place with that of trade and commerce, but the report of the year closing Dec. 31, 1883, shows that Chicago ranks fifth among the manufacturing cities of America, and shows a greater rate of increase in this department than any other city. Almost every branch of manufacturing industry is found here, especially those in wood, iron, the finer minerals, clay, etc. The principal manufactures are iron, flour, distilled liquors, agricultural-implements, pork and meats, boots and shoes, leather, cotton, and watches. Shipbuilding employs many thousands of workmen. About one-fourth of the

business of the city, especially its commerce, is based on the productions of its manufactures, and about one-tenth of its population, or 65,000 hands, are engaged thus. Its contiguity to the forests of Michigan, Wisconsin, and Minnesota, and to the copper- and iron-mines of Lake Superior, give it great advantage in these products. Excellent clay for making brick, drain-tile, sewer-pipe, etc., is found in abundance near the city, and over 2,500,000,000 bricks are made annually.

There are 7 distilleries, 30 breweries, 67 rectifying-houses, 141 wholesale liquor-houses, 75 saloons for malt liquors, 5000 for distilled liquors, 477 cigar manufactories, 7 tobacco manufactories, 9000 licensed retail sellers of tobacco. The total amount of revenue from liquors and tobacco for the year 1883 was \$8,774,891.

City Administration, etc.—The city is divided into 18 wards, numbered consecutively. The municipal government is vested in a mayor, and two aldermen from each of these wards. The municipal receipts for 1883 were \$8,772,578.18, and the total expenditure \$8,497,606.26. The number of buildings in the city at the close of 1881 was 137,098. During the year 1882 there were erected 3113 new buildings and 2005 wooden sheds, making the total number of buildings at the close of 1882, after deducting fifteen destroyed by fire in that year, 142,201. The cost of the new buildings in 1882 was \$16,286,760. The materials used were chiefly stone, brick, and iron, the ordinance passed after the great fire of 1871 forbidding the erection of wooden buildings inside the municipal boundaries being still in force, in spite of frequent attempts to rescind it. Its provisions have necessarily added to the exterior beauty of the city, while ensuring the general safety against a repetition of the memorable conflagration. The fire department of Chicago is in a high state of efficiency. It consists of 33 engines, 9 hook-and-ladder companies, 6 chemical engines, and employs 397 men with 178 horses. It has 37 buildings, worth \$305,150; real estate, \$214,655; apparatus, \$558,667.38; total, \$1,078,472.38. Of rubber hose, 41,739 feet is used by the department, and 503 miles and 2694 feet of main and distributing pipes. The number of fires in 1882 was 1304, involving a total loss of \$569,885. The expense of the department for the same year was \$552,000. The police force consists of 557 men in regular employ; there are 17 stations, with a value, including the land, of \$321,455. During the year 1882, 32,800 arrests were made, \$159,495 of fines were imposed, \$121,929.37 worth of property reported stolen, \$91,265.35 worth of property recovered. The expenditures of the police department for this year were \$745,542 for salaries, \$68,423.50 for miscellaneous expenses, \$21,000, for new sites and buildings; total expenditures, \$834,965.50. This department is inadequate to the needs of the city, but is under excellent discipline and ranks among the best in the country for official integrity.

Chicago now stands third on the list of large American cities in its death-rate, the number of deaths per thousand inhabitants being 23.60, while in New York it is 29.64; in Philadelphia, 22.62; in Brooklyn, 24.84.

The department of health furnishes the following table:

	Population.	Deaths.	No. of Deaths per 1000.
1875.....	407,000	7,899	19.41
1876.....	420,000	8,573	20.41
1877.....	439,776	8,026	18.24
1878.....	450,000	7,422	16.50
1879.....	475,000	8,614	18.01
1880.....	503,298	10,462	20.79
1881.....	540,000	13,874	25.69
1882.....	560,693	13,234	23.60

Sanitarians assert that defective sewerage caused the notable increase in the ratio of deaths since 1878.

Persistent efforts to improve the health conditions have been made, and are considered fairly successful.

In 1882 the prevailing direction of the wind was south-west; the mean temperature was $49^{\circ}.6$, highest $89^{\circ}.5$, and lowest $7^{\circ}.1$ below zero. The rainfall was 41.18 inches. The mean annual relative humidity was 75.4 per cent.

Water-Supply.—The water-works of Chicago form one of the largest and best systems in the world. The water is taken from the lake two miles from the shore, received at two points, and thence distributed over the city. The North-Side works are located near the lake, on Chicago avenue; these consist of pumping-engines and a stand-pipe, or tower, 175 feet high. On March 17, 1864, the work of building a tunnel under the lake was begun, and finished Dec. 6, 1866. A shaft which consists of an iron cylinder 9 feet in diameter was sunk; from this a tunnel extends two miles in a straight line and at right angles with the shore; the diameter of the tunnel is 5 feet. At the east, or crib, end it is 66 feet below the water-level of the lake, under a head of 18 feet, with a velocity of $4\frac{2}{10}$ miles per hour, and will deliver 57,000,000 gallons of water daily. At the water end of the tunnel stands the "crib." It was built on the shore, and towed out July 25, 1865. It is built of logs a foot square bolted together. Its dimensions are $98\frac{1}{2}$ feet in diameter, $40\frac{1}{2}$ feet high. The form is pentagonal, with three walls 11 feet apart; the diameter of the central space is 25 feet, within which an iron cylinder 9 feet in diameter reaches to the tunnel below. The water is forced by the engines into the tower, from which it is distributed by its own weight through pipes to all parts of the city. (See, also, *AQUEDUCTS*, Vol. I. p. 272.) A similar tunnel was constructed a few years after, 7 feet in diameter and 6 miles long, running south-west under the city to the corner of Ashland and Blue Island avenues and Twenty-second street. In these works is the largest engine in the world, being 1200 horse-power, with a fly-wheel 26 feet in diameter, pumping 2750 gallons at each stroke, and costing \$200,000. The four engines here are equal to 3000 horse-power. The supply of water is pure, cool, and inexhaustible, and the pumping capacity of the entire system is 150,000,000 gallons daily. The highest actual supply has been 78,000,000 gallons, and the daily average about 65,000,000 gallons. In 1882 the city had 472.3 miles of water-pipe and 3825 fire-hydrants. The cost has been over \$8,000,000, and the works are now the property of the city. The total expense for the year 1882 was \$1,307,590.55. The income for the same time was \$1,473,386.17, leaving a balance to the credit of the city of \$102,795.62.

Streets, Parks, etc.—With the exception of a few streets which abut on the lake and are interfered with by the river and its branches, the streets of Chicago are regularly laid out, with an average of 80 feet in width, and cross each other at right angles. The numbering is from the river east and west, and from Lake street north and south. In 1872 there were 534 miles of streets, of which 94 miles were improved; in 1878 there were 8 miles of sidewalk built; in 1881, 137 miles; and in 1882, 75. There are now nearly 1000 miles of streets, some from 5 to 9 miles in length. Many of the pavements are in an unsatisfactory condition, owing to the nature of the soil and the character and quality of the materials used, for the most part wooden blocks, which speedily decay. Asphalt, granite, and durable materials are coming into use. The streets are well lighted with gas and oil-lamps, of which there were in use, at the close of the year 1882, 11,784 for gas and 2049 for oil. The electric light is in use in many public buildings, but has not yet been employed by the city for the streets. The sewerage of the city has been greatly extended in recent years, and over 380 miles of pipe are in use. The North, West, and South Sides are connected with 33 bridges, which are placed at the distance of two squares apart, and swing on central pivots when boats are passing. In 1868 a tunnel

was made under the South Branch at Washington street. It is 1608 feet long, including the entrances, has a descent of 26 feet, a double roadway for vehicles and a separate passage for pedestrians, and cost \$400,000. A similar tunnel was built in 1870 under the main branch of the river at La Salle street, and connects the North and South Sides. Its length is 1890 feet, and it cost \$549,000. The boulevards of Chicago surpass those of any other city on the continent; they are 250 feet wide, finely paved, shaded, and kept. They are reserved for carriage-driving, and form a connecting chain between the principal parks. There is a continuous drive of 40 miles of boulevard. The parks are many, large, and beautiful. The oldest and best is Lincoln, on the North Side, having a front of more than two miles on Lake Michigan. It contains 310 acres, and is noted for its flower-beds, zoological gardens, and groves of natural trees. Going west and south from the north end of this park, a boulevard $3\frac{1}{2}$ miles long leads to Humboldt Park, containing 194 acres. Thence south-west by boulevard 2 miles is Garfield Park, formerly called Central. It is directly west of the mouth of the Chicago River about $5\frac{1}{2}$ miles, and contains 185 acres. Adjacent to it is the Jockey Driving Park, a great resort in the sporting season. One and one-half miles south lie Douglas Park, containing 171 acres, and beautified with a lake covering over 12 acres. A boulevard connects Douglas Park with the south park system, the most western of which is 9 miles from Douglas. These south parks lie just outside the city limits, and contain in all 1055 acres, 14 miles of interior drives, and 30 miles of walks. The two main divisions of these parks are approached by two grand parkways, called the Drexel and Grand boulevards, the finest in the country. The former is modelled after the Avenue l'Impératrice of Paris. Coming north from the south parks is the East, or Jackson, Park, containing over 600 acres and 2 miles of lake frontage. A magnificent boulevard called the Midway Plaisance will eventually connect this with the south parks; this boulevard is 600 feet wide. Besides those named, there are many smaller parks distributed over the city, the largest of which are Lake, containing about 10 acres, and Union, about 6 acres. These small parks are the lungs of the city. On the parks within the confines of the city \$12,330.28 were expended in 1882.

The finest and most elaborate building in Chicago is the new court-house and city-hall. It was begun soon after the fire of 1871, and is not yet completed, though occupied for various purposes. It is on the public square, has a frontage of 280 feet on Washington street and 340 feet on Clark and La Salle streets. It is in the modern French Renaissance style of architecture, with a colonnade story of Corinthian columns surrounding the sub-building; the columns are of polished granite, 35 feet high, and support an elegantly-proportioned entablature, which is divided into architrave, frieze, and cornice. Over this entablature is an attic-story with allegorical groups, each nearly 12 feet high, representing Agriculture, Commerce, Mechanical Art, Plenty, etc. The building is 120 feet high, the façades on Washington and Randolph streets being about 280 feet high, and the tower, when completed, will rise to a height of 376 feet. The hall has cost about \$4,000,000 already. It is used for both city and county business.

The next building is the new post-office and custom-house, built by the government, and finished in 1881 at an expense of \$6,000,000, including cost of ground. It occupies a square, measures 344 by 240 feet, is three stories high, with a basement and attic, built of stone in the style known as Romanesque with Venetian treatment. The basement and ground-floors are used by the post-office department; the second floor is for customs, internal revenue, sub-treasury, commissioners of pensions, and mail agents; the third floor, for courts of the United States and for offices connected with the Department of the Interior.

The Exposition building was erected in ninety-six

days in 1873 at a cost of \$400,000. It is the largest building in the world without interior supports, being 1000 by 225 feet. It has accommodations for 50,000 people. The Republican national conventions of 1880 and of 1884 were held in the south end of this building. Next in size to this is the Cook County Hospital, on the West Side. There are several buildings connected with this; it is said to be the best-ordered hospital in the world, and has accommodations for about 1000 patients. The Board of Trade building is opposite the city-hall, on Washington street. The board occupies the hall on the second floor, which is 142 by 87 feet and 45 feet high. A new building is in course of erection, to cost \$1,500,000. The board had 1936 members on Jan. 1, 1884 and the value of a membership was estimated at from \$3500 to \$4000. The bulk of the business of the city is transacted here, the daily trade often reaching 10,000,000 bushels of cash and future deliveries of grain and other products. It deals in all products except lumber, for which there is a Lumber Exchange.

The CHICAGO UNIVERSITY (*q. v.*) stands upon grounds in the south part of the city, presented for the purpose by the Hon. Stephen A. Douglas. On the same grounds are the Dearborn Observatory, containing the finest equatorial telescope in the country, and a monument over the mausoleum of Douglas; it is a simple column 35 feet high with a bronze statue of Douglas.

Education.—The public schools of Chicago take a high rank for efficiency, but cannot be considered sufficient for the demand, as the increase of population constantly exceeds both the expectations of the municipal authorities and the power of the taxpayers to anticipate the expenditure required for public purposes. In 1840 the total enrolment in the public schools was 317; in 1850, 1919; in 1860, 16,547; in 1870, 38,939; in 1880, 59,562; and in 1883, 72,509; but for this total enrolment there are only 56,583 sittings, 12,919 pupils receiving instruction during only one-half the daily school session, and 2480 applicants being excluded for want of room. The pressure upon the public schools is measurably relieved by private schools, denominational and secular, which, without public aid, provide for 32,038 pupils. The denominational schools are chiefly Roman Catholic, and are taught by lay instructors or by members of religious orders. In 1872 the number of public schools was 32, with 45 buildings, 476 teachers, 38,035 pupils enrolled; teachers' salaries amounted to \$359,588, and the assessed value of buildings was \$1,071,100; real estate, \$1,194,452. In 1883 the number of school-buildings was 68; teachers, 1107; pupils, 72,509; the salaries paid teachers amounted to \$771,065.37, while the total pay-roll was \$846,207.10, making the average cost per pupil on average daily attendance \$16.55. Of the teaching force there were 60 principals—37 in grammar schools, 20 in primary schools, and 3 in high schools. There are special superintendents for German, music, and drawing. The total school revenue for 1882–83 was \$1,434,571.32, and the total expenditure \$1,327,837.63. The per cent. of school-tax on the total amount levied was 28.2. The high schools cost \$50,810.13 in 1882, at an average cost per pupil, the enrolment being 1377, of \$43.83. The schools for deaf-mutes enrolled 57 pupils, with 6 teachers, at an annual expense of \$4264.10, or an average cost of \$71.53 per pupil. Evening schools, conducted during a portion of the winter, in 1883 had a total enrolment of 6956 pupils, at an average cost per pupil of \$8.94. In the evening high school the average cost per pupil was \$13.55. The total value of the school property in 1883 was \$6,210,073.80. In the school census for 1882, 241,693 persons were under 21 years of age, 155,166 were between the ages of 6 and 21, and 110,389 were between 6 and 16.

Besides the public schools, there are many educational institutions, among which are 4 theological seminaries, 1 college of photography, 2 musical colleges, 3 literary colleges—in all, 14 colleges, art-schools, and

seminaries. Of the medical colleges, there are 4 of the regular school, 1 eclectic, 2 homœopathic, 1 college of pharmacy, 1 training-school for nurses, 2 eye and ear infirmaries, 1 dental infirmary, 13 hospitals, 12 free dispensaries, 26 homes and asylums, 12 medical societies, and 1025 practising physicians, of whom about 100 are women.

Churches.—Chicago has 265 churches, 24 missions, and 83 religious societies. The Roman Catholics stand first in numbers, with 1 cathedral and 44 churches and about 45,000 members. The Methodist Episcopal denomination has 36 churches, 5686 members, 10,000 Sunday-school children, and property valued at \$750,000; the Lutherans have 32 churches, 15,000 members, 6500 Sunday-school pupils, and property valued at \$400,000. The other principal denominations have churches as follows: Baptist, 29; Christian, 4; Congregational, 19; Protestant Episcopal, 16; Reformed Episcopal, 8; Jewish, 12; Presbyterian, 24; Unitarian, 3; Universalist, 3.

There are 22 cemeteries, 14 convents, 60 temperance societies, 80 trades unions, and 704 secret societies, including 73 Masonic, 59 Odd-Fellows, 33 Knights of Pythias, 24 Knights of Honor, etc.

There are 11 libraries and reading-rooms, the most important of which is the Chicago Public Library, which was opened in January, 1873. It is sustained by taxation, \$50,000 being appropriated to its use in 1882. In June, 1883, there were 94,606 volumes on its shelves; 376,475 volumes were taken out during the previous year, and 543,456 persons made use of its reading-room, while the visitors to the reference-tables numbered 42,734. The librarian is William Frederick Poole, LL.D. The yearly augmentation has been 10,000 volumes since 1875. It is now proposed to use Dearborn Park as the site of a suitable fire-proof building for the library.

In the issue of newspapers, periodicals, and books, Chicago stands next to New York among American cities. The daily papers especially are large, influential, and have large circulation; the *Times* and *Tribune* are each valued at about \$800,000. The first paper was started in 1833 and called the *Democrat*, being edited and published by John Wentworth; in 1861 it was merged into the *Tribune*. The *News* has a daily circulation of 100,000, the *Tribune* of 65,000, *Times* of 55,000, *Inter-Ocean* of 18,000, and the *Journal* of 10,000. There are in all 234 periodicals, of which 25 are daily, 125 weekly, and the others at longer periods; there are about 60 juveniles and 35 religious papers. There are numerous publishing-houses of books, whose issues are of a high standard of literary and mechanical excellence.

There are over 200 hotels, capable of accommodating from 50 to 1000 guests each; among these, the largest are the Grand Pacific, Palmer's, Sherman, Tremont. The Palmer House cost about \$3,500,000, and the Grand Pacific about the same.

Theatres, art-galleries, and public halls are numerous, most of them dating since the great fire of 1871. They are generally of a style of magnificence creditable to the wealth and taste of the city. The churches, colleges, and asylums also are of fine architecture, imposing, and costly. But the chief peculiarity of the general aspect of Chicago is the number, regularity, and capaciousness of its business blocks and buildings, in which regard it is not surpassed by any other city on the Western continent. (M. F. S. & A. G. M.)

CHICAGO, UNIVERSITY OF, in the city of the same name, owes its origin to the Hon. Stephen A. Douglas. It was his intention to found a university which should be worthy of the Western metropolis and partake of its enterprise and prosperity, and yet be under the fostering care of the State. With this purpose, in the year 1854 he made known his willingness to give ten acres of the oak-grove near the lake-shore in the southern division of Chicago whenever assurances should be given that suitable buildings would be erected and that the institution would be established upon a permanent

basis. The offer was accepted, and on April 2, 1856, the proposed site was conveyed by contract to the Rev. J. C. Burroughs in trust. On Jan. 30, 1857, a charter was granted by the State, naming a board of trustees, of which Judge Douglas was the president and a majority of the members were of the Baptist denomination, to which Mrs. Douglas belonged; but it was added that, "otherwise than that the majority of the trustees and the president of the university shall for ever be of the same religious denomination as the majority of this corporation, no religious test or particular religious profession shall ever be held as a requisite for admission to any department of the university or for election to any professorship or place of honor or emolument in it; but the same shall be open alike to persons of any religious faith or profession." Judge Douglas held the office of president of the board till his death, in June, 1861. Since that time the place has been filled by Hon. Wm. B. Ogden, LL.D., Hon. Thomas Hoyne, LL.D., and N. K. Fairbank.

The university was opened Sept. 29, 1858, with J. C. Burroughs, D.D., LL.D., as the president. He has been succeeded by Lemuel Moss, D.D., Hon. Alonzo Abernethy, and Galusha Anderson, S.T.D.

It has been the aim to make the standard as high as in any American college. Among its professors are Dr. James R. Boise, the author of numerous Greek textbooks; Dr. Wm. Matthews, widely known by his works in English literature; and Prof. Alonzo J. Howe, of the mathematical department. Ladies are admitted to the same advantages as gentlemen in all the classes of the university. The law department was opened Sept. 21, 1858, and the names of Hon. Thomas Hoyne, LL.D., and Hon. Henry Booth, LL.D., are inseparably connected with its history.

The Rush Medical College, at one time a department of the university, is now independent of it. The vicissitudes through which Chicago has passed have materially interfered with the financial prosperity of the university, but during the twenty-four years of its history it has graduated from its literary department about 300 students, and from the law department 800, among whom may be found not a few names which are honored in the political, religious, and business world.

In the year 1865, an astronomical society having been formed, the tower of the Dearborn Observatory was erected by the Hon. J. Y. Scammon. This has been furnished with one of the largest telescopes in the world and with all the necessary apparatus for astronomical work. The director of the observatory gives instruction in that department of the university. (G. A.)

CHICKADEE (*onomat.*), a titmouse, a small oscine passerine bird of the genus *Parus*, sub-family, *Parinae*, family *Paridae*. Several distinct species of titmice receive the name "chickadee" in North America, the best known of these being the black-capped (*Parus atricapillus*). This has the crown and nape, with the chin and throat, glossy back, separated by white; the upper parts grayish-ash, the lower white, shaded on the sides with rusty-brown; the wings and tail full slate-color, edged with hoary-whitish, the bill black; the feet leaden-blue. It averages in length $5\frac{1}{2}$ inches; extent of wings, $8\frac{1}{2}$; wing and tail, each, $2\frac{1}{2}$; tarsus, $\frac{3}{4}$. It is an abundant and familiar inhabitant of the woodlands of the Eastern United States, especially in New England, the Middle States, and adjoining regions; it is hardy, and resident even in the most severe winters; of active habits and sprightly manners, with the very characteristic note of which the name "chickadee" is an imitation. It is a prolific bird, laying six or eight eggs in a nest constructed with little art, but often with infinite labor, in a natural or artificial excavation on a tree-stump or fence-post, composed of grasses, mosses, hair, fur, feathers, etc., and the eggs are white, fully sprinkled with reddish-brown dots and spots. There are numerous other species of chickadees, both of North America and of the Old World. The former are—*P. a. septentrionalis*, a large variety with a longer tail, the

feathers of which and of the wings are more broadly edged with hoary-white; this inhabits the North-western States and the Rocky Mountains. *P. carolinensis* is smaller, with shorter tail and less hoary edgings; of the Southern States. *P. a. occidentalis* is a variety of the first, from the Pacific coast. *P. meridionalis* is a darker-colored species, from the Mexican border and southward. *P. montanus*, of the Rocky Mountains, is distinguished by a white streak over the eye. The foregoing are all very similar to the *P. atricapillus*. The chestnut-backed chickadee, *P. rufescens*, of the Pacific coast region, has the back and sides bright chestnut, the throat sooty, the cap dark wood-brown. In *P. hudsonicus*, so abundant in Northern New England, Canada, and northward, the crown, nape, and back are clear hair-brown, and there are other characters. *P. cinctus*, of Alaska and Siberia, is larger than the foregoing, and otherwise different. The habits of all the species are much the same, and shared to a great extent by other *Parinae*. (E. C.)

CHICKAHOMINY, a river in the eastern part of Virginia which rises on the border of Hanover county, about 20 miles north-west of Richmond. It flows south-east nearly parallel with the James, into which it empties about 40 miles south-east of Richmond. It is about 75 miles long, but is navigable only a short distance for small steamboats. During the civil war of 1861–65 the upper part of its course, which is bordered by numerous swamps, served as the innermost natural defence of Richmond, and near it were fought the following battles in McClellan's campaign of 1862: Fair Oaks, May 31; Mechanicsville, June 26; Gaines's Mills, June 27; Savage Station, June 29; Glendale, June 30; Malvern Hill, July 1. Again in Grant's campaign of 1864 the bloody battle of Cold Harbor was fought, June 3, on the same ground as Gaines's Mills. See COLD HARBOR, and other articles on these battles.

CHICKAMAUGA, a post-hamlet of Hamilton county, Tenn., on the Western and Atlantic Railroad, 12 miles east of Chattanooga. It is noted for the scene of one of the bloodiest and most complicated battles of the civil war, fought Sept. 19 and 20, 1863, between the Union army commanded by Gen. W. S. Rosecrans, and the Confederate army under Gen. Braxton Bragg. Chattanooga was for both armies the strategic point of the campaign; success would be with the one which should occupy and hold it.

Chattanooga is a great railroad centre, and stands in the narrow and important gateway from Tennessee into the fertile counties of Georgia. To the south and west the mountains are broken into subordinate ridges, separated by creeks and valleys, which form natural obstacles to an advance on the town from that direction. From west to east the principal among these are: 1. Sand Mountain, the northern extremity of which bears the name of Racoon Ridge; 2. Beyond Lookout Creek is Lookout Mountain, 2400 feet high, but having a practicable terraced base as it declines toward the river; 3. Beyond Rocky Creek is Missionary Ridge, through the northern gap of which a road runs to Rossville; 4. South-east of Missionary Ridge and across the West Chickamauga Creek lies Pigeon Mountain. The Chattanooga River, rising above Lafayette, runs northward into the Tennessee at the city. A common watershed for these streams is found in the McLemore's Cove, which forms a great gap through or between the ridges mentioned.

Gen. Rosecrans had remained for months apparently inactive after the battle of Stone River, or Murfreesborough, in which he had defeated Bragg, Jan. 2, 1863. When, at last, June 25, after repeated remonstrances from Gen. Halleck, he began his southern movement, the elements seemed to conspire against him; an incessant rain for seventeen days impeded his advance, and his movements were necessarily slow. His force, called "The Army of the Cumberland," numbered about 60,000 men, divided into three corps, under Gens.

Crittenden, Thomas, and McCook. Supporting the army of the Cumberland by a concurrent movement upon Knoxville was a column under Gen. Burnside, of about 20,000. To resist this Federal advance Gen. Bragg had about 50,000 men, posted chiefly at Shelbyville and War Trace, covering gaps and confronting the march of Rosecrans at an average distance of ten miles from Murfreesborough. Buckner was at Knoxville with about 10,000 men. The first scheme of Rosecrans was to turn the Confederate right. Bragg fell back rapidly, destroying the bridges and railroads as he retreated toward Chattanooga. Thus impeded, Rosecrans moved very slowly. He crossed the Cumberland Mountains August 16, and then spent a month in repairing the communications and concentrating his forces. Again there was a sharp correspondence with Gen. Halleck, in which he was strongly urged to advance.

Meantime, the Confederate government, in the greatest concern lest Bragg should be overpowered, ordered Buckner to abandon Knoxville and East Tennessee and join Bragg without delay. Further reinforcements were sent him with Gen. Polk from Alabama and Longstreet from Virginia, and with this increase of numbers he was told he must fight. He posted Polk in and around Chattanooga, and Hardee on the Knoxville Railroad. Chattanooga, thus strengthened, being too powerful for a direct attack in front, Rosecrans moved his army down the river and crossed below on pontoons, rafts made of boats, and by the bridge at Bridgeport, which had been repaired. The Federal army was then set in motion on the left bank to turn the left flank of the enemy and strike his rear. Crittenden, on the Federal left, moving down the Sequatchie Valley, was ordered at the same time to advance directly upon Chattanooga. McCook, with the right wing, crossing at Caperton and Bridgeport, was instructed to advance through the mountain-passes to Valley Head, and thence by Summerville and Alpine to threaten the enemy's communications at Rome, in Georgia. Thomas, with the centre, was to pass the Raccoon, cross the Lookout Mountain by several gaps, and, passing through McLemore's Cove, to march upon Lafayette. Crittenden crossed the river August 20, and on the 21st he shelled Chattanooga. By the 1st of September the entire Union army was across.

Bragg was not for a moment in doubt as to Rosecrans's purposes, nor did he fail to observe that in carrying them out the Union general had injudiciously extended his army. In the presence of a sagacious and wary foe he had separated his three corps by difficult mountains. Determining to take advantage of this, Bragg ordered Gen. D. H. Hill to march upon Lafayette, now the objective point, with the divisions of Buckner and Walker. He withdrew his stores from Chattanooga and abandoned the place because it was untenable, yet hoped to reoccupy it after a battle. He intended to give desperate battle upon the left centre of Rosecrans, hoping to crush him before he could concentrate his forces.

The Union general was in excellent spirits. Crittenden, on Sept. 8, had occupied Chattanooga with one brigade, and had marched the rest of his command to Ringgold, on the railroad between Chattanooga and Dalton, hoping to intercept Buckner, who, however, had already passed him on the way to Lafayette. Thomas was marching to Lafayette, and McCook was still moving in the direction of Rome. Thus, while the Union general thought his enemy was contemplating retreat, he was himself in imminent peril of having his unsupported left and centre crushed by overwhelming numbers.

Bragg had received all available reinforcements, the duty of guarding the railroads and bridges in rear being left to the Georgia militia. The skilful and sagacious plan of Bragg failed from the want of co-operation on the part of his generals; before it could be tried Rosecrans and his commanders had discovered the

Confederate purpose and their own error. Thomas, who was still in McLemore's Cove, grasped the situation, and sent word that McCook must make a forced march to close up on his right. In carrying out the new orders, McCook, ignorant of the country lying between Thomas and himself, and that there was a road over the top of the mountain, was obliged to make a long circuitous route around the rear, which, had the enemy been intending to move in that direction, would have left the right flank of Thomas exposed. Fortunately, however, the closing up on the right was effected by the morning of September 18. It was not a moment too soon. Crittenden, encountering unexpected resistance at Ringgold, had fallen back across the Chickamauga. During the day and night of the 18th all the troops were placed in position. The entire Union army lay on the right bank of the Chickamauga, the right still on McLemore's Cove, and at first the left at Lee and Gordon's mills. During the night the whole force was moved northward by the flank, Thomas, in front, overlapping the left of McCook. Gen. Gordon Granger's command was in reserve in front of Rossville; Crittenden was posted in rear of the centre; the headquarters of Gen. Rosecrans were in rear of the right centre; other reserves were in scattered positions toward Chattanooga. It was now manifest that it was Bragg's purpose, while trying to overwhelm the Union centre, to turn its left and cut Rosecrans off from Chattanooga. The Confederate army lay that night on the left bank of the Chickamauga, Gen. Polk, with Walker's and Cheatham's division on the right, confronting the position of Thomas, and Gen. Hood on the left. With great rapidity Bragg moved 30,000 men across the creek and pushed division after division upon Thomas. The first attack drove in Thomas's advance, but, others coming to the rescue, it was driven back in turn. The attack was renewed with redoubled vigor along Thomas's entire front. The danger seemed imminent, when Gen. Hazen, of Crittenden's corps, rapidly posted twenty guns, and, delivering an enfilading fire, drove back the Confederates in confusion. One more organized attack, but not so vigorous as the preceding, was made upon the Union centre, and was repulsed, when night put an end to the conflict.

New dispositions were made in both armies under cover of the darkness; and when the morning of the 19th dawned, both were ready for battle. In the Union lines McCook, well closed up, still occupied the right, his flank being drawn back *en potence* to resist a movement in that direction; Thomas, well drawn together on the left, had been reinforced by the divisions of Johnson and Palmer of McCook's corps; the divisions of Brannan and Negley were held in reserve. Crittenden was placed in reserve in rear of centre, and Gen. Granger to the left and rear of the whole line, in the direction of Rossville. The cavalry occupied the extreme right. Bragg's army confronted the Union troops from left to right with Polk's corps, Hill, and Longstreet. These were arranged in two lines, with adequate reserves, and with the cavalry on the left. The Union army was on the defensive. Fortunately, Thomas had taken the precaution to throw up slight entrenchments in his front, which proved to be of great service.

Bragg had given orders to attack at sunrise, and was in the saddle with the earliest dawn listening for the sound of Polk's guns. He did not hear them; and when he sent in hot haste to find the reason, he was told that Polk had not passed the night with his command, and that in posting the troops Longstreet's right overlapped him and he could not move until his front was uncovered. This was not accomplished until ten o'clock. Then the whole Confederate right was launched, division after division, upon the devoted Thomas. To meet this, troops were hurried up from the right to reinforce him, and the tide seemed to have turned in his favor, when an unfortunate mistake changed the

aspect of affairs. Gen. Wood, on the right centre, being explicitly directed to close up to the left on Reynolds, did so, and thus unwittingly left a gap in the Union front, which Longstreet was not slow to perceive. Into this he poured his troops, rolling up the Union right and centre, sending both flying toward Chattanooga and Rossville. Thus Thomas seemed left to his fate, with no possibility of success; and if Thomas were routed, no one could estimate the disaster of the broken army in flight across the Tennessee and void of all elements of reorganization. But help was at hand. The first unlooked-for aid came in the form of Sheridan's division, which, held firmly in hand amid the flying troops, joined the right of Thomas with a defiant front to the enemy, and checked the flank movement. Upon Thomas, thus reinforced, the brunt of a new and more vigorous attack fell; he stood like a rock, and received, as he deserved, the appellation "The Rock of Chickamauga."

With the rapid dispersion of the right and centre McCook and Crittenden had been swept along in the tide of flight, and with them Rosecrans and his staff. Thomas was left to command the field. Far to the rear, disengaging himself from the fugitives, Rosecrans found himself with his chief of staff, Gen. J. A. Garfield, at a crossing of roads, one of which led to Thomas's position and another to Chattanooga. They could still hear the heavy firing. Hoping against hope that Thomas might still hold out, the Union general sent Garfield to join him or to bring tidings of him, while in person he set out for Chattanooga to make the best arrangements for holding it at all hazards.

Meantime, heroic Thomas, slowly falling back to better ground, had been able to repel every attack. In his last position his troops were drawn up in a line curved slightly inward, with its flanks resting upon spurs or slight elevations of Missionary Ridge. Polk was still pounding on his left, and Longstreet on his right. Again there came a critical moment. Another slight opening was made in the Union right, upon which Longstreet rushed as before. But Gordon Granger sent his reserves immediately to reinforce the weak point; the enemy were driven back in confusion, and thus ended their last charge.

Again night came down upon the scene of carnage; the firing ceased. Thomas fell back slowly and in good order to Rossville, leaving, indeed, his dead and wounded on the field, but capturing 500 prisoners in retiring. The next morning, in his new position, he confronted Bragg and offered him battle. The offer was not accepted, although he remained in position throughout the day. On the following night he joined the rest of the army in Chattanooga. It does not appear why Bragg, when urged by his generals, did not continue the fight on the night of the 20th, when there was a brilliant moon and Thomas's tenacity had been tried to the utmost.

It is difficult to characterize this battle. To the Union army, as a whole, it was a great disaster, but to Gen. Thomas it was a victory. In technical terms, the Confederate army had won a victory, but they had lost Chattanooga. Rosecrans was there fortifying it, so that it could only be retaken, if at all, by a painful siege. The Union losses were in all 16,351 men and guns. Unnecessarily great as they seem, they were hardly too great to pay for the prize gained and kept. The Confederate losses, according to Bragg's report, equalled two-fifths of his entire force.

On the 16th of October, Rosecrans was relieved from the command of the Army of the Cumberland, which was given to Thomas. On the same day Gen. Grant was placed in command of the Departments of the Ohio, the Cumberland, and the Tennessee, all constituting the Military Division of the Mississippi. On the 23d he was at Chattanooga with the mission to defeat Bragg, who was now besieging the town, and to render that stronghold impregnable. See CHATTANOOGA, BATTLE OF.

(H. C.)

CHICKASAW INDIANS, a tribe of North American aborigines belonging to the stock known as Appalachian, and allied in language and traditions with the Choctaws and Muscogees, or Creeks. Their language is, in fact, only a marked dialect of the Choctaw tongue. De Soto visited their town of Chicaca in 1540. In colonial times they were seated in what is now the northern part of Mississippi, their country at one time reaching north to the Ohio River. They were, as usual with Indians, divided into clans, or *gentes*. They had a king, or *mico*, besides inferior chiefs. They were often at war with the French colonists, but were almost constantly friends of the English. The formal cession of parts of their country to the whites began in 1805, and somewhat earlier than this the people had begun to remove across the Mississippi, looking for better hunting-grounds. The final cession of their lands took place in 1834. From 1837 to 1855 they were settled with the Choctaws, and formed a part of that nation. But, though they had a large money-annuity from the United States, they did not prosper. Since 1855 they have had a separate tribal organization, and have done much better. Being slaveholders, they sided with the South in the war of 1861-65, and, in consequence, lost a large part of their surplus lands and had their government annuity very greatly reduced, much to their real advantage.

The Chickasaws in 1882 were reported to number 6000. They have 7267 square miles of good land. Their country lies west of the Choctaw nation, with which it has a certain alliance; but the Chickasaws are self-governing, having laws and a system of administration based upon that of the various States. Their country lies on the Red River, which divides it from Texas on the south. The tribe is, for its numbers, the most wealthy in the Indian Territory. This wealth has come partly from the practice of hiring white laborers, partly from their former great funds and annuities, partly from their rich soil, and latterly from the facilities afforded by the railway which crosses their lands and has caused the opening of coal-mines, the latter affording a revenue to the tribe.

The Chickasaws have repeatedly asked for a distribution of their lands in severalty, but Choctaw influence has thus far prevented it. The Chickasaws have good schools, including four academies and an orphan asylum. Most of the people can speak English, and a large number are communicants in Christian churches. There are many freedmen among them, who are well treated, but are not adopted as members of the tribe. These negroes are regarded as United States citizens, and their schools are sustained by the United States government.

CHICO, the largest town of Butte co., Cal., is on Chico Creek, 5 miles E. of the Sacramento River and 95 miles N. of Sacramento, on the California and Oregon Railroad. Though laid out in 1860, improvements scarcely began till 1869, owing to the previous uncertainty of title in lands covered by the Spanish grants. Since that time it has improved rapidly, the country around being noted for its beauty, fertility, and salubrity. Large quantities of lumber from the lower hills of the Sierra Nevada are shipped to San Francisco by boat and rail. Chico was incorporated in 1872, and now has gas-works, water-works, and a park. It has three large hotels, two banks, three daily newspapers, four churches, three public schools, an academy, a foundry, two grist-mills, two planing-mills, a sash-and-door factory, carriage-factories, a fruit-canning factory, and some minor works. Population, 3300.

CHICOPEE, a town of Massachusetts, in Hampden county, 4 miles north of Springfield. It is on the Chicopee River, near its junction with the Connecticut River; also on the Connecticut River Railroad, at the junction of the branch, which extends two miles to Chicopee Falls, a village which is under the same town government. Both villages are supplied with water-

power by the Chicopee River. There are very extensive manufactures of cotton goods, farm-implements, paper, alpacas, locks, cutlery, machinery, brass and bronze castings, firearms, and other goods. The public school system is well organized and efficient. The town has several churches and schools, a national bank, two savings-banks, a convent, and Catholic parish schools. Population, 11,286.

CHICORY has been naturalized in various parts of the United States. It came originally from the East—probably from Asia; and Pliny mentions that it was cultivated in Egypt. It seems to be a wayside companion of man in his migrations. According to Dodonæus, the eminent German botanist of the sixteenth century, its German name (*Wegwart*) is due to this fact. In Europe its flowers are usually described as blue, but in the United States the white-flowered variety is nearly as common as the other. Near Philadelphia its flowers open about 9 A. M. and close at noon. Its frequency in the vicinity of Philadelphia is ascribed to its cultivation by the early settlers of Germantown and their descendants, though now it is regarded only as a weed. It was cultivated as a salad and for its supposed medicinal virtues, especially in case of ague. Within the past century it has been chiefly used as an adulterant for coffee, but sometimes as an entire substitute. What is used for this purpose is grown to a small extent in the older parts of the United States, but is chiefly imported from Europe. When mixed with coffee it modifies the stimulating effect, but in excess it acts as a diuretic. In 1882, although there was a duty of two cents per pound on chicory, while coffee was free, 1905 tons of chicory was imported into the United States. Even chicory, however, is sometimes adulterated, carrots and various barks being used for this purpose. The analysis of chicory shows the following constituents: Water, 9.09; mineral salts, 4.20; soluble extractive substances, 41.29; soluble gummy resinous substances, 5.22; dextrine, 6.12; saccharine matter, 11.36; cellulose, 19.40; caramel, 2.10; carbon, 1.18; empyreumatic oils, 0.04.

In Europe chicory has found some favor as a forage-plant. In the early part of this century it was introduced into the Southern States as such, but it afterward fell into disuse. It may yet be found serviceable in the drier parts of this country, as cattle are fond of the herbage and its long roots enable it successfully to resist periods of drought. Arthur Young, the English agriculturist, in the latter part of the last century cultivated it largely for feeding purposes. It was found to start into growth under a very low temperature, making seven inches in three weeks, and to afford three or four cuttings a year. It is superior in productiveness to lucerne, and even to the alfalfa of the Pacific Slope. In the first year after sowing Young obtained 19 tons 4 cwt., per acre at two cuttings, and in the second year 38 tons 9 cwt., and the same field in four years gave an annual average of 30 tons per acre. The objection to it as a hay-plant in England seems to have been the difficulty of drying its succulent roots in that moist climate—an objection which would be entirely removed in the arid portions of the United States. Some experiments in its cultivation have been made by German farmers in San Joaquin county, California, and about 400 acres are grown there. In good years an acre is said to furnish \$300 profit, the root, when dried and ready for market, being worth \$200 a ton.

(T. M.)
CHIGI, FLAVIO, an Italian cardinal, born at Rome May 31, 1810, of an illustrious family, being a brother of the prince Chigi-Albani. In 1848 he became an officer of the pope's noble guard. In 1856 he was made titular archbishop of Mira, and went to Moscow as papal representative at the coronation of the czar Alexander II. He was afterward apostolic nuncio in Bavaria, and from 1861 to 1873 was nuncio in Paris. In that year he was recalled and made a cardinal-

priest. He is also archpriest of the patriarchal arch-basilica of the Lateran, a grand prior of the order of St. John of Jerusalem, Latin secretary to Pope Leo XIII., and a secretary of memorials, being one of the palatine cardinals.

The Chigi family of Roman princes is an offshoot of the Sienese house of the same name. Pope Alexander VII. (Fabio Chigi, 1599–1667) planted the Roman branch of the family tree and greatly increased that vast wealth which built the splendid Chigi palace and established the noble Chigi library. The present head of the house, Prince Mario Chigi-Albani, born Nov. 1, 1832, succeeded to his titles in 1877; is hereditary marshal of the Church and guardian of the conclave.

CHILD, SIR JOSIAH, BART. (1630–1699), an English economist, born in London in 1630. He became an eminent merchant and chairman of the East India Company, and was made a baronet by Charles II. His son was the first earl of Tylney. Among his works are *A New Discourse of Trade* (1690; often reprinted); *The East India Trade the most National of all Foreign Trades* (1681); *Observations concerning Trade and the Interest of Money* (1668; subsequently expanded into the "New Discourse," above noticed); *The Interest of England Considered* (1694); *The Relief and Employment of Poor*, etc. He died in London in 1699. He counselled a reduction of the rate of interest to four per cent., the prohibition of the export of wool, the transportation of paupers to the colonies, and reciprocity with those countries which bought English goods and sold to England raw materials.

CHILD, LYDIA MARIA (1802–1880), an American authoress, was born at Medford, Mass., Feb. 11, 1802. Her father, David Francis, was a baker, and removed to Maine while she was a child. Here, as she grew up, she studied with her brother, Rev. Convers Francis, a Unitarian minister, who afterwards became a professor in Cambridge Theological School. In 1824, upon reading an article by Rev. Dr. J. G. Palfrey in which he suggested early New England history as a proper field for a novelist, she rapidly wrote off a chapter, and when this was highly commended by her brother, continued until in six weeks she had completed *Hobomok, an Indian Story*. In the following year she published *The Rebels*, a story of the American Revolution. Prominent historical characters are introduced, and the speeches attributed to them have often been quoted as genuine. In 1826 she commenced *The Juvenile Miscellany*, a monthly magazine, which she edited for eight years. In October, 1828, she was married to Mr. David L. Child, a lawyer of Boston, noted for the boldness with which he denounced social wrongs. She published a book on domestic economy and cookery, called the *American Frugal Housewife*, which has gone through many editions. Turning her attention to education, she prepared *The Mother's Book*, 1831, and *The Girl's Own Book*, 1832. These were followed by lives of several eminent women, as Madame de Staël, Lady Russell, Madame Guyon. To these she afterwards added *Biographies of Good Wives*, 1846, and *History of the Condition of Women in All Ages and Nations*, 1845. When the anti-slavery agitation began, Mrs. Child became interested in the movement, and published *An Appeal in Behalf of that Class of Americans called Africans*, in which she advocated immediate emancipation. This was followed at various times by other anti-slavery writings. In 1841 she and her husband removed to New York to become editors of the *National Anti-Slavery Standard*. While there she also wrote a series of letters to the *Boston Courier*, treating of every-day life in the metropolis and its vicinity, which were afterwards gathered into two volumes under the title *Letters from New York*. They were reprinted in London, and are superior in interest to most of her writings. In 1836 she published *Philothea*, a classical romance of the times of Pericles and Aspasia, which has been highly praised for its ar-

tistic reproduction of a bygone age. In 1853 she published the *Life of Isaac T. Hopper*, a noted Quaker of Philadelphia who was prominent in his opposition to slavery. It was published in but a small edition, and, becoming very scarce, was reprinted in 1882. A translation of it was published in Germany. It is one of the best biographies in the language. In 1859, having written a letter of sympathy to John Brown, the emancipator, she became involved in a controversy with some ladies of Virginia, and her letters were extensively circulated. In the *Progress of Religious Ideas*, published in 1855, she treats at length the various religions of the human race; and though her work gives evidence of a wide range of reading, it also shows that she was unable to weigh the authorities for her statements, as many of them are incorrect and misleading. In 1864 she published *Looking towards Sunset*, and in 1867 *The Romance of the Republic*. In 1865 she prepared a compilation called the *Freedman's Book* as a help in the education of the emancipated negroes. She also gave liberally for the support of schools among them, as she had formerly done during the war for the relief of the soldiers. She died at Wayland, Mass., Oct. 20, 1880.

CHILDERS, HUGH CULLING EARDLEY, a British statesman, was born in London, June 25, 1827, being the only son of Rev. Eardley Childers of Cantley, Yorkshire. He was educated at Trinity College, Cambridge, graduating in 1850. After his marriage, in the same year, he went with his wife to Australia, where in 1851 he became a member of the newly-established government of Victoria. He held in succession charge of the education, immigration, revenue, and finance departments, and displayed in them all remarkable administrative ability. He retained his seat in the executive council for six years, and for two years (1856-57) was the representative of Portland in the Legislative Assembly. He then returned to England as agent-general for the colony, and took part in various commercial enterprises. He also studied law at Lincoln's Inn, but was not called to the bar. After an unsuccessful attempt to enter Parliament in 1859, he was elected as Liberal from Pontefract in 1860, and has since continued to represent that district. His large experience in public affairs led to his appointment on many important committees and royal commissions.

He thus was called to investigate transportation, penal servitude, law courts, and other matters, and his views have since been embodied in statutes. In April, 1864, he was appointed by Lord Palmerston one of the lords of the admiralty. In the next year he was transferred to the position of financial secretary of the treasury, which office he held till the close of that administration, in June, 1866. His activity was by no means confined to his official and parliamentary duties. Besides attending to his commercial enterprises, he found time to write some vigorous pamphlets on national education and other questions of the day. In December, 1868, he entered Mr. Gladstone's cabinet as first lord of the admiralty, but in March, 1871, resigned this position on account of ill-health. During his tenure of office he had effected important changes the tendency of which was to increase the power of the first lord of the admiralty, while rendering the departmental officers individually more responsible. In August, 1872, Mr. Childers was appointed chancellor of the duchy of Lancaster, and his re-election for Pontefract on this occasion is memorable as being the first parliamentary election by ballot in England. A year later, when Mr. Gladstone's cabinet was reconstructed, Mr. Childers retired; but in April, 1880, when the Liberals, after an interval of six years, returned to power, he was appointed secretary of state for war. In December, 1882, Mr. Gladstone felt obliged to relinquish part of his onerous duties, and Mr. Childers was called to succeed him as chancellor of the exchequer.

CHILI (Spanish *Chile*), a republic of South America which occupies the narrow strip of country lying between the Andes and the Pacific Ocean, and extending from the Camarones River, in 19° 12' 30" S. lat., to Cape Horn, in lat. 55° 59'. Peru in 1883 ceded the province of Tarapacá to Chili, at the same time assigning two other provinces for ten years, at the end of which time a local popular vote is to decide the question as to whether the two provinces N. of Tarapacá are to be Chilian or Peruvian. The boundary treaty made with the Argentine Republic Oct. 22, 1881, terminated a long controversy between the two countries, and gave to Chili the greater part of the Terra del Fuego islands and all the Straits of Magellan. The new boundary-line takes Cape Virgen on the Atlantic (Dungeness Point) for its starting-point, running directly south to the ocean and west to the summit of Mount Aymon, thence along the northern shore of the Straits of Magellan to where it intercepts the 52d parallel of latitude in long. 70° W. Thence the line follows the summit of the Andes to the north-western extremity of the Argentine Republic. In June, 1882, the Chilian administration submitted to Congress a bill making the Camarones River the boundary, thus annexing the rich Peruvian province of Tarapacá and all the sea-coast of Bolivia, which formerly extended from the 24th parallel N. to the Loa River, which separated Bolivia from Peru. The area of Chili, with the additional territory now annexed, is about 300,000 square miles.

Population.—The population of Chili, according to the last census (1875), as given by Mr. Asta-Burnaga, without taking into account the 40,000 Indians, was 2,075,971. Classified by civil state, it is as follows:

Unmarried,	Males,	725,389	Females,	690,469
Married,	"	278,013	"	276,948
Widowers,		30,572	Widows,	74,580

By grade of instruction, as follows (children included):

	Males.	Females.
Able to read.....	270,908	206,413
" " and write.....	244,985	176,162
Not able to read or write...	518,081	659,422

By nationalities, as follows:

	Males.	Females.	Total.
Germans.....	3,143	1,535	4,678
Argentines.....	4,560	2,623	7,183
Spaniards.....	1,102	121	1,223
French.....	2,408	906	3,314
English.....	3,459	808	4,267
Italians.....	1,725	259	1,984
North Americans.....	821	110	931
Peruvians.....	470	261	831
From other South American countries.....	470	209	679
From other European countries.....	1,211	199	1,410
From Asiatic countries....	132	4	136
Total foreign-born.....	19,500	7,135	26,635
" native-born.....	1,014,474	1,034,862	2,049,336
Grand total.....	1,033,974	1,041,997	2,075,971

PROVINCES AND TERRITORIES.	Square miles.	Population, Jan. 1, 1880.		
		Male.	Female.	Total.
Territory of Magellan, from lat. 47° to Cape Horn.....	57,761	746	505	1,251
Chiloe Islands and continent, to lat. 47.....	38,567	34,341	35,482	69,823
Llanquihue.....	7,810	27,718	25,782	53,500
Valdivia	7,521	17,669	16,689	34,358
Arauco.....	8,085	29,550	26,469	56,019
Territory of Angol.....	2,117	12,084	10,484	22,568
Biobio.....	4,146	41,808	38,807	80,617
Concepcion.....	3,382	82,782	84,079	166,861
Nuble.....	3,362	67,380	67,459	134,847
Maule.....	2,771	60,576	63,512	124,088
Lináres	3,298	65,738	63,397	129,135
Talca.....	3,477	56,089	57,516	113,605
Curicó.....	2,754	50,635	53,010	103,645
Calchagua.....	3,588	74,927	77,700	152,627
Santiago.....	7,323	188,574	198,537	387,081
Valparaiso.....	1,504	90,138	89,949	180,087
Aconcagua.....	5,886	65,230	68,698	133,928
Coquimbo.....	12,307	81,315	83,250	164,565
Atacama.....	48,409	42,122	32,709	74,831
Total.....	224,068	1,089,400	1,094,034	2,183,434

The annual increase of population being about 20,000, the total Dec. 31, 1882, should have been 2,243,434, though the actual population is probably somewhat larger. The total area between 24° and 44° of latitude being 129,721 square miles, the medium density is 17.26 inhabitants per square mile. The Government has appropriated \$200,000 annually to encourage foreign immigration. A like attempt some years earlier proved very fortunate in the German colonies of Valdivia, Llanquihue, and Osorno.

Outside the colonies and the newly-acquired territory there are 41 cities, 78 corporate towns, 186 villages, 83 hamlets, and 35 ports. There are 17 provinces, 60 departments, 682 sub-delegations, and 2738 districts.

The following are the approximate populations of the principal cities: Santiago, the capital, 180,000; Valparaiso, the principal port, 110,000; Talca, 21,000; Concepcion, 20,000; Serena, 14,000; Copiapó, 12,000; Iquique, 9000; Antofagasta, 7000: two-thirds of the people live in the rural districts. The newly-acquired territories are estimated to have something over 60,000 inhabitants, as follows: Antofagasta (Bolivian and foreign), 19,500; Tarapacá (Peruvian and foreign), 42,000.

Tempered continually in its whole extent by ocean-breezes, shut in by high mountain-barriers from the contagious diseases of other countries, occupying the healthiest of zones, and having abundant means of support and all natural resources for hygiene, Chili ought to be the most healthful of lands. But the natural indolence of a large part of the people, the extreme poverty of the masses, and the lack of local precautions neutralize to a great extent these natural advantages. The great mortality among nursing children and the prevalence of small-pox give evidence of this. In Chili only the strongest constitutions attain to manhood and old age; hence there is a notable absence of invalids. The vigor and strength of her laborers, soldiers, and sailors are remarkable.

The republic is intensely unified. This national cohesion is attributable in part to the nature of the territory. There are four entirely distinct powers of government: the executive, invested in a president; the legislative, invested in a national Congress composed of an upper and lower house; the judicial, invested in the various judges of the courts; and the municipal. The president is elected every five years by the people, and since 1871 is not capable of re-election except after an interval of at least one term. He has five ministers or secretaries, and is supported by a council of state composed of eleven members, five of whom are named by the president himself under certain regulations, and the other six are elected by Congress. They hold office for three years. The salary of the president is \$18,000 a year. He has also the privilege of residing in the treasury building. The salary of the ministers is \$6000 a year. The members of the council of state give their services gratuitously, and are of little consequence, because of the excessive power given to the president. The provinces are governed by *intendentes*, named by the president and removed at his will. Their salary is \$4000 a year, with residences. The departments are presided over by governors, named in the same way. The governors are of three classes, according to the salary, which varies from \$1000 to \$2500. The sub-delegations are presided over by sub-delegates appointed by the governors, and the districts by inspectors appointed by the sub-delegates. The national Congress is composed of two houses, and its members are elected every three years. The senate has 37 members, elected by the provinces, and the house of deputies 108 members, elected by the departments. They give their services gratis, and since 1876 the deputies are elected by the system of cumulative voting devised by John Stuart Mill. The judicial power is vested in the supreme court, composed of six members resident in Santiago, who have no political functions. In 1881 a law was passed declaring the incompatibility of the

judicial and legislative functions. The supreme court is occupied chiefly with cases of real estate, war-claims, and criminal cases.

Chili is fortunate in possessing an excellent codification of her laws. The civil code was promulgated in 1858, and the commercial code, penal code, code of mines, code of organization of tribunals, etc., followed in order. The civil code is taken largely from the Code Napoléon, and the military code from the ordinances of Spain. Recently (1882) a rural police has been organized throughout the republic, sustained by a small property-tax.

The religion of the country is Roman Catholic, but Protestantism is tolerated, and in Valparaiso and Santiago there are Protestant congregations having chapels and supporting their own pastors. The state Church has one archbishop, nominated by the president and confirmed by the pope. The archbishop resides at Santiago, and the bishops have their see-houses at Serena, Concepcion, and Ancud. The state assists to maintain the Church in return for the tithes of the fruits of the land, which the Church formerly enjoyed. The archbishop and bishops receive salaries of \$6000 a year, and the other revenues of the Church amounted in 1881 to \$237,030. The tithes (appropriated by the state since 1850) amount to five times this amount. At present, in consequence of disputes regarding the naming of bishops and archbishop, there is a strong feeling in favor of the separation of Church and State. The clergy of Chili are generally well educated and moral, but they are insufficient in number, although there exists a fine theological seminary in Santiago, and others at Valparaiso, Serena, Concepcion, and Ancud. The whole number of native priests is not over 400, but many come from Spain and Italy.

Public education in Chili is comparatively meagre, but in its higher courses is very thorough. Unfortunately, however, the school system does not adequately provide for the practical needs of the people. It has scarcely recovered from the early Spanish influences, yet it has a strong French tendency, which has affected the literature, tastes, and industry of the country. Fortunately, the excess of the evil has produced a reaction, and the youth are changing from a very general preference for the legal profession to the study of medicine, agriculture, civil and mining engineering, mechanics, etc. Public education is divided into three grades—superior, intermediate, and primary. Santiago is the seat of the National University, which has five faculties. A council of higher public education superintends the higher and intermediate schools of the country. These schools are free, and have their own buildings, apparatus, etc. The principal one is in Santiago, founded in 1813 and called the National Institute. In the provinces these schools take the name of *liceos* or high schools. The university preparatory course in the National Institute in 1880 had 843 students; the intermediate course had 918. In the provinces there were also 2176 intermediate students.

In the capital there are special schools for teachers, agriculture, and manual trades: there is also a military academy, an academy of painting, a conservatory of music, and in Valparaiso a naval academy. In these schools together the number of students maintained by the state is about 5000, including those in the theological seminaries. In the private schools there are as many more.

Primary instruction, which formerly received considerable attention, especially under the energetic administration of Pres. Montt (1851–61), is now somewhat neglected by the State. Benevolent societies supply in part this deficiency. The number of children enrolled in the public schools in 1880 was 48,794—24,961 boys and 23,833 girls. The average attendance was 34,089. To this must be added the private and society schools, which numbered 405, with 15,106 scholars—9218 boys and 5888 girls. The total number of public and private schools open this year was 1043, with an average en-

rolment of 64 scholars. The public-school expenses in all grades were the following:

National Institute (university preparatory).....	\$56,841
“ “ intermediate	116,784
Provincial high schools.....	208,777
Normal schools.....	43,872
Primary schools.....	385,377
Publication of text-books.....	30,000
Administration, premiums, etc.....	106,195
Total.....	\$947,846

The total appropriation made by Congress for school purposes in 1881 was \$1,119,620, and in 1882, \$1,386,022.

In Santiago is the National Library, with more than 60,000 volumes. Just now it is being removed and arranged according to an improved system. The university, institute, and many private schools, as well as the provincial high schools, have excellent libraries. In Santiago and Valparaiso there are museums of natural history, in Serena and Copiapó museums of mineralogy, and a taste for the fine arts may be cultivated in the many private galleries of paintings.

The regular army of the republic, which never in time of peace exceeded 3500 men, was reduced at the beginning of the late war (1878) to the number of 2700. During the war over 60,000 men were enlisted, and at its close (1884) the army contained about 22,000.

The merchant marine of the republic has been on the increase ever since the war with Spain in 1866. In 1879 it was composed of 106 sailing vessels and 30 steamers. During the first year of the war there was a large decrease, but since then there has been a gradual increase. The coast trade has developed, and some Chilean vessels have even been called into the foreign carrying-trade.

There are five steamship companies doing business on the coast—one of them, the Pacific Steam Navigation Company of England, having one of the largest fleets in the world. Its steamers sail bi-monthly to England by way of the Straits of Magellan, and weekly to Panama. The South American Company of Chili runs steamers as far north as Panama and as far south as Chiloe. The German line runs to Hamburg, and the French line to Havre. The Lota Company employs several steamers in the coal and copper trade.

Chili has in operation over 1100 miles of railroad, and surveys are being made for the speedy construction of as many more, one line being intended to extend the central line which runs from Valparaiso and Santiago as far as Valdivia, thus traversing the territory of Araucania. To Chili belongs the first railroad constructed (1850) in South America, that from Caldera to Copiapó. The state railway lines (590 miles) had cost for construction up to 1880 nearly \$40,000,000, obtained for the most part from British loans. In 1880 these roads transported 1,362,989 passengers and 569,385 tons of freight. Their receipts were \$2,142,985. There are also short lines used in the coal-mines of Coronel, Lota, Lebu, and Punta Arenas. At Santiago and Valparaiso, and from Old San Antonia to the mouth of the Maipú, there are street-railways with a total length of 35 miles. In addition to these there are public roads, kept in repair at Government expense, with a total length of 18,600 miles, and 1600 mule-paths, with a total length of 17,000 miles, which are kept in repair by the municipalities or private individuals or companies. There are also 78 streams, with a total navigable extent of 2800 miles.

The number of post-offices in 1880 was 335, and the Government owns a system of electric telegraph lines which had 105 offices with 178 instruments. The total length of wire, including some temporary lines used in the military operations at the north, was 5700 miles. A new line has since been constructed to Ancud, giving 12 additional offices and 473 miles. There is a private line between Santiago and Valparaiso, and another between these two cities and Buenos Ayres, opened in 1872, and connecting with Europe. Altogether, Chili has in operation more than 6200 miles of wire. There is a marine

cable to Callao, which has recently been extended to Panama, there connecting with Mexico and the U. S.

The commerce of the republic is prosperous, and the country, by reason of its agricultural products and its extraordinary mineral riches, is one of the great markets of the world.

The importation of foreign goods to Chili in 1882 amounted to \$50,739,901. The values of the principal articles was as follows: Sugar, \$4,229,496; cotton goods, \$9,252,549; hardware, \$754,909; machines, \$292,848; clothing and jewelry, \$530,547; miscellaneous, \$2,156,796.

The nations which in 1882 sent the largest amounts to Chili were: England, \$22,586,495; Germany, \$8,975,178; France, \$7,776,264; United States, \$2,577,992; Argentine Republic, \$2,823,304.

The articles and products which Chili exported in 1882 amounted to \$69,994,519. The principal were: Grain and produce, \$10,364,901; metals, \$56,355,838.

The agricultural products exported were: Wheat, \$6,649,348; flour, \$1,282,806; barley, \$120,692; wool, \$259,731.

The mineral products exported were: Bar copper, \$14,778,333; ingot copper, \$2,066,649; silver, \$3,909,852; saltpetre, \$28,698,364.

The foreign and coast trade showed the following number of vessels in 1882:

Entered.	Foreign Trade.		Coast Trade.	
	No.	Tons.	No.	Tons.
Sailing vessels,	960	623,414	2,277	859,393
Steamers,	522	744,435	4,473	4,389,088
Cleared.				
Sailing vessels,	805	514,721	2,372	888,881
Steamers,	723	906,307	4,341	4,151,852

In Valparaiso the Government has very large bonded warehouses, which cost over \$3,000,000. They were intended to be fireproof, but are not so.

Agriculture and mining are the most important industries of the country. Some advancement has also been made in manufactures. There are manufactories of cloth, silks, paper, metal-amalgamation, castings, oil, sugar-refining, carriages, furniture, wool and hemp goods, ceramics, pottery, candles and soap, lumber-sawing, lime and brick, whiskey, wine and beer, steam-boilers, leather, dyeing, marble-cutting, and many other industries and manual arts and trades.

At the Continental Exhibition held at Buenos Ayres (March to August, 1882) Chili, having had only a month for preparation, competed with great honor, exhibiting her natural productions and manufactures. She received seventeen medals of the first class, some of the second, and many bronze medals and honorable mentions, amounting in all to 117 premiums. The Chilean products which attracted the most attention in this international exhibit were cloths, ropes, sugar, spirits, and especially wines.

The native timbers exhibited by the National Agricultural Society, one of the most useful institutions of the country, represented 200 different species. In 1827 the Government of France gave a contract for bringing Chilean timber to her navy-yards, and during the colonial days there were built in Talcahuano and Valparaiso vessels of considerable size. But now the Chilean Government buys all her war-vessels in Europe, and only builds launches and flatboats. These launches are sent as far as Peru and Ecuador, manned by only two men, and they generally carry cargoes of wood and lumber.

During the time of the colony, when the public expenses did not exceed \$300,000, they were entirely provided for by annual appropriations made by the viceroy of Peru for the support of the army. The total expenses in 1776, under Jáuregui, were \$295,277. In 1810, at the time of the emancipation, the revenues had reached \$400,000. With the removal of the restrictions on commerce, and the development of agriculture, mining, and other industries, the income

quintupled during the last ten years of the war for independence (1816-26). The estimate in 1826, under Pres. Freire, was \$1,736,823. In 1836, under Pres. Prieto, the revenues had augmented to \$2,321,936; ten years later, in 1846, under Pres. Bulnes, to \$3,741,672; and in the next decade, under Pres. Montt (1856), to \$5,708,058. Since that epoch, on account of the introduction of railroads, the institution of banks (1855), the introduction of paper money (1878), the development of coal-mining on a large scale, and the cheapening of blasting materials for mines, the incomes have increased rapidly. In 1866 they amounted to \$9,079,936; in 1877 to \$16,830,000; and in 1882 to \$39,008,219.

Public Debt.—The home and foreign debt of Chili (June 1, 1882) was as follows:

Foreign debt (gold 48 pence to the dollar)	\$34,870,000.00
Home debt (gold 35 pence to the dollar, the present rate of exchange).....	36,546,384.85
Total.....	\$91,416,384.85

The circulating capital of Chili, as represented in 1882 by the principal banks, was as follows:

Banks.	Year of organization.	Nominal capital subscribed.	Available capital.		
			Capital paid in.	Reserve fund.	Total.
Valparaiso	1856	20,500,000	5,125,000	600,000	5,725,000
National	1865	16,000,000	4,000,000	500,000	4,500,000
Alianza					
Agricola	1868	1,593,600	1,593,600	22,500	1,616,100
Concepcion	1871	1,000,000	400,000	50,600	450,600
Consolidado					
Mobilario	1870		1,125,000	70,000	1,195,000
Union	1873	500,000	216,500	15,000	231,500
A. Edwards & Co.	1867		1,500,000	250,000	1,750,000
Matte & Co.	1875		1,000,000		1,000,000
Melipilla	1878	60,000	60,000	3,200	63,200
Total		39,653,600	15,020,100	1,511,300	16,531,400

There are also numerous credit, industrial, and mining companies, etc. One of these, the Lota Coal-mining Company, has an annual net profit of \$900,000. There are also a loan association and a hypothecating bank, which have made loans of many millions to the land-owners and renters.

History since 1876.—The administration of Pres. Anibal Pinto is chiefly notable for the war into which the country was drawn in 1879 in consequence of a secret treaty made between Peru and Bolivia in 1873. In this long war Chili received no defeats, and gained a prestige which has placed the country, along with the Argentine Republic, at the head of all the Spanish-American countries. The Bolivian port of Antofogasta was occupied Feb. 14, 1879, and some skirmishers were dispersed in a slight engagement at Calama, on the banks of the Loa, on the 23d of the following March. A maritime war was begun, but was without decisive results until the capture of the famous Peruvian iron-clad Huascar, Oct. 8th of the same year. The ocean thus freed from the enemy's vessels, 10,000 Chilean soldiers were landed at Pisagua, a port of Tarapacá, Nov. 2, 1879, and in the battle of San Francisco one-half of this force overthrew the allied Peruvian and Bolivian army of 11,000 men. From that day Chili has remained in undisturbed possession of the rich and desirable territory as far north as the Camarones River. After these victories the operations of the army were retarded by hopes of peace, but it became necessary to undertake a second campaign against the provinces of Moquegua and Tacna, which resulted in the bloody battle of Tacna, in which the allies were again defeated, May 26, 1880. The port of Arica was taken by assault on the 7th of the following June; and, although it would have been easy to carry the victory into unarmed and panic-stricken Lima, new negotiations of peace were entered upon, which protracted the campaign through eight months more. At the end of December, 1880, 25,000 Chileans set sail in three divisions from Arica. They occupied the valley of the

Lurii strategically to the end of this month. They then undertook the assault of the formidable works, which were defended by 30,000 men and 200 cannon and protected Lima. On Jan. 17, 1881, they victoriously entered that capital, after having annihilated both the army and the fleet on the 13th and 15th in the bloody battles of San Juan, Chorillos, and Miraflores.

These three campaigns of Antofogasta, Tacna, and Lima brought about ten battles, besides several minor encounters, and cost the army and navy of Chili 10,000 men in killed and wounded. The total extinction of the military power of Peru should have produced immediate peace after the decisive battles which took place at Lima. But a generous policy on the part of Chili, and the unreasonable and unwarranted interference of outside parties, caused the war to be prolonged, thus imposing heavy expense of money and life on Chili, without bettering in the least the condition of the allies. In 1883, Bolivia conceded the Chilean claims to the full. In July of that year Chili gained important military successes over certain irregular armed bodies of Peruvians, and in the same month a final cessation of hostilities was announced. The treaty of peace with Peru was ratified and exchanged in March, 1884. In April of the same year a truce was concluded with Bolivia. Thus the Pacific war has come to a close.

(B. V. M.)

CHILLICOTHE, the county-seat of Livingston co., Mo., is finely situated on a high prairie near the Grand River, and at the junction of the Hannibal and St. Joseph Railroad with the Wabash, St. Louis, and Pacific Railroad, 136 miles W. of Quincy, Ill., and 76 miles E. of St. Joseph. It has a fine city-hall, four hotels, two banks, two daily and three weekly newspapers, nine churches, a public school whose building cost \$35,000, and a Catholic convent and school. The industries comprise three flour-mills, a foundry, a broom-factory, tobacco-factory, etc. It was settled in 1837, and is incorporated as a city. Coal is found in the vicinity. The population numbers 4078.

CHILLICOTHE, a city, the county-seat of Ross co., O., finely situated between the Scioto p. 543 Am. River and Paint Creek, 45 miles south of ed. (p. 624 Columbus. It is on the Ohio and Erie Edin. ed.) Canal, and on three railways—the Cincinnati, Washington, and Baltimore, the Scioto Valley, and the Toledo, Cincinnati, and St. Louis Railroad. It is handsomely and regularly laid out, with macadamized and well-shaded streets. It has a fine stone court-house, a handsome city-hall, an admirable system of public schools, public gas and water-works, three national banks (aggregate capital \$750,000), five weekly papers (one German), fifteen churches, and a very active trade. There are five roller-process flour-mills, three large tanneries, extensive planing-mills, paper-mills, railway-shops, a foundry and machine-works, three carriage-factories, two breweries, a shoe-factory, and also manufactories of sewing-machines, household utensils, etc. The valuation (one-third of market value) of real property is \$2,975,260. There is no city debt. Near the city is a large and beautiful cemetery. Chillicothe was founded in 1796 by Gen. Nathaniel Massie. It was the capital of the Northwest Territory 1800-03, and capital of the State of Ohio, 1803-10, and again 1812-17. Population, 10,938.

CHILLON, a castle and former state prison of Switzerland, canton of Vaud, built on a rock in the Lake of Geneva, near its eastern end, and six miles south-east of Vevay. A wooden drawbridge connects it with the shore. Amadeus IV. of Savoy is said to have built it in 1238, but some authors say, with probable truth, that it was built as early as 1120. Bonivard, "the prisoner of Chillon," was here confined six years (1530-36) by Charles III., duke of Savoy, surnamed "the Good." Chillon was strengthened and made a fortress by Peter of Savoy ("the Little Charlemagne") in 1248. After its capture and plunder by the Bernese, in 1536, and the liberation of Bonivard,

it became the residence of the grand-bailiff of the canton. It was a state prison 1733-98, and during the present century it has been used as a cantonal magazine for army stores and as a military prison. The story, made famous by Byron, that Bonnivard was here chained to a pillar is entirely without evidence, though pillar, chain, and the track of the prisoner worn in the stone floor are still shown to tourists.

CHIMNEY (Old French *cheminée*, from Latin *caminus*, "a fireplace") is a passage or funnel for the creation of a draught to carry off smoke and other offensive products of combustion from a fireplace. The ancients had no chimneys in their houses. Their living-rooms were heated by either a charcoal brazier, like that still used in the South of Europe, or by an expensive arrangement of hot-air tubes which conveyed the heat from the fire into an adjoining room, or by an open hearth-fire, whose smoke was diffused through the room. We find Vitruvius warning his readers against placing carvings in wood in a room that contains a fire, for the reason that the smoke will ruin them. The last method of heating, therefore, was the most usual, and it is said to have given its name to the Roman *atrium*, or hall ("black room"). The houses of the earlier Middle Ages—the English *hall*, the Old Scandinavian *skali*, the Old German *sal*, the Old French *salle*—all seem to have been heated by the open hearth-fire placed at the middle of the room, from which the smoke rose freely to the lofty and open space under the roof, whence it escaped in part through openings made for that purpose, and also for the purpose of illumination. These openings were closed by a shutter in bad weather.

The first approach to a chimney was forced upon the residents of some parts of Northern Europe by the scarcity of fuel. The open hearth-fire was exceedingly wasteful in this respect, while it promoted sociability by its cheerful glow and kept up a certain democratic equality among all the dwellers in the house by their use of a common fireplace. Around it the old sagas and romantic tales were told, and the traditional songs of the Northern people were sung, long before the means and the knowledge necessary to commit either to writing were in possession of our forefathers. In the absence of any plan for ventilation, the antiseptic properties of the smoke served a useful purpose. But in regions not heavily wooded the consumption of fuel was exhaustive of the supply. The communities which dwelt on the sea-coast and lived by fishing would be the first to feel this, and to look about for some fuel-saving device. The first they hit upon shows that it was not the inconvenience from the smoke which suggested the change. It was a structure of rude masonry, not unlike an old-fashioned "Dutch oven," in which the fire was placed on an elevated hearth, while the smoke escaped into the room, as before, through an opening in the top. By this arrangement the heat was economized through the whole structure being heated when the fire was first started, and its continuing to radiate this heat after the fire had been extinguished. The earliest mention of this device is in the saga which contains the history of Olaf Kyrre, a king of Norway contemporary with William the Conqueror in England. The next step was to lengthen the aperture at the top of this structure until it reached the opening in the roof, and thus to secure a complete escape of the smoke and a measure of safety from the danger of firing the house. When or where this improvement was first made we have no exact information; it seems most likely that it was effected in France about the year 1170. The terms used to designate the new invention are French, not only in Normanized England, but throughout the North of Europe. The oldest instances of chimneys approaching the modern form are in France, and date from the last quarter of the twelfth century. Although the invention seems to have spread with some rapidity among the wealthy classes in Northern Europe and in the cities, it did not

supersede entirely the open hearth-fire among the peasantry and small farmers until a very recent time. At the close of last century the earlier arrangement was still to be found in parts of England, and still later in the Orkneys and Shetlands. Even in England chimneys were not common before the end of the fifteenth and the beginning of the sixteenth century.

The invention of the chimney brought about a social revolution in the direction of deepening the distinction between master and man, between rich and poor. It made the intercourse between them less constant and more formal than when all sat by one fire, ate at one table, and slept, if not in one room, at least in recesses from that one room. It deprived the lower classes of much that had been refining in the intercourse of the common hall, and left them to their own mental and social resources. But it made the privacy and refinement of the life of the true family, as distinguished from the larger and more artificial group of the old hall, possible to a degree not before thought of. It led to breaking up the hall into a large number of smaller rooms on different stories, each of which had its separate use. It led to the substitution of windows in the walls for lighting apertures in the roof. In fine, it transformed the old hall, where a large group lived almost or altogether in one large room, into the modern home of the modern family.

The principle of the chimney is simple. A column of heated air is lighter than a similar column of cooler air. Other conditions being the same, a high chimney will have a better draught than a low one. A straight flue will draw better than a tortuous one. By pinching or contracting any part of a flue we can obviously intensify the speed of the ascending draught of air at the point of contraction. In this way Count Rumford cured hundreds of smoky chimneys—by making the throat of the flue small, and thus making the draught at that point so strong that downward blasts of wind failed to overcome it. Chimneys frequently smoke because they are overtopped by neighboring buildings, which at times deflect the wind and drive it down their flues. The most obvious cure for such chimneys is to build them higher. Defective ventilation in a room will sometimes compel chimneys to smoke, since a draught is thereby rendered impossible. It is found in practice that it is better to have the air enter a room from a point opposite the fireplace; for if it came in beside the fireplace there may be generated such a strong circulation of air-currents about the room as at times greatly to enfeeble the chimney-draught. A great variety of cowls and chimney-tops have been devised for curing smoky flues, but most of them are worthless. Espy's is the best, and works admirably.

There are chimneys which rank among the loftiest structures in the world. One at Port Dundas, Glasgow, is 454 feet high, or 458 feet above the foundation. At Manchester, England, there is a chimney 415 feet high. A celebrated chimney-stack at Lochee, near Dundee, is in the campanile style, built of parti-colored brick and stone; it is 282 feet high. Wrought-iron chimneys are often built, but unless well lined with brick they are faulty, since their contained air cools off too readily. Where wood or soft coal is burned, soot collects rapidly in narrow or tortuous flues. For the removal of this substance machines have been invented, and these have to a great extent superseded the labors of the old-time chimney-sweeps.

A good account of the development of the house will be found in Prof. Troels Lund's work *Das Tägliche Leben in Skandinavien während des Sechzehnten Jahrhunderts* (Kopenhagen, 1882). Prof. Lund has made large use of the investigations of the late Rev. Eilert Sundt, who examined the old houses in every part of Norway and published the results in his *Afskellige Bygnings-skikken in Norge* (Christiania, 1861). The literature of chimney-draughts is rather important. A paper of Count Rumford's, to be found in vol. i. of his *Essays*, is very noteworthy. Several later discussions on the subject occur in the *Journal of the Franklin Institute*. (R. E. T.)

CHINA. Since the suppression of the Tai-Ping rebellion, in 1864, the control of affairs, so far as the imperial authority extends, has been chiefly in the hands of Li Hung Chang, the successful general of that war. Although nominally no more than the first member of the Neko, or imperial council, he has been virtually the mayor of the palace, enjoying the support of the two dowager-empresses, who, except in the interval February, 1873, to January, 1875, have been regents since the death of the emperor Heen Fung, in 1861. Tung Chê, his only son, who succeeded him, died in his eighteenth year, in 1875, and was in turn succeeded by his infant cousin, Tsaitien, surnamed Kwang-Seu, son of Prince Chun, born in 1871. The elder of the two empresses, Tsze-An, died in 1881, but the other, Tsze-Hi, still survives, and supports Li Hung Chang's authority. The Mantchu princes of the royal house are said to resent the pre-eminence of a soldier who has no pedigree to sanction his honors, and to have been intriguing with the patriotic or war party for his overthrow. The effect of this internal struggle upon the foreign policy of the empire has been to make China more jealous of her dignity and more ready for war in its vindication. Much attention has been given to military matters. Camps of instruction have been created to impart European discipline to the troops; the capital has been made impregnable and the coast-line strengthened by forts constructed on scientific principles, and a fleet secured, chiefly of swift gunboats, for defensive service in the shallow waters of the Yellow Sea. Several powerful cruisers have been built to Chinese order in English and German dockyards, but the empire now possesses well-appointed navy-yards and arsenals of its own. The army is said to number 1,200,000 men, but to save the expense of maintaining so large a force in time of peace a part only is in service and under discipline at one time.

Diplomatic Relations.—The long-standing dispute with Japan as to the sovereignty of the Loo Choo (or Riu Kiu) Islands is still unsettled. The hopes entertained from the mediation of Gen. Grant were disappointed. China follows a policy of delay. The last communication from Japan on the subject was left unanswered for a year and a half. In the mean time, the preference of the islanders for the suzerainty of its more distant authority is openly cherished by China, the annual proffer of tribute being received and rewarded as usual. Relations with Japan are further complicated by the claims of China to the suzerainty of the Corea; and in the recent treaties made between Corea and other countries, at the instance of China, a recognition of the claims of the Pekin government has been inserted, to the great indignation of the Japanese.

The dispute with Russia as to the retrocession of the Kuldja province has been settled. In the great uprising of the Mohammedans of Kashgar, on the western borders of the Chinese empire, this frontier province shared to an extent which threatened the peace of the adjacent province under Russian rule, inhabited by Kirghese Moslems. In 1871, Russia occupied Kuldja, with the acquiescence of China, for the preservation of order. On the suppression of the rebellion, in 1877, the return of the province to China was asked, but delayed. After some negotiation a treaty was made at St. Petersburg (September, 1879), by which Western Kuldja was ceded definitely to Russia for a payment of 5,000,000 rubles. This treaty caused great excitement among the patriotic party in China, but the government of the regency refused to approve it, and punished Chung How, the envoy, severely. The prospect of a war seemed imminent, but the warlike spirit was somewhat checked by an edict—following a precedent set by the emperor Heen Fung—which involved those who advised war in loss of their estates in case of a defeat. Negotiations were resumed, and (February 2, 1881) resulted in the restoration of the province

to China, with the exception of a small district in the north-west, to which those of the inhabitants who prefer Russian rule are allowed to migrate. On the other hand, China paid the costs of occupation (9,000,000 rubles) and granted some privileges to Russian trade on her frontier. The new boundary begins at the Bedshintaw Mountains, and follows the course of the Chargoss River to its junction with the Ili, and then crosses the Ili to the Usuntan Mountains, leaving the town of Koljak on the left. This, with the contemporary cession of a larger district in the Irtysh, reduces the Chinese area by 35,450 square kilometres.

With France, China has been involved in diplomatic complications through the French conquest of Cochinchina from the empire of Annam in 1858-59. China has claimed a suzerainty over the Annamese since as well as before their revolt in the tenth century; but the treaty of 1862, which concluded the conquest, never received sanction from Pekin. The comparative indifference to what was happening on the southern border ceased when it was found that France was preparing to extend her authority over the province of Tonquin, which lies on the seaboard between Cochinchina and the southern provinces of China. The authority of Annam in Tonquin, outside the few large cities, is largely nominal; it is inhabited by half-independent tribes and infested by Chinese outlaws (Yellow and Black Flags), the remnants of the Tai-Ping rebellion. The population is estimated at 10,000,000. It was explored in 1870 by Jean Dupuis, a French adventurer, who went thither under Chinese auspices, and who in 1872 fitted out in France a filibustering expedition for its conquest. With a small fleet he penetrated to the capital, Hanoi, and drove the Annamese garrison into the citadel, and, refusing offers from the Chinese, sent to invite the French in Cochinchina to take possession of the province. The invitation was accepted, the citadel taken by storm, and the Tonquinese accepted very generally the French rule. But a new French governor abandoned the conquest, and by the treaty of 1874, in return for concessions in Cochinchina, recognized the rights of Annam over Tonquin, while he drove Dupuis from the country. The attempt of another French governor of Cochinchina to set aside the treaty of 1874 and resume the occupation led China to put forward her claims to the suzerainty of Tonquin, as Annam is a vassal state of the Chinese empire. Unwillingness to have France on the frontier of the three southern provinces of China contributed to this purpose, and once more the war-party made use of the situation to force the regency and its trusted general to follow a vigorous line of policy. Yet China asked little more than recognition of her rights. She was willing to recognize the treaty of 1862 and to assist in the revision of that of 1874, or to sanction its revision after Annam and France have concluded their negotiations, but not to admit the competence of Annam to alienate territory which belongs to the Celestial Empire, nor of France to make acquisitions which will destroy the authority of her vassal in a province so situated. France, in defiance of her protests, proceeded (1883-4) with the conquest of Tonquin, taking its three great fortresses by force of arms. The inaction of the imperial government was blamed upon Prince Kung, who was removed from the council and committed suicide. At this writing negotiations for peace are pending.

The relations of China with the United States have been readjusted by a new treaty negotiated by Hon. James B. Angell in 1881, revising that of 1868, negotiated by Hon. Anson Burlingame as the envoy of China. In the new treaty each party had a special purpose in view. America aimed at securing the right to restrict the immigration of unskilled Chinese labor into the United States, in the belief that the current introduction of coolies was, in the language of Mr. Garfield, rather an importation than an immigration, and that it had the effect of displacing white labor and

of reducing white workmen's wages to a level below the natural and proper rate. The Pekin government agreed to concede the right of restriction for a reasonable period, with the reservation of free ingress for Chinese scholars, merchants, and the like. On the other hand, China embraced this opportunity as a first step to securing the recognition of her full autonomy in the matter of the regulation of commerce, and especially of the trade in opium. It was agreed that no opium should be carried into Chinese ports by American merchants or in American ships, and that our merchants should comply with the laws enacted by China for the government regulation of commerce in her own ports. This treaty forms an important step in the movement begun by China and Japan simultaneously to emancipate their commerce from the trammels imposed in the interests of British trade, and has been followed up by a demand for the revision of the treaties of commerce with the United Kingdom and other European countries. The demand that England shall recede from her claim of right to send East Indian opium into China is supported by a powerful body of philanthropic opinion in Great Britain, but resisted by Anglo-Indian opinion generally as involving disaster and disorganization to the finances of India. Without the revenue from the opium monopoly in Bengal—amounting in 1878 to over £9,000,000—the money to govern India in British fashion cannot be raised. Without the Chinese market for that opium, the production in Bengal must be retrenched more than one-half. The present Liberal ministry in England gives no signs of compliance with this demand, and its reluctance is shown by the fact that it has transferred from Japan to Pekin Sir Harry Parker, whose name is associated most unhappily with the second opium war (1856–58), and with the policy of dictation pursued toward Japan since 1868.

Statistics.—The area of the Chinese empire is estimated to be 11,767,853 square kilometres; that of China proper, 4,024,690 square kilometres. The population is estimated at 379,700,000 for the empire, and 350,000,000 for China itself. These figures exclude Annam, but include Corea. They cannot be regarded as more than distantly approximative to the truth. A proper census of China never has been taken, and what profess to have been such are mutually destructive. Mr. Hippenley of Shanghai estimates the population in 1876 at 250,000,000. The estimates made by Europeans have been based too often on observation of the densely-peopled provinces of the seaboard, while travellers who have penetrated the interior are unanimous in the report that the inland population is sparse. Three bad harvests in succession in the northern provinces in 1876–78 produced a famine affecting the whole province of Shanse and parts of Chili, Shantung, Honan, and Szechuen; 60,000,000 people are said to have suffered, and 5,000,000 to have perished by starvation.

As the government publishes no budget of expenses, we have nothing but the estimates of European observers as to the income and outlay. Mr. A. E. Hippenley estimated the revenue for 1875 at 79,500,000 taels (the tael being worth about \$1.40). Of this amount 18,000,000 was from land-tax (paid mostly in kind), 5,000,000 from the monopoly of salt, 7,000,000 from the sale of dignities, and 35,000,000 from taxes on foreign and domestic commerce. For 1881 the duties on exports were 8,329,668 taels; on imports, 5,002,011; tonnage, transit, and similar charges, 1,352,483. The rates of the import and export duties are defined in the treaties of commerce, as is the right of foreign merchants to carry goods which they really own, and which have paid those duties, out of or into any part of the empire without paying internal transport (*likin*) duties. The liability of such goods to pay *likin* duties, if transported farther than specified at the time of their importation, is a matter of dispute between China and the foreign merchants. These *likin* duties furnish a fourth of the revenue.

The foreign commerce of China is still confined to the treaty-ports, now twenty-two in number. Kiungchow was opened in April, 1876; Itchang, Wuhu, Wênchow, and Pakhoi, in April, 1877. The aggregate values in taels are as follows:

Year.	Exports.	Imports.
1866.....	80,850,512	70,269,574
1877.....	67,445,502	73,233,876
1878.....	67,172,179	70,804,027
1879.....	72,281,262	82,227,424
1880.....	77,883,587	79,293,452
1881.....	71,452,974	91,910,377

The exclusion of opium would turn the balance of trade heavily in favor of China, in spite of a vicious system of existing duties, which taxes exports more heavily than imports, the chief of the former being tea and raw silks. The effect of these duties has been to stimulate their production in other quarters, until one-third of the tea consumed in Great Britain comes from India. In 1881 opium was imported to the value of 37,592,000 taels; cotton goods, 26,046,000; linen goods, 5,584,000; metallic goods, 4,829,000; miscellaneous, 17,590,000. The exports were: tea, 32,776,000 taels; silks and raw silk, 26,868,000; sugar, 2,584,000; miscellaneous, 9,225,000, every important article showing a decrease. As a consequence of this dependence upon foreign countries for textile and metallic wares, there is no increase of employment for the people proportional to the increase of population, and China is falling to a lower industrial level through the want of variety in her industries.

By far the greater part of the foreign commerce is in the hands of Great Britain and her dependencies in the East. American exports to China and Hong Kong in the year 1882 were valued at \$9,123,000; our imports at \$22,638,433; British exports for the year 1881, at £6,234,003; imports at £10,701,645.

The carrying-trade is also largely controlled by foreigners, but the Chinese are taking steps to make the coasting-trade their own by purchasing ships of English and American build, especially steamships of light draught. In 1873 they owned but 344 such ships; in 1878, 5168. For the use of their steamers they first tried to work the coal-deposits in the island of Formosa, but the quality proved very poor. At Kaiping, a short distance from Tientsing, deposits of coal equal to the best in Europe have been found, and in 1881 a native company was mining 500 tons a day. Within easy reach lie great beds of magnetic iron ore, said to yield 50 per cent. of pure iron, and these the same company intend to work. They carry their coal to the seacoast by tram-cars drawn by horses, the government having refused them leave to construct a steam railway. Baron von Richthofen estimates the area of coal-beds at 200,000 square miles.

Domestic commerce in China, when there is not a river or canal at hand, is carried on by beasts of burden. Heretofore, the construction of railroads has been discouraged, lest the amount of employment for human muscle should be diminished, and lest the little family cemeteries which are strewn over the whole country should be disturbed to make room for the lines. In July, 1876, an English company began the construction of a railroad from Shanghai to Wusum, its outer harbor, on ground purchased for the purpose, and without permission from the government. The local authorities bought up the railroad at a handsome price, and stopped traffic the next year. The rails were taken up and transferred to Formosa. But it is said that the famine and the necessity of military strategy have combined to convince Li Hung Chang of the necessity of railroads for China, and an extensive plan for their construction, involving an outlay of 30,000,000 taels, is under consideration. Telegraphs might seem open to less objection, but it is very recently that the business of connecting Pekin by telegraph with Shanghai, and thus with Europe and

America, was begun, the only line being the short one between Shanghai and Wusung. The peculiarity of the language has compelled the use of numbers to represent words in telegraphic despatches. The Foreign Quarter of Shanghai now enjoys gas, the electric light, the telephone, and street-railways.

Intellectual Condition.—China, under the Mantchu or Ta-Tsing dynasty, established in 1644, has been in a stagnant, if not a retrograde, condition. In literature, in art, in science, in invention, and in religion it has shown no capacity for initiative in progress. Its only forward impulses have come from without. The imitation of ancient models accepted as perfect, and the want of genuine imaginative power, have resulted in general barrenness in literature as in art. Of modern books, except a few histories of recent events, the most notable are translations from the European languages. Except the peculiarly Chinese form of Christianity adopted by the Tai-Ping rebels, China has originated no religious movements or impulses. As for centuries past, the prosaic and repressive agnosticism of "The Sacred Edict" divides the allegiance of the people with a degraded and superstitious form of Buddhism. The Christian missions in China had the interior thrown open to their operations by the Treaty of Tientsin in 1860. A general conference of Protestant missionaries at Shanghai in 1877 showed that twenty-six missionary societies and three Bible societies are represented by about 300 missionaries of both sexes. Of these, 122 are English and 123 Americans. There are about 320 native churches, with 13,515 communicants, representing a native Christian population of about 50,000. The Roman Catholic missions, established three centuries ago, but often interrupted in their labors, had, in 1876, 404,530 adherents, with a yearly growth of about 2000.

To the French still belongs the honor of pre-eminence in the study of Chinese literature and history. But the most recent contribution to our knowledge of the empire is Baron Karl von Richthofen's *China, Ergebnisse eigener Reisen und darauf gegründeter Studien*, of which vols. i., ii., and iv. have appeared (Berlin, 1877-83). W. F. Mayers's *Chinese Reader's Manual* (Shanghai, 1874) is a valuable epitome of the history and literature of the empire. See also A. E. Hippenesley's *China: A Geographical, Statistical, and Political Sketch* (Shanghai, 1877); J. H. Gray's *China: A History of the Laws, Manners, and Customs of the People*, in two vols. (London, 1878); Playfair's *Towns and Cities of China; A Geographical Dictionary* (London, 1880); Gill's *The River of Golden Sand* (London, 1880); Joseph Edkins's *Religion in China* (London, 1877); George F. Seward's *Chinese Immigration in its Social and Economical Aspect* (New York, 1881), and Dr. S. Wells Williams's *The Middle Kingdom*, (2d edition, New York, 1883).

CHINA GRASS. See GRASSES.

CHINCH-BUG (*Blissus leucopterus*, Say). This is an insect of a length usually not exceeding .15 of an inch, its width being less than one-half its length. It is rounded on the under side and flat above, of a coal-black color, with white wings which have a triangular black dot on their outer margins. It belongs to the order HEMIPTERA and sub-order Heteroptera, to which group also belongs the common bed-bug. This species, like all of the order, has the mouth prolonged into a slender, horny, jointed beak, usually turned under the breast when not in use. With this instrument, and with the slender needle-like setæ enclosed within it, the insect punctures the bark, leaves, and stems of plants and sucks out their juices. As it has no means of gnawing plants, and is so diminutive in size, it would appear to be incapable of inflicting any very serious injury on vegetation, but what it lacks in individual capacity is made up by the immense numbers of insects which are occasionally developed. A myriad of tiny pumps incessantly drawing away the juices of a plant must in a short time cause it to decay and die. Sometimes—as, for example, in 1881—the number has been so great that an entire stalk of corn was often literally covered with them.

Although the insect was known long before 1831, yet it was not until that year that it was scientifically

described by Mr. Say, who "took a single specimen on the Eastern Shore of Virginia" and named it *Sygæus leucopterus*. Nineteen years afterwards, Dr. Le Baron, not aware that the species had previously been described, named it *Rhyparochromus devastator*, and gave the following description: "Length $1\frac{2}{3}$ lines, or $\frac{3}{20}$ of an inch. Body black, clothed with a very fine grayish down not distinctly visible to the naked eye; basal joint of the antennæ honey-yellow; second joint the same, tipped with black; third and fourth

joints black; beak brown; wings and wing-cases white; the latter are black at their insertion, and have near the middle two short, irregular black lines and a conspicuous black marginal spot; legs dark honey-yellow; terminal joint of the feet and the claws black."

The distinguishing characteristic of the preparatory states is a red color of the abdomen, which finally disappears as the insect approaches the perfect state.

The egg (fig. 2, *a* and *b*) is about .03 of an inch long, elongate oval, at first of a pearly white, but it soon changes to an amber color, and at length shows the red parts of the embryo. The appearance in the larval stages is well shown in fig. 2, *c-f*. In the first stage (fig. 2, *c*) the red pervades all except the front part of the body.



FIG. 1.—Chinch-bug: the line below shows the natural length.

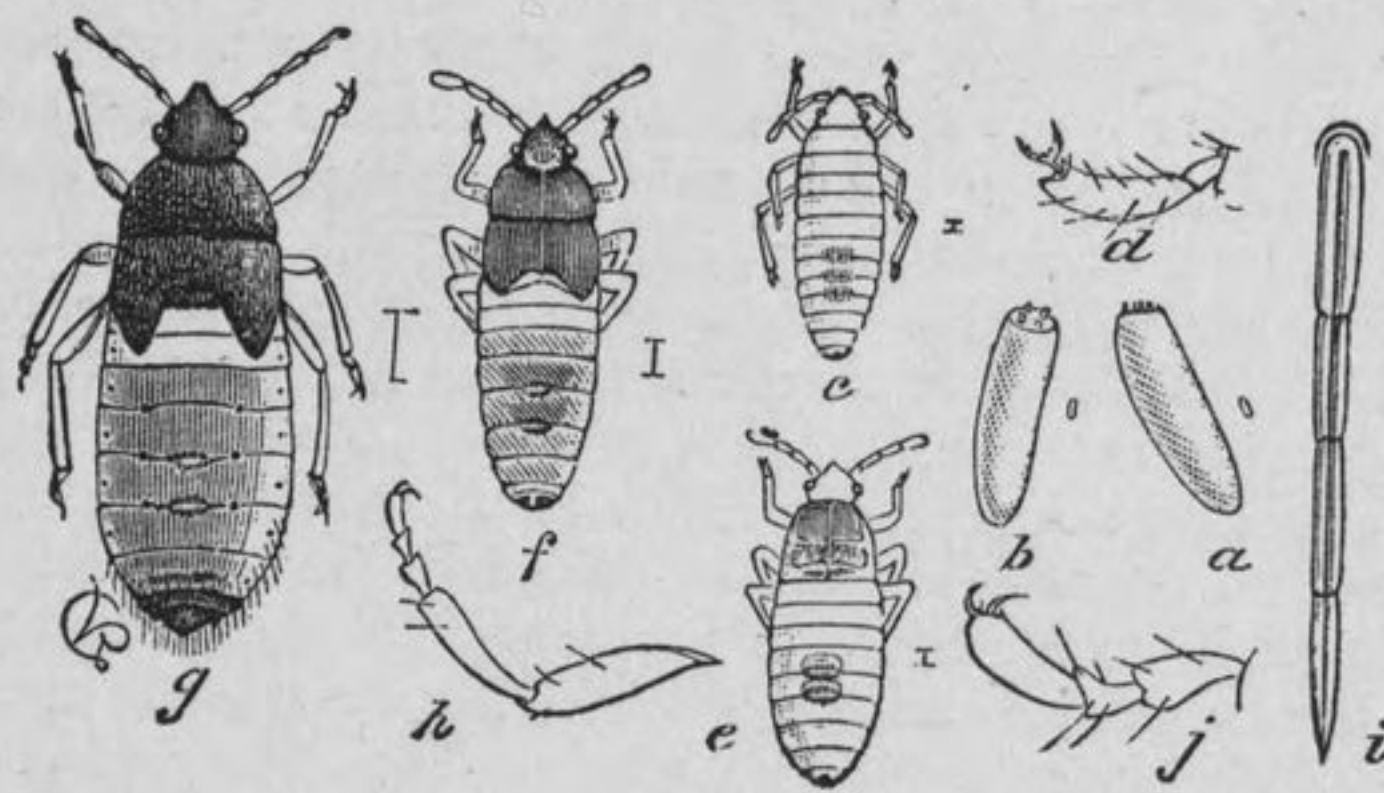


FIG. 2.—Chinch-bug larva, pupa, and egg. *a* and *b*, eggs; *c*, young larva; *d*, tarsus of same; *e*, larva after first moult; *f*, larva after second moult; *g*, pupa; *h*, leg; *i*, the beak or tubular mouth; *j*, tarsus of mature bug.

After the first moult (fig. 2, *f*) the thorax is dark or dusky, and the red of the abdomen duller.

In the pupa (fig. 2, *g*) the head and thorax assume a brownish-black color, and the abdomen an ash-brown or gray.

There are two broods annually. Insects of the autumnal brood, having hibernated in the perfect or imago state, come forth in the spring and deposit their eggs on the wheat-stalks at or just below the surface of the ground. The insects produced from these eggs form the first brood. Having reached the perfect state before the females deposit their eggs, they usually leave their original quarters and migrate, for about this time the wheat becomes dry and hard and ceases to furnish them with food. They sometimes fly at this time, but the much more common method of migrating is by marching along the surface of the ground. In those regions where corn (maize) is cultivated it is frequently attacked. Since the number of stalks to a given area is much less than in the wheat-field, the forces are concentrated, and each stalk of corn receives the chinch-bugs of perhaps a hundred wheat-stalks. When the insects are numerous the effect is soon visible.

In all such movements both mature and immature individuals will be observed. In some instances the numbers are so great that not only is the surface of the ground literally covered, but they are piled on each other. If the insects are disposed to fly, which is not

often the case, it sometimes becomes necessary to protect the nostrils of the horses at work in the fields. Those who have never witnessed a movement of this kind have a very faint idea of the immense numbers of these insects in a single field of wheat.

Their migrations on foot seldom extend to a greater distance than 80 or 100 rods. When cold weather comes on those of the fall brood leave the now dry and hardened cornstalks and seek secure places in which to remain during the winter. Occasionally they take flight at this time, but usually they seek the most secure places which can be found in and immediately around the field. Corn-shocks, straw-piles, stumps, logs, and fence-rows are used as hiding-places; they even hide beneath the clods and stones when no better places can be found. But many move into the forest or grove if either happens to be near at hand. Sheds, barns, rail fences, and stacks often furnish them with winter quarters. In timbered sections they seek shelter under the leaves and in the crevices of the bark of trees. During the winter they remain in a torpid or semi-torpid state, but are easily warmed into life and activity. As the cold weather becomes more and more severe they press deeper and deeper, if possible, into the inner recesses of their hiding-places. They prefer dry quarters.

A careful study of their history, and a comparison of the meteorological conditions during and immediately preceding their visitations during the past forty years, have resulted in bringing to light the following laws relating to their increase and diminution: (1) That a more than ordinarily dry and warm season is favorable to their increase, while, on the other hand, more than ordinarily moist or rainy weather is destructive to them; (2) that they never appear in destructive numbers, as in 1871 and 1874, except there have been two dry seasons in succession, and the latter above medium temperature. Even with these conditions fulfilled, excessive multiplication may be prevented by an unfavorable intervening winter. Excessive cold does not appear to materially affect them if there is uniformity; a changeable winter, in which there are warm spells with rains, followed suddenly by cold, freezing weather, is most destructive. The eggs are more easily affected by meteorological conditions than the young or perfect insects, and are destroyed by heavy rains. If compelled to deposit all their eggs at one time, an entire brood might be destroyed by a single drenching rain, but the female deposits a few eggs daily, the process being carried on for two or even three weeks.

The eggs of the spring brood usually hatch out in 15 or 16 days. The young commence almost immediately after they leave the eggs to pump the sap of the plant on which they find themselves—a work they continue without cessation through all their stages of growth as larva, pupa, and imago. The consequence is, that they grow rapidly and moult often, undergoing four of these changes during five or six weeks. The length of life from the time they are hatched until they reach maturity is usually from five to seven weeks; from the time the egg is deposited to the perfect state is about 60 days. It is but a short time after they reach the perfect state—a few days only—before they pair and the females deposit their eggs. The insects produced from these constitute the "fall" or "second brood," and pass through the same changes as those of the first brood. The perfect insects of this autumnal brood live through the winter.

The chinch-bug is one of the most formidable insect pests with which the farmers within the wheat-producing area of the United States have to contend. Mr. Walsh estimated the loss from the ravages of the chinch-bug in Illinois alone in 1850 at \$4,000,000. Dr. Le Baron estimated the loss to the farmers of the North-west in 1871 at \$30,000,000. A careful estimate by counties, from the most reliable data obtainable, showed the loss occasioned by this insect to the States of Missouri and Illinois in 1874 was not less than

\$50,000,000; and it is not probable that the loss to the nation in that year fell short of \$100,000,000.

The discovery of the laws relating to the bearing of climatic conditions on the chinch-bug's development is of much practical value, for it enables the farmer to know beforehand most of the seasons when these insects will *not* appear in injurious numbers. Thus, if the year has been unusually wet and rather cool, the farmer knows that he need have no fear of them within two years, for in such a season they are reduced by the unfavorable conditions to a minimum; and two favorable years are necessary to develop them in excessive numbers. As a rule, with apparently few exceptions, the season following a "chinch-bug year" is moist and cool; hence one severe visitation is not likely to follow another within three years. The history of these visitations in the North-west, when compared with the meteorological record of that section, seems to indicate that they seldom appear in injurious numbers in more than two out of seven years, and but rarely more than once in seven years. That there are local visitations to some extent in intermediate seasons is true, but perhaps if the comparisons were limited to a given locality the same rule would hold good there. As the bugs from which the future generations are to be developed hibernate in the perfect state, hiding in the rubbish of the fields, it is evident that if they can be reached and destroyed in their winter retreats their development will be prevented; and since the females are much in excess of the males at this season, the laying of their spring crop of eggs will be largely prevented. If it is possible, therefore, to reach their winter retreats with fire, this will be the most effectual method of destroying them where irrigation is impracticable.

If the season has been dry, and an examination in the fall shows the chinch-bugs to be present in considerable numbers, although they have done no material injury, yet it is almost certain that if the next season is dry, unless killed by an unusual winter, the chinch-bugs may be expected in destructive numbers. It is true that they sometimes appear in great force when no complaint has been made the previous season. If the season is wet, examination is unnecessary, but if it is dry, search for them should be made by every farmer in the autumn before cold weather sets in, and in and around every field where found every hiding-place should be promptly subjected to a fiery ordeal. If it is found at the time wheat is harvested that the bugs have not taken their departure, this fact may be taken advantage of to destroy them. If the wheat is at once threshed and the straw scattered over the stubble and burned, it will destroy most of those that are there. This practice has been followed in some districts for a number of years by the German farmers, with good results. Irrigation is undoubtedly a most effective method of destroying these pests. It will be found most effectual in the spring after the eggs are deposited. Unfortunately, in the greater part of the region where this species proves most destructive the remedy is not applicable. Rolling the ground with a heavy roller after seeding is thought to be advantageous, for the mother-bug, having to work her way to the roots and underground stem in order to deposit her eggs, is less able to penetrate the hard and compact surface than loose soil.

We are decidedly of the opinion that the best method of contending with these pests, so far as corn and spring wheat are concerned (for winter wheat is seldom seriously injured by them), is to plant or sow such varieties as mature early. If the season has been dry, and examination in the autumn shows the bugs to be present, and the winter following is not of the character to destroy them, then the seeding and planting should be done as soon as possible in the spring, and oats should be relied upon for the fodder- or feed-crop instead of corn, since oats are less liable to injury than the latter.

The summer brood, when compelled to migrate in search of food, move chiefly on foot. Since they all

go together or in bodies when the movement commences, and the movement is usually in the same direction, it is apparent that if an obstruction can be so placed as to retard their progress, this will mass them in a comparatively small space and render their destruction much easier than when they are scattered through the fields. If the obstruction can be made to bar their progress effectually, they will be compelled to seek food elsewhere or perish. Farmers who are aware of this fact have had recourse to a number of expedients to save their crops. One of the devices employed is to set up boards edgewise around the field or along the side which the bugs are approaching, and to besmear the boards with tar or kerosene. A more common method is to plough a narrow strip around the field, keep it well pulverized by harrowing and rolling, and then plough one or two furrows in this dusty strip. This work should be done over again every day or two, care being taken to keep the strip as thoroughly pulverized as possible, for the bugs cannot travel well through the dust. As the insects attempt to crawl up the sides of the dusty furrows, the loose particles give way and they roll back to the bottom. If they accumulate in the furrows a log or stone must be drawn through them, so as to crush and destroy them. As it is always dry weather when they migrate, it is not difficult to keep the ploughed strip pulverized if the clods are well crushed at first. Ditching is sometimes resorted to. Care should be taken to have the side next the protected field perpendicular.

(C. T.)

CHINCHILLA, a South American quadruped of the order *Rodentia*, family *Chinchillidae*; the *C. lanigera* or *C. brevicaudata*. Animals of this family belong to the hystricine series of simple-toothed rodents; the rootless molar teeth are divided into transverse plates by the enamel folds: the incisors are short; there is one premolar above and below; the clavicles are perfect. In the genus *Chinchilla* proper the fore feet are five-toed, though the thumb is very small; the hind feet have four toes; the tail is long and bushy; the ears are large and rounded; the length of *C. chinchilla* is nine or ten inches, the tail about half as long; the general appearance is squirrel-like. The beautifully soft and fleecy pelage, gray marked with darker, is a well-known article of commerce, formerly, however, in greater demand than it is at present. There are other chinchillas of a different genus, as Cuvier's (*Lagidium cuvieri*), of larger size, with longer ears and tail, and four-toed on both feet. All are alpine animals, inhabiting the Andes of Ecuador, Bolivia, Peru, and Chili, and noted for the activity they display in skipping among the rocks. They are shy, and chiefly nocturnal in their habits. A much modified member of the *Chinchillidae* is the biscacha (*Lagostomus trichodactylus*) of the Pampas. (See BISCACHA.) (E. C.)

CHINOOKS, a family of American Indians which formerly occupied the valley of the Columbia River west of the Cascade range and south to Rogue River, between the Puget Sound Indians of the north and the California group of the south. These tribes are closely related in customs, though not in language. They were once a numerous and powerful people, but are now almost exterminated by war, disease, and the advance of the whites. Only a squalid and miserable remnant remains. They are of low stature, and seem to have very little endurance. The face seems more Mongolian in character than that of most other Indians. The peculiar custom of flattening the head, which gave the Western Indians the name of Flatheads, seems to have originated in this region, and the Chinooks were almost the only North American people who persistently practised it. The origin of this custom is unknown. The object is to produce a straight line from the point of the nose to the crown of the head, which is done by binding the infant immediately after birth on a piece of board, while another piece of wood, bark, or leather is placed on the forehead and tied to the plank with strings, which are tightened every day. It takes from

three months to a year to produce the desired effect. Soft pads are placed between the skin and the wood, and little pain seems to be felt, the bones at that age readily yielding. There is no apparent injury to the brain or the health.

The salmon of the Columbia formed the chief food-supply of the Chinooks, being taken with the spear and the net. The weaving of baskets and matting formed their principal industry, while their boats, dug out of logs, were very light and shapely. The Chinooks were not a bloodthirsty people, and in their frequent quarrels little injury was done. They were more a commercial than a warlike race, and were very shrewd in their trade-dealings with other Indians. Slavery was practised, as in all the coast tribes, and marriage consisted in the taking as many wives as the husband could buy or support.

The languages of the Chinooks are complex and difficult, and a peculiar dialect has arisen for ease of intercommunication called the "Chinook Jargon." It seems to have originated among the tribes before the advent of the whites, but has been greatly modified and extended by European intercourse. Many French and English terms, in degraded forms, have been introduced by traders and trappers, the dialect serving as a medium of intercourse between the whites and the Indians. There have been published a vocabulary of their principal language and a *Dictionary of the Chinook Jargon*, both by George Gibbs (1863). The principal tribes or bands were the Watlala, Skilloot, Cathlamet, Wahkiahkum, Clatsop, Klackamas, Calapooya, Yacally, and Killamook or Tillamook. Their various languages seem radically distinct from each other and from the other Indian tongues. Nearly all these Chinook languages are now extinct, being known only by published vocabularies.

CHIPMUNK, or **GROUND SQUIRREL**, a small North American quadruped of the genus *Tamias*, family *Sciuridae*, order *Rodentia*. There are several species to which the name is applicable, that one to which it is usually given being *T. striatus* of the Eastern United States. *Tamias* stands on the dividing-line between the true arboreal squirrels (*Sciurinae*) and the marmot squirrels (*Arctomyiinae*), rather inclining to the latter. Cheek-pouches are present; the tail is long, bushy, and distichous, though less developed than in *Sciurus*; the coloration is characteristic, all the species being striped on the back or sides, or both. The teeth vary from $\frac{1-1}{1-1}$ to $\frac{2-2}{1-1}$. In *T. striatus*, the representative species, there are five black stripes, the two lateral of which enclose a white one on each side; the general color is brown, reddening on the haunches; the length of head and body is five or six inches, the tail about two-thirds as much. *T. asiaticus* is a smaller species common to both hemispheres, more numerous streaked and otherwise different; in North America it runs into several varieties, one of which is *T. quadrivittatus*. The other species, larger and conspicuously different from the foregoing, are *T. lateralis* and *T. harrisi*, of Western and South-western North America; both are light-colored, with a whitish streak on the flanks, which in the first named is set between two black stripes, as is not the case with the other. The chipmunks are provident animals, laying up great stores of nuts and seeds in their retreats; they are generally observed about fences and brush-heaps, among rocks or fallen trees, etc.; they are very active, and climb trees with almost the agility of true squirrels. (E. C.)

CHIPPEWA, a village in Welland county, province of Ontario, Canada, at the junction of the Chippewa and Niagara rivers, about two miles above the Falls. It contains manufactories of steam-engines and stoves. Population, 664.

In this vicinity a battle was fought July 5, 1814, between a British force under Gen. Riall and an American army under Gen. Jacob Brown. On the morning of July 3 the latter, with 3500 men, including two brigades of regulars, had crossed the Niagara above and

surprised Fort Erie, which had a garrison of only 140 men. The next day Gen. Winfield Scott's brigade pushed on to Street's Creek, 16 miles farther. The British army was still north of the Chippewa, but both armies crossed the respective streams on the morning of the 5th, and a spirited action ensued, the result being that the British retreated across Chippewa River, burning the bridge behind them. The honor of the victory belonged to Gen. Winfield Scott, as it was won while Gen. Brown had gone back to hurry up additional troops. The actual forces engaged were, on the British side, 2100, and on the American 1900. The British loss was 503, of whom 135 were killed; the American, 335, of whom 68 were killed.

CHIPPEWA FALLS, the county-seat of Chippewa co., Wis., is on the Chippewa River, 12 miles N. E. of Eau Claire and 90 miles E. of St. Paul, on the Wisconsin and Minnesota Railroad and the Chippewa Falls and Northern Railroad. It has a court-house, jail, four hotels, two banks (one national), three weekly newspapers, five churches, and four schools. The Chippewa River and Duncan Creek here furnish abundant water-power, which is used in a saw-mill, two planing-mills, two sash-and-door factories, and a shingle-mill. The city is the centre of trade for an extensive lumber-region. It was incorporated in 1870, and is lighted with gas. Its property in 1881 was valued at \$2,500,000; its public debt was \$35,000, and its expenses were \$15,000. Population, 3982.

CHOATE, RUFUS (1799-1859), an American lawyer and statesman, was born Oct. 1, 1799, in that part of Ipswich, Mass., now called Essex. His father, David Choate, was a man of strong native sense and unswerving integrity, and his mother, Miriam Foster, was noted for a native dignity of bearing, quickness of perception, and ready wit. Their son, early noted for an insatiable thirst for knowledge and an extraordinary tenacity of memory, began the study of Latin at the age of ten, and after a term at the academy in Hampton, N. H., entered Dartmouth College in 1815. The four years which Choate spent at Dartmouth were critical in the history of the college, being memorable for the legal contest between the board of trustees and the State legislature. The year after his graduation he spent as tutor in the college, and in 1820 he entered the law-school at Cambridge, Mass. The next year (1821) he spent at Washington in the office of William Wirt, then Attorney-General of the United States, and finally he was admitted to the bar at Salem, Mass., in 1823. He opened an office at South Danvers (now Peabody), and here and in Salem he spent the early years of his professional life. He was early sent to the State legislature as a representative, and subsequently was a member of the senate, and in 1830 was chosen as a representative in Congress. In April, 1833, he was re-elected, but resigned his office at the close of the first session, having determined to remove his residence to Boston. In that city, the centre of the learning and refinement of New England, stimulated by the larger rivalries of its distinguished bar and by the opportunities of emolument and professional distinction, he devoted himself with immense diligence and earnestness to his chosen profession, nor was it long before he gained recognition as a thorough lawyer, and especially as one of the most ingenious, eloquent, and successful advocates.

In 1841, Daniel Webster having accepted the office of Secretary of State under Pres. Harrison, Mr. Choate was chosen to succeed him in the U. S. Senate. While in that body he spoke on most of the important questions—on the McLeod case, the Bank Bill, the confirmation of Mr. Everett as minister to England, the Bankrupt Law, on Mr. Clay's resolution for retrenchment and reform, the Naval Appropriation Bill, the tariff, the bill to provide further remedial justice in the courts of the United States, and more earnestly and eloquently still on the ratification of the Webster-Ashburton Treaty. In December, 1843, he delivered

before the New England Society in New York an oration memorable for its eloquence and for the subsequent discussion on some of the principles of church government to which it led. In 1844, Mr. Choate made one of his most able and eloquent speeches in the Senate, against a resolution to give notice to the English Government of the termination of the joint occupancy of Oregon. In the political contest of the same year he earnestly supported the nominee of the Whig party, Henry Clay. On the ground both of unconstitutionality and inexpediency he opposed the admission of Texas.

At the close of the session in 1845 he left the Senate and returned to his profession. Thenceforward, until his death in 1859, there was hardly a case of peculiar difficulty or perplexity before the courts of Massachusetts in which he was not, if possible, retained. He was many times called to other States and to Washington in cases involving legal difficulties or great pecuniary responsibility. During these years, crowded with professional work, he never failed in his love of letters but by resolute determination secured some small portion at least of every day for pursuits which were most congenial to his tastes—for the study of the ancient classics, of history, and of philosophy. A brief tour in Europe in 1850 afforded him a needed vacation and enabled him also to compare more intelligently the characteristics of the older and the newer civilizations. The clear result was to strengthen his patriotism, while it made him, if possible, the more sensible of the perils which history taught would be likely to follow the disruption of the Union. During this era the anti-slavery agitation had received a fresh impulse from the acquisition of new territory from Mexico. Mr. Webster made his memorable speech on the Constitution and the Union. The strain upon our institutions was so great that the danger of a rupture was imminent. Union meetings (so called) were held in many States. At the meeting in Boston, in Faneuil Hall, Mr. Choate, in a speech profoundly earnest and solemn, pointed out the dangers which threatened the republic. The key to his later life will be found in his dread of disruption and civil war, which he thought he foresaw, and in the duty, as he conceived it, which the times imposed. He enforced this duty in his address on Washington, delivered in February, 1851, and especially in an address before the Story Association in Cambridge a few months later. In 1853 he was a member of the Massachusetts convention for revising the constitution of the State. In July of the same year he gave at Dartmouth College his memorable eulogy on Daniel Webster, a production which is unsurpassed in that species of eloquence.

During the next few years Mr. Choate's health began to show signs of failure. His professional business was great and exacting, but, yielding to solicitations from one and another, he found time to prepare a charming lecture on "Sir Walter Scott and the Early British Poets of this Century," and another on the "Eloquence of Revolutionary Periods," and still another on "Jefferson, Hamilton, and Burr." His last public effort was an oration on the 4th of July, 1858, on "American Nationality: its Nature, some of its Conditions, and some of its Ethics." He was so weak that he could hardly deliver what he had to say, and his voice was too feeble to fill the hall, but his last public words were, as he wished them to be, in behalf of the one undivided nation which he so warmly loved. During the succeeding autumn and winter his health became more precarious, though he generally went to his office and did not entirely forsake the courts. In the spring of 1859 he determined to try the effect of a voyage to Europe. It was thought that this might relieve his complaints, if it did not lead to a cure. Accordingly, after several disappointments, he sailed for England June 29, but before the ship reached Halifax it became evident that he was not able to continue the voyage. Yielding, therefore, to the advice

of friends, he was taken ashore at Halifax, N. S., and died there July 13, 1859. His remains were subsequently taken to Boston and buried in Mount Auburn Cemetery.

Mr. Choate's eloquence was unique, brilliant, fascinating, indescribable. To every subject and every effort he brought his full power of thought and feeling, of imagination and wit. The dullest and driest theme he invested with interest and illuminated by the lights which he flashed upon it from all sources. His logic was concealed by the profusion of graceful imagery, but whoever attempted to break the chain was sure to find links of steel beneath the garland of flowers. His mind was deeply reverential towards God, and the great problems of our nature and destiny were always present to him, modifying his thinking and his life. He died in the full strength of his powers, untouched by age, in the fulness of his fame and in the midst of universal love and respect.

CHOCTAW INDIANS, a North American tribe, See Vol. V. of the stock known as Appalachian, or p. 591 Am. Chahta-Muskoki, its two principal branches ed. (p. 680 being the Muscogeas (Muskoki), or Creeks, Edin. ed.) and the Choctaws (Chahta). The last named are closely akin to the Chickasaws, the difference in their languages being merely one of dialect. Their country in colonial times lay south-east of that of the Chickasaws and west of that of the Creeks; it is now mainly divided between the States of Alabama and Mississippi. They lived chiefly by agriculture, and formerly had the practice of flattening the heads of their children by pressure. In 1540 they fought a terrible battle with De Soto at their capital, called Mauvilla (whence Mobile was named); afterward they were allied with the French, and later with the English. In the war of 1812-15 they fought for the United States against the Creeks and the English. Georgia offered them full citizenship (but even before 1800 some of the people had begun to cross the Mississippi), and by the treaties of 1820 and 1830 all their original country was ceded to the whites in exchange for lands in the Indian Territory, and for a large gift of goods and money. From 1837 to 1855 the Chickasaws were joined with them in a tribal union, and up to this day their lands are somewhat blended and a slight bond of alliance still subsists. The two tribes have now separate and regular governments. The country is divided into counties. The present Choctaw country lies south of that of the Cherokees and Creeks, east of the Chickasaw lands, and is bounded east by the State of Arkansas and south by Texas. Pine timber and coal are abundant, and silver-bearing lead-ores are reported. The people are making commendable progress. The area of their land is 10,450 square miles. The tribe numbers about 16,000 persons. There are 59 common schools, besides male and female academies and private schools. Promising youths are in many cases sent to college at the public expense. The Choctaws are very generally Christians. They are less progressive in some respects than their neighbors the Chickasaws. Being slaveholders, they were drawn into alliance with the Southern Confederacy in the war of 1861-65, and consequently suffered much. Pressure has been brought upon them to adopt their freedmen as members of the tribe, but this they have thus far refused to do; but in other respects the freedmen and their descendants are treated with kindness. (c. w. g.)

CHOLERA, in North America. The first introduction of epidemic cholera in North America took place in the spring of 1832, in connection with the arrival of large numbers of emigrants in Canada. At that time there appears to have been no proper system of quarantine on the St. Lawrence. No isolation of persons from ships infected with cholera was attempted, and those who were apparently well were allowed to proceed at once on their journey. Cholera appeared at Quebec, Montreal, and other points in the early part

of June, and from these places spread rapidly, following the lines of travel pursued by emigrants. From the St. Lawrence the disease entered the United States by the way of New York, in which State some twenty cases occurred between June 13 and the end of the month. It is asserted that cholera arrived at the port of New York in infected ships prior to its outbreak on the St. Lawrence, but that for prudential motives the facts were suppressed by the board of health. The disease rapidly spread from New York into adjoining towns and cities. In the following year (1833) the cholera first appeared in the United States in New Orleans, in which city it was epidemic in May. Previous to this time it had become epidemic in Cuba. From New Orleans the disease was carried northward, affecting almost all the large cities in the Mississippi Valley. In 1834 the cholera was again introduced into North America by the way of the St. Lawrence quarantine station, first appearing early in July, from which time it rapidly spread, advancing along the line of the St. Lawrence and from thence into Upper Canada and the United States. In 1835 cholera appears to have been introduced again into the United States from Cuba, and after this year there was an immunity from this disease until 1848.

The following account of its introduction in that year is given by Prof. Alonzo Clark: "Two ships left Havre, one on the 31st of October, the other on the 9th of November, 1848. The latter ship, the New York, was bound for the city of New York; the former, the Swanton, was bound for New Orleans. The passengers of these two ships were of the same character, mostly German emigrants; they had been taken up in both instances at Havre, which port was at that time said to be free from cholera. They had come to Havre for the purpose of finding a ship for this country. One report states that a portion of them had left infected places in Germany. The ships came out with a clean bill of health. The New York had been at sea sixteen days when cholera appeared—that is, on the 25th of November; the Swanton had been at sea twenty-seven days when the first case occurred, it being on the 26th of November. They were 1000 miles apart. They were both off the coast of the United States, one in latitude 25° 47', and the other in the parallel of 42°. The outbreak on the New York is by the captain of the vessel ascribed to the following fact: A very cold, chilly wind came up on the 24th, and the passengers found themselves in want of warm garments; in his own phrase, 'there was a general overhauling of baggage for warm clothing.' Then the next day became exceedingly hot, and on that day the first case of cholera occurred. It has been found that on board the ship New York there was an emigrant who had clothing that belonged to an individual who had died in Germany of cholera. During the day of intense cold some articles of this clothing were taken from the chests and were worn by several of the passengers, and these passengers were the first taken on the ship. The two ships go on their voyage. One arrives in the Harbor of New York on the 1st of December, six days after the outbreak, having lost seven of her passengers; the other goes into the Mississippi River and up to New Orleans, having lost several passengers, reaching the city December 11."

On the arrival of the vessel at New York, on the 2d of December, eleven cholera patients were sent to the quarantine hospital. The Swanton reached the city of New Orleans on the 11th day of December, and the day of her arrival one cholera case was sent to the hospital. Two days after her arrival the first case in the city was announced; this was also an emigrant from the Swanton. This was followed by a rapid increase of the disease until the following June, in which month it culminated in more than 2500 deaths. It is however, possible that cholera may have been introduced into New Orleans by emigrant ships several days before the arrival of the Swanton. The disease gradu-

ally spread throughout the country during the year 1849, reaching San Francisco in October. From New Orleans it also spread to Cuba and to the Isthmus of Panama. It is very doubtful whether North America was free from epidemic cholera from this time until about the end of 1854. It existed in Cuba in 1851, in 1852, and in the middle of 1852 it appeared in the Mississippi Valley, notably in Chicago and St. Louis.

According to Dr. Alonzo Clark, ships from infected ports, bringing emigrants suffering from the disease, arrived in large numbers in the Harbor of New York in the autumn of 1853. The first appearance of cholera following this, however, was not in New York, but in Chicago in the latter part of April, 1854, where it occurred among recently arrived emigrants, gradually increasing until it was declared epidemic in June. The infected ship *Glenmanna*, on which forty-five passengers had died of Asiatic cholera during the voyage, arrived at the quarantine station below Quebec on the 15th of June, and this was soon followed by the spread of the disease in Canada.

The next outbreak of cholera in the United States occurred in the city of New York in May, 1866. Prior to this date a number of vessels arrived at New York from European ports at or adjacent to which cholera was known or reported to prevail, and had been detained for observation and fumigation. Thirty such vessels arrived during the latter part of 1865, and upon some of these deaths from cholera had occurred during the voyage. The disease, however, did not spread beyond the emigrants' hospital on Ward's Island. It is usually considered that the cholera epidemic of 1866 in North America was due to the steamship *England*, which left Liverpool for New York on the 28th of March, having 1185 German and Irish emigrant passengers. One hundred and sixty cholera cases, with forty-six deaths, occurred on this ship prior to the 9th of April, at which date she put into Halifax. The pilot who spoke her on her arrival, but would not board on account of the cholera, but was towed after her, died on the 11th of March at his home, near Halifax. His five children all had the disease, and two of them died. The health officer who boarded the ship died of cholera on the 17th. On the 18th of April, 1866, the first vessel having cholera on board arrived at the New York quarantine—viz. the steamship *Virginia*. From this point the disease gradually spread, being carried in part on the lines of emigration and in part by recruits sent out from Fort Columbus, Governor's Island, New York Harbor, in the garrison of which the disease appeared about the 1st of July.

The next outbreak of cholera in the United States began in New Orleans in February, 1873, but there is no satisfactory evidence as to the mode of its commencement or the manner of its introduction. From New Orleans the disease spread to the Mississippi Valley, appearing in Mississippi, Arkansas, and Tennessee in April; in Illinois, Kentucky, Ohio, and Indiana, in May; in Alabama and West Virginia, in June; Georgia and Minnesota, in July; Pennsylvania, Texas, Utah, Dakota, in August; and in New York, in September. An elaborate account of this outbreak was published by Congress under the title *The Cholera Epidemic of 1873 in the United States*.

The precise origin of the first cases of epidemic cholera in each of the outbreaks which have occurred in this country is difficult or impossible to trace, but in every instance these outbreaks have been preceded by the appearance of the disease in Europe or the West Indies, and by the arrival of ships either known or fairly presumable to have been infected. The course of the disease has followed the main lines of transportation, especially those used by emigrants; and in the epidemics of 1866 and 1867 the evidence of its transmission by parties of recruits and soldiers going from infected parts to the West and South is beyond question. In some cases it seems very probable, though not actually proved, that the cause of the

disease has been carried far into the interior in the baggage of emigrants, which baggage had not been opened since it was packed in infected localities in Europe, and the carriers of which showed no signs of the disease until they arrived at their inland destination and opened their boxes and bundles. This probability is sufficiently great to warrant the giving of special attention to the opening and thorough aëration and purification in our quarantine stations of all luggage brought in by emigrants when cholera exists in the vicinity from which they have come. (J. S. B.)

CHOPIN, FRANÇOIS FREDERIC (1809–1849), was born March 1, 1809, at Zela Zowa Wola, near Warsaw, Poland. His father was a private tutor from Paris, who educated the sons of gentlemen, and among these Frederic found suitable companions in his boyhood and became imbued with the national spirit, although from his mother (who was of pure Polish blood) he received the characteristics so markedly Slavonic. At nine years of age Chopin appeared in public as a pianist, playing a concerto and making improvisations, and at nineteen was not only one of the very greatest pianists of the time, but one who had a marked individuality as regards execution, form of the passages executed, and who introduced compositions so original as to reveal a new world of beauty to musicians and art-lovers. Before he was twenty years of age he had given concerts in Vienna, Dantzic, Berlin, Leipsic, Dresden, and elsewhere. In 1836, while in Paris, he first met Georges Sand, to whom he was ever grateful for her kindness in nursing him through the winter of 1838–39, when he suffered from bronchitis. They had retired to Majorca in the autumn, that Chopin might leave the gay and busy life of Paris, which had increased his tendency to consumption. He died at Paris, Oct. 17, 1849. His obsequies were celebrated with great pomp at the Madeleine (Mozart's *Requiem* forming part of the service, in accordance with his wishes), and he was buried at Père la Chaise, between the graves of Bellini and Cherubini.

Chopin has been greatly misrepresented. He has been caricatured in *Lucrezia Floriani*, and biographers have exalted the poetic side of his nature and artistic powers, as though his music of itself were not worthy so great attention. He was the constant associate and friend of Meyerbeer, Bellini, Berlioz, Balzac, Heine, and Liszt; it is made to appear that he was merely admitted to their charmed circle—in it, but not of it—although he was most truly one of its most illustrious members. Nor has any composer suffered so much as Chopin from becoming popular. When his music attracted amateurs it was played with such exaggerated expression, forced emphasis, variations of speed, *tempo rubato*, etc., and ridiculous affectations, that it appeared to ordinary listeners as almost grotesque.

He wrote seventy-four numbered works and seven unnumbered ones, all of which consist mostly of piano-forte concertos, sonatas, études, mazurkas, polonaises, rondos, scherzos, ballades, etc. Chopin so idealized the melodies of his country that they found an echo in many hearts in Europe and America. They remind us of the ingrained sorrows of the Polish people, whose lands were overrun with Mongol Tartars and other peoples, whether these were going east or west in their migrations. He is therefore the representative musician of his country. Although his music is rarely sublime, heroic, profound, or mighty, yet it is never trivial or commonplace, and is as far as conceivable removed from the slightest suspicion of vulgarity.

His shortest nocturnes are extremely delicate and tender. The melodies are embellished with grace-notes that are original, beautiful, and make the sorrow expressed by the music seem more hopeful. The treatment of the harmonies, the rhythms, the forms, and intertwined melodies proves the hand of a most highly-trained, and legitimately-trained, musician. Yet notwithstanding this, his writings are spoken of as amateurish, though clever. Chopin, from excess of modesty,

dreaded concert appearances, and hence his detractors took advantage of his retiring nature. His compositions seem more like confessions of a private personal character suited for the hearing of a few kindred spirits, rather than adapted for large concert-halls, the display of great executive power, and to entertain a large assembly. The music of Chopin may therefore be regarded as subjective, and, not moving in the extended psychologic range of a Bach or Beethoven, may appear as comparatively narrow; yet it finds a place in the human heart that other composers have not sounded or discovered; causes sympathetic vibrations to respond to its strains that have not been called forth before; occupies a position in the art of the nineteenth century that cannot otherwise be filled; and enriches music by exhibiting a new and fascinating phase of it, which causes the composer and his country's sorrows to be remembered well. When the Russian soldiery found in the second story of his homestead (in the room which Chopin's sister occupied) his piano and mementoes that had been preserved so religiously by the family, and dragged them out into the courtyard to be burned, the whole civilized world blushed at the vandalism.

(S. A. P.)

CHOSE IN ACTION, in law, a right to recover a debt or money or damages for breach of contract, or for a tort connected with contract, which cannot be enforced without action.

It was a favorite doctrine of the ancient common law that choses in action were not assignable. No person, it was held, could transfer what he had not actually reduced to possession. Hence the owner of a right of action could sue in his own proper person only, and could confer no such right upon a third party. Courts of equity have, however, constantly recognized the validity of such assignments, and have extended their aid to assist the assignee in enforcing his rights wherever it was necessary to do so. Common-law courts have now, however, adopted equitable principles with regard to the assignment of choses in action in many cases, and the intervention of chancery is therefore seldom needed. The assignment of a mere litigious right will not be recognized either at law or equity. Hence the right of action for a mere personal tort or a bare right to file a bill in equity on the ground of fraud cannot be transferred. It seems, however, that a right to recover damages for an injury to property may be transferred.

No particular form is necessary to effect the assignment of a chose in action. It may be either in writing or by parol. The assignee must, however, in order to protect his rights as against subsequent innocent transferees of the assignor, take such steps as the peculiar circumstances of the case will admit to indicate that title has vested in him. In order to protect himself against any subsequent payment of the debt or claim by the debtor to the assignor, the assignee must at the time of the assignment notify the debtor thereof.

As a rule, the assignee of a chose in action takes it subject to all existing equities between the assignor and the debtor, but free of those outstanding equities in third parties of which he has no notice. (L. L., JR.)

CHOUTEAU, AUGUSTE (1739-1829) and **PIERRE** (1749-1849), the founders of the city of St. Louis, were born in New Orleans. They joined the expedition of Laclède in Aug., 1753, to establish the fur-trade in the region watered by the Missouri and its tributaries, and Auguste was placed in command of a boat. In the following winter they selected a point 61 miles above St. Genevieve as their principal post, and named it St. Louis. Auguste commanded the party that commenced operations here Feb. 15, 1764. In course of time both brothers became heads of highly respectable families, and their name long commanded safety and hospitality among the Indians of the North-west. Auguste died Feb. 24, 1829, and Pierre July 9, 1849.

CHRISTADELPHIANS, a small sect of American origin, with congregations in the United States, England, and New Zealand. The Christadelphians, or

Brothers of Christ, hold that all other churches are in apostasy, and for the sake of distinction they call their churches *ecclesias*. They regard John Thomas, M. D., an Englishman, as their founder. Mr. Thomas, according to his own account of the rise of the Christadelphians, joined many years ago "the most apostolic and scripturally-enlightened religious organization in America," the Disciples of Christ. Study of the Scriptures, however, convinced him that the "religious teaching of the day" was essentially opposed to the Bible. Therefore, having found the truth for himself, he began to teach it by "platform and press in America and England." He did not claim to found a new sect, but only to revive the Church of Christ and his apostles. Within a generation churches of this faith have existed in Jersey City, Philadelphia, Washington, and other cities; books and tracts are published in Jersey City and Birmingham, England. The Christadelphians assert that all the Christian churches are in apostasy, and that there is no salvation within the pale of any of them. There is salvation only for those in the Christadelphian Ecclesia. Their doctrinal belief is set forth in thirty-seven propositions, of which seventeen relate to the kingdom of God and twenty to the Lord Jesus Christ. They believe that there is "one God, out of whom all things (even the Son and the Spirit) have been creatively elaborated;" that the Spirit is not personally distinct from the Father, the difference being that the Father "is Spirit in focus so intense as to be substance and light inconceivable," while the Spirit is continually outflowing from the divine centre; that Christ is the manifestation of the one eternal Creator, and was called Son because of his manhood (when he was in the flesh his nature was purely human), the Deity dwelling in him being the Father; that Christ was of human nature raised up as a second Adam "to remove by obedience, death, and resurrection the evil consequences resulting from the disobedience of the first Adam;" that by a "full discharge of its claims in a temporary surrender to its power" he abrogated the law of sin and death and developed immortality by resurrection; that the devil does not exist personally, but is only a scriptural personification of sin; that man consists only of body and life, and that immortality can be attained only by acceptance of the gospel; that the wicked will be annihilated; that those who have never heard of the gospel "will pass away in death as though they had never existed;" that Christ will return from heaven to set up his kingdom in the earth, when he will judge the living and the resurrected dead, and reassign the wicked "to corruption after punishment" and invest the saints with immortality; that baptism, which is necessary to salvation, is a bodily immersion, "only enjoined on those who have intelligence enough to believe" the gospel, and therefore "unauthorized and useless" in the case of infants; that few (only the Christadelphians and those who believe and obey as they do) will be saved; that the "truth of apostolic prophecy requires the world at the present time to be in a state of complete and universal apostasy;" that there is no deliverance from this state by the preaching of the gospel, but only by divine interference; that the kingdom of God preached by Christ and his apostles is a "divine political dominion to be established on earth with the object of upsetting and superseding all existing governments" and restoring the ancient kingdom of Israel; that the city of Jerusalem will become the queen city, the residence of Christ and the headquarters and metropolis of the kingdom of God; that Christ will rule, and his saints with him, and that he will return from heaven for this purpose and visibly appear; that his reign will be for a thousand years over mortal nations, sin and death continuing in the world in a milder degree; that at the close of this millennium Christ will surrender his supremacy and become subject to Deity, who will proceed to judgment, after which only redeemed immortal persons will remain.

In support of all these propositions copious quotations from the Bible are given. Thomas, who has been dead some years, declared in his *Revealed Mystery* that Romanism and Protestantism are the "mothers of harlots and abominations of the earth." In regard to the second advent of Christ, Thomas held in his *Book Unsealed*, prepared in 1869, that the world was now in the period of the sixth vial, during the pouring out of which Christ would come. His advent must be quite near.

The Christadelphians meet every Sunday "to eat bread and drink wine in remembrance" of Christ, to sing the "songs of Zion" "concerning the Christ as found in David," to offer prayers, and to read the Scriptures and hear lectures. A monthly periodical called *The Christadelphian* is published in Birmingham and Jersey City.

CHRISTIAN COMMISSION, THE UNITED STATES. This was an organization formed during the Civil War to supply the religious and moral, and to some extent the physical, needs of the soldiers of the Union army. During the first enthusiasm of volunteering, in 1861, many individual Christians, and especially the Young Men's Christian Associations which within the previous five years had been formed in most of the larger towns and cities, engaged actively in ministering to the wants of those who had enlisted from their sections of the country. But the experience of a single campaign proved the necessity of co-operation to make their assistance effective, and of a well-regulated system to conduct a work whose magnitude was constantly increasing, as well as to overcome the unavoidable friction with military discipline. At the suggestion of Mr. Vincent Collyer, a convention was called by the national committee of the Young Men's Christian Association for this purpose. It met in New York, Nov. 14, 1861, and organized the Commission. Mr. George H. Stuart of Philadelphia was chosen president, and retained that office throughout its existence, discharging its onerous duties with marked ability, zeal, and success. The movement was at once approved by President Lincoln and the other authorities at Washington, yet for some time it received little encouragement from the people, and was thus hindered in carrying out its intentions. This was perhaps chiefly owing to the previous establishment of the UNITED STATES SANITARY COMMISSION (*q. v.*), which had grown out of the Women's Central Association for Relief, organized in New York in June, 1861. As the object of the latter was simply to supply the deficiencies in the provision hastily made by the government for the health and comfort of the soldiers, the originators of the Christian Commission felt that there was abundant room for ministering to the higher wants of the soldiers. Both societies sprang from the philanthropic Christian sentiment of the people of the North. The earlier organization obtained widest favor, but as the work progressed the members of the evangelical churches were more disposed to contribute through the agency of the distinctively religious society. In the accomplishment of their self-imposed mission both societies had the same experience. The army-officers at first regarded with disfavor and jealousy the attempts of either to benefit the men, yet gradually these volunteer helpers, by patient continuance in well-doing and cheerful submission to the restrictions of army life, won their way to cordial appreciation by all. The plan adopted by the Christian Commission after some trials was to have for each army a general field-agent, with one or more assistants. This agent established stations wherever needed, and assigned the delegates to their work, while he was responsible on the one hand to the military authorities, and on the other to the central executive committee of the Commission. A large force of volunteer delegates, both ministers and laymen, who were enlisted and were required to enter the service for at least six weeks, were subject to the direction of the field-agents. They assisted the chaplains of the regiments and did such

other work as the necessities of the case required. Especially after each great battle was there abundant need for the services of all the helpers that could be found. These delegates served usually without compensation, only their necessary expenses being provided for. Transportation was generally allowed by the army-officers. An auxiliary commission in New York had charge of the work in the navy, sending out delegates for not less than six months, and generally paying them small salaries. The entire work was in effective operation by the end of 1862 wherever the Union forces were employed. A full system of reports from the delegates and agents enabled the Commission to keep the Christian people of the North fully informed of its extent and results. In 1863, in addition to a vigorous prosecution of the work as previously carried on, chapels were erected and chapel-tents provided for religious services, correspondence between soldiers and their families promoted, and much was done to alleviate sufferings in emergencies. An important part of the work was the formation of regimental libraries for the soldiers, especially during the winter cessation of military operations. At the close of the war these libraries were transferred to the posts of the United States army. In the latter part of the war, when the Confederate prisoners were retained in the North, the Commission extended its benevolent operations to them. Efforts were also made to reach the Union soldiers in Southern prisons, but these were frustrated by the Confederate authorities. When the war closed, in 1865, and the armies were disbanded, the Commission endeavored to extend its protecting care to the men until they were restored to their homes. Its work was continued also among the detachments of troops which were sent to the Southwest; so that its last field-station, at Fort Leavenworth, Kansas, was not closed till June, 1866. The last anniversary of the Commission had been held in the hall of the House of Representatives, Washington, Feb. 11, 1866. At this meeting testimonials of the value and efficiency of the work of the Commission were given by the Union generals and by prominent representatives of all branches of the government. During the four years of its existence the Commission employed 4859 delegates, distributed 1,466,748 Bibles and Testaments, besides ten millions of other books and nearly twenty millions of religious papers. Its total cash receipts had been \$2,524,512, and other donations exceeded \$3,000,000 in value. For details of its history see *Annals of the United States Christian Commission*, by Rev. Lemuel Moss (Phila., 1868). (J. P. L.)

CHRISTIAN CONNECTION, a denomination of American origin, usually classed with the Baptists, and often confounded with the larger and similar body known as the "Christians," or, more definitely, the DISCIPLES OF CHRIST (*q. v.*). Its members are sometimes called Christ-yans, by way of distinction, but they do not thus pronounce the name themselves. It grew out of the union, early in the present century, of parties of believers who had come out of the Methodist, Baptist, and Presbyterian churches for doctrinal reasons and to avoid human creeds and sectarianism. The first of these parties rose in Virginia and North Carolina under the leadership of the Rev. James O'Kelly, who withdrew from the Methodist Episcopal Church, chiefly on account of opposition to the adoption of the episcopal feature. He denied the doctrine of the Trinity as commonly held, and contended that the Bible was the only necessary standard of faith. With about a thousand followers he left the Church in 1792, and organized soon after the Republican Methodist Church. In 1794, at a conference held in Surrey co., Va., this designation was dropped and the name "Christian" assumed. The principles on which the new organization was formed were—(1) Christ the only Head of the Church; (2) no sectarian name; (3) the Bible a sufficient rule of faith and practice; (4) Christian character or vital piety the only test of membership; (5) the

right of private judgment and liberty of conscience. It is stated that the Republican Methodists of North Carolina took similar action in 1793.

The second of the three movements from which the denomination sprang began in New England with the preaching of Abner Jones, a physician, in Lyndon, Vt. He was a Baptist, but was led to reject not only the name of the denomination, but its method of organization. He believed that articles of faith, church covenants, and councils were anti-Christian. He also denied the Calvinistic doctrines of predestination, reprobation, etc. He began to proclaim his views and organized a church in Lyndon in 1801, which was called simply "Christian." This was the first church of the connection in New England. The second church was founded in Hanover, N. H., in 1802. The next year Elder Elias Smith withdrew from the Baptist denomination, and soon a number of churches of the new faith were organized in different parts of New England by Elders Jones, Smith, and others.

The leaders of the third party of "Christians" were Barton W. Stone and David Purviance, and the scene of their labors was in the West. At the beginning of the present century there was a general revival in Kentucky, Tennessee, and other States known as the "Great Revival." Some of the Presbyterian ministers, it is claimed, preached doctrines which were not in harmony with the Calvinistic system, and the result was the trial and expulsion of several of them, including B. W. Stone, all in the bounds of the synod of Kentucky. Those who were expelled, including David Purviance, a licentiate, formed the Springfield presbytery, and most of their churches followed them into the new organization. Three of the ministers were in Ohio and three in Kentucky. In a short time, however, the Springfield presbytery was dissolved (June, 1804), the reason stated being that, seeing the many divisions existing among professing Christians, and that they were simply establishing another party, and finding that the Bible gave neither "precept nor example" for sessions, presbyteries, synods, and the like, they chose to be simply Christians, putting away sectarian names and titles and organizations and human creeds and delegated ecclesiastical authority. Of the six ministers who constituted the presbytery, two became Shakers and two returned to the Presbyterian Church. Elders Stone and Purviance (they objected to the title *Reverend*) continued to preach in accordance with the principles declared in the act dissolving the presbytery. They travelled widely, holding meetings, organizing churches, and ordaining ministers, and the movement thus begun soon spread through Kentucky, Tennessee, Ohio, and other States.

For some years the New England party had no knowledge of the existence of the other parties. Perhaps the discovery was not made until 1808, when the Christians of the East began the publication of a religious newspaper, *The Herald of Gospel Liberty*, the first, it is claimed, in this country. The editor, Elder Elias Smith, says in his autobiography that he first heard in that year of Christians in Pennsylvania, Virginia, and Kentucky. A letter from a Christian pastor in Philadelphia, dated Oct. 24, 1808, written to the editor, stated that the movement had spread through Virginia, North Carolina, South Carolina, Georgia, Tennessee, Kentucky, Ohio, and the western part of Pennsylvania, and "thousands" were united in it. The Pennsylvania brethren, he said, had never heard of the churches in the other States, "being chiefly locked up in the German language." William Guiry, a prominent Christian minister in Virginia, said in 1809 that there were Christians in every State south of the Potomac, and that they probably numbered about 10,000. The first six volumes of the *Herald* contain frequent notices of ordinations; and a list of ministers in New England, printed in 1814, embraces forty-nine names, including those of six unordained ministers.

As the movement in New England had come out of the Baptist denomination, immersion was, as a matter of course, regarded as the proper mode of baptism, and infants were not recognized as proper subjects for the sacrament. In the West, however, the practice of sprinkling was continued till 1807, according to the custom of the Presbyterian Church, from which the leaders had come; but on a re-examination of the Scriptures some of them became convinced that infant baptism was not taught in them; and when, in 1807, a young woman applied for baptism by immersion, Elder David Purviance requested Elder B. W. Stone to immerse him, and he in turn immersed Elder Reuben Dooley and several others. Elder Stone was subsequently immersed himself, and immersion has been the prevailing rule since, although it was resisted by some at first. In Virginia, James O'Kelly and his co-laborers practised sprinkling only for some years, but gradually a sentiment favorable to immersion grew up. O'Kelly opposed it, refused to immerse himself, and desired his brethren to observe the same rule. The question came to an issue in 1809, and a division occurred which continued several years. The liberty of choice of method of baptism, which Mr. O'Kelly opposed, was established through this division.

It has already been stated that the New England and Kentucky movements were partly the result of the denial of the Calvinistic doctrines of a limited atonement, election, and reprobation. The leaders of each appear also to have arrived at similar conclusions respecting the Trinity, on which, as has already been seen, Elder O'Kelly of Virginia held views deemed unsound. Elder David Purviance of Kentucky rejected the orthodox doctrine of the Trinity. He held that Christ was divine, but inferior to the Father; that, though he "now administers the kingdom," his kingdom will end; and that he is not coeval with the Father. Purviance and Stone also denied that the sufferings of Christ were vicarious; they taught that the object of the atonement was the reconciliation of man to God. Dr. Abner Jones of New England also held the Arian view of Christ, and denied that the atonement was expiatory. The Christians both East and West were generally regarded as Unitarian.

Among those who, with Elders Jones and Smith, labored to extend the movement in the East were Elder Daniel Hix (d. 1838), a Baptist of Massachusetts, who brought his church into the Christian Connection; Mark Fernald (d. 1851), who travelled almost constantly for many years through New England and made many converts; Joseph Badger (d. 1852), who labored successfully in New York, especially with his pen; Mrs. Nancy G. Cram (d. 1816) and Mrs. Abigail Roberts (d. 1841), who in preaching-tours in New York secured hundreds of converts; Simon Clough (d. 1844), who organized the first Christian church in New York City, and was considered the best educated minister in the Connection; and Frederick Plummer (d. 1854), who organized many churches in Pennsylvania. In the South, besides James O'Kelly, there were William Guiry, formerly a Methodist and author of a history of episcopacy and other works; Rice Haggard of Norfolk, Va., who wrote much for the new movement; Joseph Thomas (called the "White Pilgrim," because he dressed in white), who travelled almost constantly in Virginia and the Carolinas; and Mills Barrett, a successful evangelist. In the West, in addition to Stone and Purviance and Dooley, the names of Matthew Gardner, who helped organize the Ohio conference in 1820, and was a leading debater; Nathan Worley of the Miami Valley; William Kinkade, the author of *Bible Doctrine*, a theological work highly esteemed in the Connection; and John McCreary, a pioneer in Indiana,—deserve to be mentioned. As women were among the pioneer preachers, so they have continued to occupy the pulpits of the denomination and to labor acceptably as evangelists. The first ordination of a woman is stated, however, to have occurred as late as 1866. In the list of ministers for

1882 the names of women are quite frequent, both among the ordained and the unordained.

In the first years of the denomination ordinations were conducted by two or more elders, and there were general meetings which partook of a revival character. In the course of some years these general meetings developed into organized conferences, which ordained elders and cared for the general interest of the churches connected with it. It is stated in the life of Elder Joseph Badger that the first regularly organized conference in this country was formed at Hartwick, N. Y., in 1818. Yet there are notices of conferences in the South almost a quarter of a century before this date, though they were not held regularly, and a general conference or convention had met in Windham, Conn., in 1816, and adopted a declaration to the effect that the ground of fellowship should be the "New Birth," and that nothing but sin and denial of the Father and Son should destroy this fellowship. Another general convention, spoken of in Summerbell's *History of the Christians* as the first, was held in 1819, and thereafter such meetings were held annually until 1831, when the convention became triennial, changing to quadrennial in 1834. This was the origin of the American Christian Convention, the last session (quadrennial) of which was held in the fall of 1882 in Albany, N. Y. In the convention of 1842 eleven conferences were represented. The denomination had spread over the larger part of the settled territory of the United States, and had been represented by churches in Canada many years. According to the imperfect statistics given in 1844, there were no less than 1500 ministers and 500 licentiates, 1500 churches, and 325,000 communicants. The kindred body, the Disciples of Christ, also called "Christians," and often confused with the Christian Connection, was reported to have at this time about 200,000 communicants. It had risen many years after the Christian Connection was organized, and for a similar purpose—the rejection of creeds, the acceptance of the Bible as the rule of faith and practice, and the union of Christians. It was at first a movement within the Baptist denomination, but ultimately its leaders and followers were excommunicated, and were thus led to form a new denomination, which was intended to be unsectarian. Alexander Campbell, the founder, appealed strongly to the Christian churches in the West to unite with his followers. B. W. Stone, acknowledged to be the leader of the Christian Connection in the West and South-west, accepted Mr. Campbell's proposal on condition that the sectarian name "Disciples of Christ" be dropped for the simple title "Christians." A majority of the churches and ministers in Kentucky, Tennessee, Indiana, Ohio, and Illinois followed Mr. Stone. This withdrawal had of course a very marked effect on the statistics of both bodies.

The Christian Connection apparently has declined considerably in numbers since 1840. Ten or fifteen years after the division in the West the Advent excitement of 1843-44 in the Eastern States drew heavily upon its ministers and churches, and its estimated 325,000 communicants of 1844 have shrunk, from various causes, to not more than 150,000 in 1882; but the statistics of the denomination are in a very unsatisfactory condition. The figures given for 1844 are those of Elder Daniel Millard. In 1848, according to the *Christian Almanac* of that year, there were, instead of 1500 churches, only 875; instead of 1500 ministers, 926; and instead of 325,000 communicants, 28,892! The possible explanation is that Elder Millard included in his estimates the Disciples of Christ, and that the *Almanac's* reports were only partial. The fullest and most accurate returns in recent years are said to be those of 1874, according to which there were 1254 ministers, 1124 churches, 76,000 members, and 64 conferences. Since 1874 the *Christian Almanac* has omitted the statistical table, on the ground of the imperfect character of the official reports from the conferences. The number of conferences (in 1882) is 60, and Pres.

A. W. Coan, of the American Christian Convention, estimated the number of communicants at 150,000. Of the 60 conferences, 1 is in Canada, 9 are in New England, 10 are in the Middle States, and 40 are in the West and South-west. The ministerial list embraced over 1200 ordained and 178 unordained ministers. The number of churches is 975.

The Christian churches of the East and West bore testimony from the beginning against slavery. Purviance, Stone, and other leaders in the West wrote and spoke against it, and advised those having slaves to make them free. This advice was generally followed, and probably few Christians in Kentucky and Tennessee were slaveholders in later years. In the South, however—Virginia and the Carolinas—the Christians, like other denominations in that section, imposed no restrictions, either on minister or layman, respecting slavery, and it was both patronized and defended. At the general convention of 1854, which was held in Cincinnati, it was thought some action ought to be taken on a question which was coming more and more into prominence, and a committee of three on anti-slavery was appointed. One of the three was the only delegate present from the South, W. B. Wellons. A majority report was brought in which declared that it was the "imperative duty" of the convention, representing the North, South, East, and West, to define clearly its position on this great moral question; and it recommended the adoption of resolutions denouncing slavery as the infringement of the rights of others and as tending to degrade men morally and mentally, and admonishing "our brethren of the South to wash their hands from this evil." After discussion these resolutions were adopted. It was furthermore declared that the Fugitive-Slave Law was contrary to the spirit of the gospel, and should be considered null and void. The Southern delegate, Elder Wellons, who had brought in a minority report, said he considered himself disfellowshipped by the action taken, and withdrew with several others. This gave rise to the SOUTHERN CONVENTION (see below).

In doctrine the Christians have generally been regarded as Unitarian because of their rejection of the Trinitarian view. Their true position, as claimed by Elder Badger in the *Christian Palladium* in 1834, was midway between the extremes of orthodoxy and rationalism. Taking the Bible as their guide and teacher, they find, as they think, distinctions plainly set up between the Father and the Son, and claim that the only rational view to be obtained from the Scriptures, taken in their natural meaning, is that Christ is inferior to God. As has already been stated, the founders of the denomination denied the doctrine of the Trinity, and held that there was but one supreme God, who alone is eternal, self-existent, and unchangeable. Christ, though divine and pre-existent, is neither supreme nor self-existent. Though higher than angels and men, he is not equal nor coeval with God. Though he made the worlds, it was as God's agent and by his power. His power is derived, and the time will come when he will yield up the kingdom which he now rules, so that God may be "all in all." These views are set forth fully in Kinkade's *Bible Doctrine*, one of the earliest and most valued theological works produced by the Christians. Kinkade held concerning the Holy Ghost that it "is something more than a mere quality; it is real being, and yet not a distinct person from the Father." While some of the early Christians may have taken a more advanced position on these doctrines in the midst of the exciting discussions of their time, the main body of the denomination held, and still holds, these views. Christ is the Mediator between God and man, the divine, only, and all-sufficient Saviour, and the Holy Spirit is the divine agent for the work of regeneration and sanctification. The doctrine of the atonement generally taught is that Christ's incarnation, death, and resurrection were not to appease God's wrath, to vindicate his justice, to satisfy the penalty of a broken law, nor to provide for the exigencies of moral government, but

to show God's love and compassion and reconcile man to him. They do not hold that human nature is totally depraved. They "discard Socinianism and the mere religion of the intellect," and "unite to a large extent the light of reason on subjects of belief with the most earnest piety and zeal for the salvation of sinners, regarding in all discussions of sacred themes the Scripture testimony as final and supreme" (*Badger*).

The cardinal principles of the Christians are—(1) The Bible the rule of faith and practice; (2) the name "Christian" as scriptural and unsectarian; (3) Christian character the test of fellowship. The form of baptism is almost universally immersion. The system of church government is congregational. The annual conference is composed of ministers and lay representatives. It receives reports from all the ministers and churches within its bounds, and through standing committees examines into the character and qualifications of ministers; examines and ordains ministers; arranges the churches into pastorates; sees that every church is supplied with preaching; provides a course of study; and attends to the general interests of the churches. There are State conventions, including a number of annual conferences, in New York, Ohio, and Indiana. The general conference is styled the "American Christian Convention." It meets every four years, and is composed of presidents of denominational colleges, of conferences, and of State associations, and of ministerial and lay delegates from the various annual conferences. It has control of missionary, church-extension, education, publication, and Sunday-school matters.

In educational work the denomination has been backward. It was believed, in the first half century at least, that the ministry not only ought not to be so worldly-minded as to ask for or expect a salary, but that men of piety, zeal, and gifts were sufficiently qualified for service in the sacred desk without a special education. There were, indeed, during most of this period strong prejudices against an educated ministry. The first denominational college was founded as late as 1850, and it claims the distinction of being the first institution of the kind to open its doors to both sexes on equal terms. Antioch College, with Horace Mann as its first president, was the pride of the denomination, but after raising about \$200,000 it was sold, though it was soon after restored. The trustees, however, transferred it to Unitarian control, on condition that it be endowed. The college is now again (it is situated at Yellow Springs, Ohio,) in the hands of the Christians. Union Christian College, Merom, Ind., was established in 1859. Fifteen years previously the Unitarians and the Christians had established a theological school at Meadville, Pa., which the latter patronized extensively, sending scores of students to it. They were represented in the faculty by David Millard from 1845 to 1867. In 1869 the Christian Biblical Institute, now located at Stanfordville, N. Y., was opened in connection with Starkey Seminary, and it has prepared about ninety students for the ministry. There is a literary and theological school for freedmen at Franklinton, N. C.

THE SOUTHERN CONVENTION.—The Southern Christian churches approved the withdrawal of their delegate, W. B. Wellons, from the general convention in Cincinnati, the reason for which is stated above, and in 1856 they organized the Southern Christian Convention. They had organized ten years previously the Southern Christian Association for the promotion of unity and co-operation. This biennial body now gave place to the convention. These churches differed from those of the North not only on the question of slavery, but in doctrinal matters, and a proposition to adopt a "Declaration of Principles" and to provide a better system of organization was made at this convention. Subsequently (1866) it was adopted, and the Declaration, with a system of government, was published and bound up with the denominational hymn-book. This action caused a division (1869), and several churches and ministers

united with the Northern Convention. Wellons published a book in 1859 with the title *The Christians not Unitarians*. It declared that they were orthodox. The sections on doctrine in *The Principles and Government* declare, in the language of Scripture, the belief of the Church respecting the inspiration of the Bible, the relations of the Father, the Son, and the Holy Ghost, human depravity, repentance and faith, the resurrection, everlasting punishment, and eternal life. The Son is declared to be one with the Father, equal with God, mediator between God and man, head of the Church, heir of all things, judge of the world. Through his name alone is salvation. The mode of baptism is left to the choice of the candidate, and communion is not restricted, but is given to all who are "true followers of our Lord." The system of government is not strictly congregational. The quadrennial general convention, the last session of which was held in May, 1882, is the chief body. The convention *orders*, the annual conference *recommends*, the local church *advises*. The duties of churches and conferences are laid down in *The Principles and Government*, and directions are given, with forms, for the ordination of deacons and elders, the administration of baptism and the Lord's Supper, the burial of the dead, etc. The annual conference is composed of the ministers and lay representatives of the churches, and the general convention of ministerial and lay delegates elected by the annual conferences. Ministers can only be ordained or brought to trial by the annual conference. Provision is made for the prosecution of churches which neglect their duties or disregard their obligations before the conference. There are five annual conferences and about 14,000 members, chiefly in Virginia and North Carolina. The ministerial list embraces 56 elders and 18 licentiates. The oldest of the conferences, the Eastern Virginia, was organized in 1818, the general meetings having been previously held irregularly. The chief denominational schools are Graham College, Graham, N. C., and Suffolk (Va.) Collegiate Institute. A weekly paper, *The Christian Sun*, with other denominational literature, is published at Raleigh, N. C. A conference of colored Christians was organized in North Carolina in 1866. There are 33 ordained colored ministers in North Carolina and Virginia, and 7 unordained. Fraternal delegates from the Southern Christian churches attended the general convention at Albany, N. Y., in 1882. (H. K. C.)

CHRISTIAN UNION, THE, or perhaps more correctly **THE CHURCH OF CHRIST IN CHRISTIAN UNION**, is a denomination organized in Columbus, O., to unite all Christians on the basis of the Bible. The date of the first conference is 1863 or 1864, but the minutes of the Missouri Council for 1877 call that council the "thirty-third annual meeting." At the conference in Columbus, O., five denominations were represented. Prominent among the ministers were elders J. V. B. Flack and J. F. Given. The reason given for the new organization was that the denominational yoke had become too heavy, and men's "hearts were wearied with the cruel intolerance and divisions of the sects." The new organization was characterized by strong objection to the recognition or discussion of political subjects. Its platform was no creed or written discipline, local church government. A General Council was organized in 1865 at Terre Haute, Ind., delegates being in attendance from councils which had been organized in Ohio, Indiana, Iowa, Illinois, Missouri, Michigan, Kansas, Nebraska, Wisconsin, Arkansas, and Texas. At present (1884) the denomination has two annual councils in Ohio, two in Missouri, and one each in Indiana, Illinois, Iowa, Kentucky, Tennessee, Kansas, Texas, Oregon, and Michigan, besides some churches in other States. The president of the General Council, Elder H. J. Duckworth, also editor of the weekly organ of the denomination, *The Christian Witness*, of Newark, O., estimates that the Church has over 100,000 communicants, 1000 churches, and 2000 ministers, but the number attending its council, is very small.

The principles of the Church are thus formulated: "The oneness of the Church of Christ; Christ the only head; the Bible our only rule of faith and practice; 'good fruits' the only condition of fellowship; Christian union without controversy; each local church governs itself; political preaching discountenanced." A fuller declaration of principles, appended to the minutes of the General Council (1882), contends that "all churches should be organized and governed as New Testament churches were;" that "every Christian giving scriptural evidence of his discipleship has a right to membership in any Christian Church on earth;" that immersion and episcopal ordination are not indispensable conditions to Christian and ministerial fellowship. A manual of church and council business adopted by the same council provides that each local church shall elect its own officers; that when two or more churches are united under one pastorate, the officers of each church shall compose the charge council, whose province it is to hear reports from the pastor and churches, licensed preachers, and Sunday-school superintendents, and decide questions on appeal from decisions of the churches; that three or more charges, not to exceed ten, shall form a district council, to be composed of the officers of the churches; an equal number of delegates, male and female, and the pastors and preachers, and to have power to decide appeals from charge councils and care for missionary and church extension matters; that the annual conference shall consist of the preachers and pastors within its bounds and delegates from the churches, shall require written reports from each pastor and various committees, including one on examination and ordination, and shall have charge of the general work within its limits; that a General Council, consisting of delegates, ministerial and lay, elected by the annual conferences, shall meet quadrennially and have jurisdiction over the whole country. In doctrine the Christian Union is evangelical; as to baptism, it practises both modes.

(H. K. C.)

CHRISTISON, SIR ROBERT, LL.D., D. C. L., F. R. S. (1797–1882), an eminent Scotch physician and toxicologist, was born at Edinburgh, Scotland, July 18, 1797. His father, Alexander Christison, was professor of humanity in the University of Edinburgh. The son entered this institution in 1811, and passed through the literary and medical course, graduating in 1819. He then continued his medical studies at London and Paris, devoting special attention to toxicology. He settled as a physician in Edinburgh, and in 1822 was appointed professor of medical jurisprudence in the university. In 1832 he became professor of *materia medica*, which position he held forty-five years. He was twice elected president of the Royal College of Physicians, Edinburgh. In 1866 he received the degree of D. C. L. from the University of Oxford, and in 1872 that of LL.D. from the University of Edinburgh. He was physician in ordinary to the queen for Scotland, and in Nov., 1871, was created a baronet. He made frequent contributions to medical journals and published several books, of which the most famous is his *Treatise on Poisons*, which is a standard work on that subject. He died at Edinburgh, Jan. 27, 1882.

CHRISTLIEB, THEODORE, D. D., Ph. D., a German evangelical theologian, was born at Birkenfeld, in Würtemberg, March 7, 1833. He was the son of a pastor, and studied theology at Tübingen from 1851 to 1855. He then spent a year at Montpellier, France, as a private tutor, and in 1856 became an assistant pastor in Würtemberg. Two years later he was called to Islington, London, to take charge of a German congregation, and built a church there. In the autumn of 1865 he was made pastor of the court church at Friedrichshafen, on the Lake of Constance, where the king of Würtemberg has his summer residence. In the winter of that year he delivered a series of discourses in the neighboring St. Gall, which were afterwards published under the title *Moderne Zweifel am Christlichen Glauben* (1868). This work gave him a

wide reputation as a champion of evangelical Christianity. It has been translated into English, and published in Edinburgh and New York under the title *Modern Doubt and Christian Belief*. In 1868 he was appointed professor of practical theology in the University of Bonn, being also preacher to the university and director of the homiletical seminary. In 1873 he attended the meeting of the Evangelical Alliance in New York, and his essay on *The Best Methods of Counteracting Modern Infidelity*, read at that meeting, has been translated into most of the European languages. He is a prominent advocate of foreign missions, and assisted in founding the *Allgemeine Missions-Zeitschrift* (Gütersloh), which he still edits. He has contributed to Herzog-Plitt's *Real-Encyclopædia* articles on "Apologetics," "Homiletics," etc. Besides the works already mentioned, he is the author of *Leben und Lehre des Johannes Scotus Erigena* (1860); *Der Missionsberuf des evangelischen Deutschland* (1876); *Der Indo-Britische Opiumhandel und seine Wirkungen* (1877), which has been translated into English and French; *Der gegenwärtige Stand der evangelischen Heidenmission* (4th ed. 1880), translated into English under the title *Protestant Foreign Missions, their Present State* (London and Boston; 3d ed. 1881); *Zur Methodistischen Frage in Deutschland* (2d ed. 1882). Many of his sermons have been published both in German and English.

CHRONICLES, BOOKS OF. As to the date of these books, the article in the *ENCYCLOPÆDIA* See Vol. V. p. 613 Am. ed. (p. 706 Edin. ed.). *BRITANNICA* calls attention to the fact that in 1 Chron. xxix. 7 the Persian term "darics" is used in giving an account of events which occurred in the time of King David. From this it is inferred that the book was written after Persian coin had been long current in Judæa. But the inference is almost equally strong that it was written before the close of the Persian period, that coin being still the standard. Use is also made of the genealogies in Chronicles and in Nehemiah to fix the date. In the article in this work on the BIBLE it is shown that, taking the high priest Jaddua as the most extreme instance of this sort, the latest date in the genealogies is within the Persian period and within the probable lifetime of Nehemiah.

The position of the Chronicles as the last book in the Hebrew Bible must be taken as evidence that it was written the latest of the historical books. It is true that there is a unity between the books of Chronicles, Ezra, and Nehemiah, and that the books of Chronicles close abruptly at the point in the history where the book of Ezra begins. Many critics have inferred from this that the whole was first written in chronological order; that at some date after the writing of it the Israelite scribes detached the latter portion, now found in the books of Ezra and Nehemiah, and added it to the canon of Scripture, in order to supplement the history of Israel as contained in the books of Samuel and Kings; and that other scribes still later added the books of Chronicles to the canon. It is much more probable that the compiler of this line of historical books first produced the books of Ezra and Nehemiah to bring the history down to his own time, and afterward, finding himself still in possession of valuable materials, compiled a fresh history to cover the times from the beginning up to the period of which he had already treated—just as Josephus first wrote his *Wars of the Jews*, and afterward his *Antiquities*, and in modern times Hume began his *History of England* with the accession of the house of Stuart, but afterward went back to the invasion of Julius Cæsar.

This view of the motive for the writing of the Chronicles is certainly preferable to the view that some Levite, at some indefinite date after the establishment of the services of the second temple, set himself to rewrite the history, so as to authenticate the Pentateuchal ordinances, thus remedying what he regarded as the faults and deficiencies of the older books of Samuel and Kings.

Among these faults the critics who hold this view

point out the "recording, and that without condemnation, things inconsistent with the Pentateuchal law." But the instances are mostly made out either by giving a mistaken meaning to the records contained in the books, or by assigning to the Pentateuchal laws an unnatural rigidity of interpretation, or by counting as the interpolations of a later hand the expressed and implied disapprovals of recorded violations of the law which now appear all through the books of Samuel and Kings.

It is further said that "The history of the ordinances of worship holds a very small place in the older record. Jerusalem and the temple have not that central place in the book of Kings which they occupied in the minds of the Jewish community after the Exile." But if any one will read in the books of Kings the account of the building and dedication of the temple, the accounts of the reforms under Asa, Joash, Hezekiah, and Josiah, of the desecrations or attempted desecrations by Athaliah, Ahaz, Sennacherib, and Manasseh, or of the coronations or burials of the successive Jewish kings, he will easily convince himself that the ordinances of worship and Jerusalem and the temple occupy an important and central place in those books, as really as in the writings produced after the Exile. The difference between the books of Kings and of Chronicles in these particulars is better described by saying that the Chronicles give relatively less prominence to the northern kingdom and its prophets, than by saying that the books of Kings give less prominence to Jerusalem and the temple.

The article in the *ENCYCLOPÆDIA BRITANNICA* says: "Long before the chronicler wrote, the last spark of prophecy was extinct." But while such men as Ezra and Nehemiah may not be prophets like Isaiah or Samuel, in the sense of having that character more prominently than any other, they yet were prophets, like Moses or David or Daniel, in the sense of being largely endowed with distinctive prophetic gifts. Ezra, the contemporary of the younger years of Nehemiah, appears to have also been, earlier in life, the contemporary of Haggai and Zechariah. Some of the prophets of this group may have been still living when the author of the Chronicles had reached manhood and had begun his historical researches. He must have been a contemporary of the generation of prophets and prophetic men to which Nehemiah and the writer of Malachi belonged. We must therefore regard the books of Chronicles as the final literary product of an age peculiarly rich in prophecy, and not as produced after the cessation of prophetic endowments.

The idea, therefore, that the books of Chronicles were written from a priestly point of view to supersede the older historical books, which had been written from the different point of view held by the prophets, is not very decisively favored, even by the internal evidences adduced by its advocates. On the other hand, if we distinguish between the prophetic and the priestly type of the religion of Israel, the priestly type was that which prevailed from Nehemiah to Jesus; and if the Chronicles had been written in the interest of this type of religion, and to counteract the possible heterodox influence of the older books, then the same motives would certainly have led to their being honored and used in preference to the older. But nothing of this kind happened. The books of Samuel and Kings continued to be the standard sacred history; prophetic lessons for synagogue-reading were selected from them. The books of Chronicles remained in such relative obscurity that it is a matter of dispute whether they are at all recognized in the New Testament. This is what we should expect if the purpose in writing them was mainly historical; that is, if they were written for the specific object of supplementing the other books, of utilizing materials which had been previously neglected, and thus of completing the historical Scriptures; but not at all what we should expect on the opposite theory.

An item of external evidence not to be despised is

the Greek title of these books in the Septuagint version—*Paraleipomenon Basileon Iouda* ("Of the Omitted Affairs of the Kings of Judah"). The current tradition, substantially accepted by critics of all schools, is that a group of Israelitish scholars—among whom Ezra and Nehemiah were prominent—who lived during the Exile and after the Return, did some sort of work in collecting, classifying, and supplementing the sacred literature of the Jewish people. The book of Second Maccabees (ii. 13) cites a letter which purports to have been written 164 B. C., in which it is said of Nehemiah, "He, founding a library, gathered together the books concerning the kings, and prophets, and those of David, and epistles of kings concerning holy gifts." Without attaching too much weight to the authority on which this statement rests, it is every way probable that men of the group to which Nehemiah belonged would do precisely what is here ascribed to him. In their work upon the sacred literature of their nation it is a matter of course that they would gather what apparatus they could. It can hardly be otherwise than that their apparatus would include not merely the sacred books which had previously been written, but also some of the sources from which the previous historical books had been compiled. They are likely to have had fragments at least of the old "Chronicles" of the kings of the two kingdoms or of extracts from them. They are likely to have had access to Assyrian, Babylonian, and Persian sources of history, such as are being now recovered from the monuments. As they used these in their work upon the older sacred literature, and in bringing the sacred history up to the date of their times, what could be more natural than that they should notice the existence of a considerable amount of material properly available for the writing of sacred history, but omitted from the older books? What more natural than that some one should have been led to utilize this material by writing just such a book as we have before us, repeating enough of the older narrative to show where the new materials belong, and inserting them in their places?

According to the other view, the writer of the Chronicles "had nothing to add to the Pentateuch, and the period from Moses to David contained little that served his purpose. He therefore contracts the early history into a series of genealogies." But an examination of the genealogies of the first chapters of Chronicles shows that they are not a mere abridgment of the history given in the older biblical books. Moreover, they are fragmentary and imperfect, and are interspersed with anecdotes and short narratives. If we suppose that the compiler of the Chronicles here set down whatever fragments of the ancient Jewish records of early genealogies had been preserved, either using or omitting such parts of this material as were found in the earlier sacred books according as it suited his purpose, and bringing some of the lists down to his own times, we have a supposition which accounts for the phenomena here apparent.

In regard to the historical value of the Chronicles the article in the *ENCYCLOPÆDIA BRITANNICA* differs widely from the opinions of the extreme destructive critics, who hold that the compiler had no historical materials of value except the older sacred books, and that his testimony to historical facts is therefore worthless. But, notwithstanding this difference, it groundlessly depreciates the historical value of the Chronicles. It affirms that "the book was throughout composed not in purely historical interests, but with a view to inculcate a single practical lesson." But is not the narrative of the book of Kings arranged for the inculcating of precisely the same practical lesson? Is not the question whether each king "did right in the eyes of Jehovah" the one to which especial attention is called? The author of the Chronicles certainly lived in different conditions of society from the authors of the books of Kings, and his point of view was somewhat affected by it. But it is only in a limited and

comparatively unimportant sense that he can be represented as "presenting the history in quite a different perspective from that of the older narrative." In the main, his work is in the same spirit with that of the others, and for the same purposes. And there is not a particle of reason for insinuating that the practical aim of either the older or the later narrators ever led them to neglect historical truth.

In the Chronicles are used the expressions "ships to go to Tarshish," "ships going to Tarshish," "were not able to go to Tarshish" (2 Chron. ix. 21; xx. 36, 37), where the expression employed in Kings is simply "ships of Tarshish," the meaning in each case being "ships for long voyages." The expression is further varied in the addition of the Vatican Septuagint after 1 Kings xvi. 28, where it is "a ship for Tarshish (*εἰς*) to go to Ophir." It is sometimes assumed that the author of the Chronicles here shows his incompetence as a historian, in that he supposed that Tarshish ships meant ships that were actually bound for Tartessus. But nothing of this kind appears in his language. If "ship of Tarshish" means "ship for long voyages," then "Tarshish-going ship" may easily mean the same. "Were not able to go to Tarshish" (especially since the ships were broken before they started) may mean "were not able to make their long voyages."

In 1 Chron. xxi. 28-30 it is explained that David sacrificed on the threshing-floor of Ornan because the national altar of burnt-offering was then in Gibeon, and was rendered inaccessible by the sword of the angel. This statement is pronounced unhistorical, because "it is certain that at the time of David the principle of a single altar was not acknowledged." In proof of this is cited 1 Kings iii. 2-4 to the effect that "Gibeon appears only as the chief of many high-places." This chosen instance admirably represents volumes of argument that have been adduced for similar purposes. In the three verses the author of the Kings records the fact that Solomon and the people sacrificed in various high-places. But he regards it as a strange fact, needing explanation, for he explains it by saying, "because a house to the name of Jehovah was not yet built." Moreover, he regards the sacrificing at different places, even with this explanation of it, as illegitimate, and protests against it twice in the three verses: "only the people sacrificed," "only he sacrificed." The author of Kings is as distinct as the author of Chronicles in acknowledging "the principle of a single altar," and in holding that the contemporaries of Solomon ought to have acknowledged it. When the author of Chronicles assumes that David acknowledged it, he assumes something which is contradicted by no known facts, and in regard to which he, living twenty-two centuries nearer than our modern critics to the events, and having in his possession sources of evidence which they have not, is a better qualified witness than they.

If speeches like those of Abijah in 2 Chron. xiii. are mere literary devices, putting the author's words into the mouth of his hero, the statements thus uttered may none the less be historical truth. In this instance the assertions made by Abijah as to the tender age of Rehoboam when he began to reign present decided difficulties. They agree with the statement made in the Greek addition after 1 Kings xii. 24, that Rehoboam began to reign at the age of sixteen, but apparently contradict the statement of all the copies of both Kings and Chronicles, that he was forty-one at his accession. If we could prove that the unsettled condition of things after the death of Solomon lasted twenty-five years before the simultaneous accession of Jeroboam and Rehoboam, that would reconcile these statements. Very likely we should find them consistent if we had a full account of all the events of those times. Meanwhile, we may rest assured that if the author of Chronicles had invented these facts to put into the mouth of Abijah, he would have invented them free from such difficulties. Evidently, he found

the statements of fact in some of the sources from which he drew, and repeated them as he found them.

It is true that the text of the Chronicles has been preserved with less care than that of the books which were more used, and contains a few evident errors of transcription; but this is the extent of what can be proved as to the historical inferiority of these books.

Literature.—Important and accessible contributions to the literature are the translation of Zöckler's *Commentary* in Dr. Schaff's edition of Lange, by Dr. James G. Murphy of Belfast (1877), and the little work on the Chronicles published by Prof. Murphy (1880). The introduction in Zöckler's *Commentary* concludes with a full list of works on the Chronicles. (W. J. B.)

CHRONOGRAPH ("time-recorder"), an astronomical instrument invented in America in 1848 by Dr. J. Locke, though Prof. O. M. Mitchell, Joseph Saxton, and Sears C. Walker had much to do both with its invention and subsequent improvement. Its general introduction has inaugurated a new era in observational and instrumental astronomy. So accurate and permanent are its records, and so easily and minutely are they made, that it has become an indispensable instrument in every well-equipped observatory. It is of several varieties, and is chiefly used for the registration by electricity of the time of transit of any heavenly body across the meridian, instead of by the eye-and-ear method, as it is called, which required the observer's powers of attention to be distracted beyond what they are able to bear.

Before the introduction of this method (usually called the chronographic or magnetic method) the usual plan for noting the time of any celestial phenomenon was for the observer to listen to the beats of his sidereal clock; to keep count of the minutes, and estimate the space passed over by the object during the interval between the beats; to mentally divide this space into tenths, and record in his note-book the minutes, seconds, and tenths, meanwhile counting the clock-beats that not one be lost. All this must be repeated at the bisection of the object with each of the several wires (spider-lines) in the field of view of his telescope, sometimes as many as ten or more being employed. Even by this wearisome method skilled observers, after years of practice, have been able to record the time of transits to within one-tenth of a second, though it was more frequently to one-fifth of a second. But by the new plan an inexperienced person will, by a single night's practice, record them to one one-hundredth of a second. The chronographic, which has almost entirely superseded the old "eye-and-ear method," relieves the observer of all anxiety regarding the time, the clock-beats, and the making of the record in his note-book, and enables him to give his undivided attention to the observation of the transits, which, under the other method with its attendant difficulties, he was, to a certain extent, prevented from doing.

The most popular form of chronograph in use consists of a metallic cylinder some twenty or more inches in length and from eight to ten inches in diameter, made to revolve on an axis by a driving clock regulated to cause the cylinder to make exactly one revolution per minute. Around the cylinder is wrapped a sheet of blank paper which revolves with it, and upon which the records are made, the sidereal clock of the observatory recording its own time, and the observer his observations.

Three things are rigorously demanded in the successful working of a chronograph—viz., 1st, that the cylinder or disk (depending on which variety is used) be made to revolve uniformly once in a sidereal minute; 2d, that the standard clock makes an unfailing record on the paper once in a sidereal second; and, 3d, that the observer at the telescope shall have the power of electrically making a signal on the paper at the instant of the passage of any object across each of the several wires of his telescope. It is possible to quite perfectly accomplish the second and third conditions, but for the first no mechanical device has as yet been invented that will cause a cylinder to revolve with mathematical ex-

actness for any great length of time. The deviations are, however, too slight to vitiate the results to any appreciable amount.

The pen (called the time-pen) is electrically connected by a wire directly or indirectly to the pendulum of the sidereal clock, which causes tracings of uniform length to be made on the revolving paper. Close to the time-pen is another called the observing-pen, which is electrically connected by a wire with a signal key within easy reach of the observer, who at every transit of an object makes the connection with his galvanic battery by tapping on the key, which instantaneously imprints a dot close to that made every second by the time-pen, which can be read and copied at leisure, and preserved and re-examined at any future time if necessary.

Both pens are attached to a small carriage which is slowly propelled lengthwise along the cylinder by a long revolving screw, so that the chronographic characters are recorded spirally around the cylinder. When the paper is filled a moment suffices to remove it and substitute another. Two or three blanks are sufficient for a night's constant work.

A straight line drawn on the sheet lengthwise of the cylinder will indicate the commencement of the minutes, or, as is often done, a time-signal may be omitted at the end of the minutes by removing one of the sixty teeth in the escapement-wheel of the clock, which breaks the electric circuit.

In some forms but a single pen is used, the clock marking signals that correspond to one second of time in length, and the observer using the same pen to record his observations. There is no difficulty in distinguishing the two sets of signals.

As far as theory is concerned, the instruments can be miles away from the observatory, and the clock and chronograph equally as far from each other.

The chronograph affords the easiest and most exact method known for determining the difference of longitude between two places connected by telegraph. Without going into the refinement of all the details, the process is briefly as follows: Suppose it be required to ascertain the difference of longitude between the Naval Observatory at Washington and the Dearborn Observatory at Chicago. All that is necessary is for the observer in the latter city to connect his chronograph with the sidereal clock in Washington by means of the telegraph-line between the two cities. The beats of the Washington clock are thereby recorded on the Chicago chronograph. The Washington observer signals the transit of a star across the wires in the field of view of his transit instrument, which are instantly recorded on the chronograph at Chicago. While the star is apparently moving towards the meridian of the last-named place the Washington clock is recording its own beats at Chicago, whose observer, when the same star passes the wires in his transit instrument, makes the record not only on his own, but likewise on the chronograph at Washington. The simple process of measuring up his chronograph sheet is all that is necessary to ascertain how much time has elapsed between the two records, which is the same thing as the difference of longitude between the two observatories. It must be remembered that by this process the star's right ascension and declination are not necessary to be known by either observer; all that is required being to measure the flow of time, which, resulting from the earth's rotation, is uniform for all the stars. If the clock at Washington has no rate, and the chronograph cylinder revolve with undeviating accuracy, and the exact time of the passage of the electricity through the wires be known, a single trial will give the difference of longitude to within the one one-hundredth of a second of time.

One source of error in recording transits by the eye-and-ear method is the imperfection of the ear as an organ in associating its sensations with those of sight. It has been computed that the precision of the associations of sight and touch is to that of sight and hearing as 17 to 10.

It is difficult to over-estimate the advantages which this invention has conferred upon astronomy, for it may be safely assumed that the value of a night's work with a transit instrument by the chronographic is about ten times as great as by the former method.

For facts regarding the priority of this invention see the two letters of Sears C. Walker to Prof. A. D. Bache (superintendent of Coast Survey), dated Dec. 15, 1848, printed as a public document by Congress in Jan., 1849.

A printing chronograph has been invented by Prof. G. W. Hough, and for three years was constantly and successfully used by him while director of the Dudley Observatory at Albany, N. Y. It possesses very decided advantages over all other forms of chronograph, the principal one being that no measuring up of the blanks, as in the recording chronograph, is required, as the observation signals are printed in Roman characters by type-wheels controlled by the standard clock. The probable error for a single impression is only 0.013 of a second, or the same as in other forms. The instrument, being somewhat complex in its mechanical construction, cannot be intelligently described here, but a detailed description may be found in vol. vii. p. 66 of the *Transactions of the Albany Institute*.

For descriptions of the different methods invented for breaking the electric circuit by a standard clock, and also the improvements made by Mr. Saxton and Profs. Mitchell and Walker, and for engraved sample of a chronographic record, together with many other facts directly and indirectly connected with the subject, see *Recent Progress of Astronomy*, by Prof. Elias Loomis, published in 1849. For a cut of the Greenwich chronograph, with description, see Lockyer's *Star-gazing*, pp. 260-266. (L. S.)

CHRONOLOGICAL TABLE. The following is a continuation of the Table in the *ENCYCLOPEDIA BRITANNICA*, which closes with the year 1875.

1876.—Jan. 1. The imperial bank of Germany opened. March 7. Jules Grévy elected president of French Chamber of Deputies; Prince of Wales returns to England from his visit to India. May 1. Queen Victoria proclaimed empress of India; 30. Abdul-Aziz, sultan of Turkey, deposed; Murad V. succeeds. July 1. Death of Michael Bakunin, founder of the Nihilists (born 1814); 2. Servians invade Turkey, but, unaided, are unsuccessful. Aug. 12. Mr. Disraeli created earl of Beaconsfield; Murad V., sultan of Turkey, deposed on ground of insanity; Abdul-Hamid II. becomes sultan. Nov. 6. Death of Cardinal Antonelli (born 1806). Dec. 23. New constitution proclaimed in Turkey, giving Christians political equality with Mohammedans.

American.—Jan. 1. Centennial year of American Independence opened with special demonstration at Philadelphia; 15. Telephone invented by Prof. Graham Bell, of Boston. Feb. 17. Death of Rev. Dr. Horace Bushnell, Congregational theologian (born 1802). March 2. W. W. Belknap, secretary of war, impeached by Congress. April. Headquarters of the United States army transferred from St. Louis to Washington; 17. Death of Dr. O. A. Brownson, Roman Catholic philosopher (born 1803). May 10. Centennial Exhibition opened at Philadelphia. June 16. Republican National Convention at Cincinnati nominates Gov. R. B. Hayes of Ohio for President, and W. A. Wheeler of New York for Vice-President; 25. Massacre of Gen. G. A. Custer and his troops by Indians at Little Big Horn River; 29. Democratic National Convention at St. Louis nominates S. J. Tilden of New York for President, and T. A. Hendricks of Indiana for Vice-President. July 4. Centennial anniversary of American Independence celebrated. Aug. 1. Colorado declared a State by President's proclamation, its Constitution having been ratified July 1; 20. Death of M. C. Kerr, speaker of the United States House of Representatives (born 1827). Nov. 10. Centennial Exhibition at Philadelphia closed; 11. Presidential election. Popular vote: Democratic 4,284,885, Republican 4,033,950; Electoral vote:

Tilden 184, Hayes 185; but there were disputes as to the result in South Carolina, Louisiana, and Florida. Dec. 4. Second session of the Forty-fifth Congress; S. J. Randall of Pennsylvania chosen speaker.

1877.—Jan. 15. The Great Powers present to Turkey their ultimatum on its affairs. March 1. Treaty of peace between Turkey and Servia. April 10. Turkey rejects the protocol of the Great Powers, signed at London March 31; 12. British troops annex the Transvaal republic; 16. Roumania makes a convention with Russia; 24. Russia declares war on Turkey. May 19. French cabinet (monarchical) formed under duc de Broglie, and the Chambers prorogued, 363 members protesting. June 21. Russians cross the Danube; 25. French Assembly dissolved. July 20. First battle of Plevna (second, July 30; third, Sept. 11). August. Convention between England and Egypt for suppression of the slave trade; H. M. Stanley reaches the west coast of Africa, having sailed down the Congo; Aug. 19–Sept. 17. Defence of Shipka Pass in the Balkan Mountains. Sept. 3. Death of Adolphe Thiers, French statesman (born 1797). Oct. 14. French elections result in a decided republican victory. Nov. 17. Kars, in Armenia, captured by the Russian general Melikoff. Dec. 10. Plevna taken by Russians under Gen. Tottleben after a gallant defence since July 19 by Osman Pasha; 14. French cabinet (republican) formed under Dufaure.

American.—Jan. 30. Congress chooses an electoral tribunal of fifteen to settle points in dispute as to Presidential election. March 2. Election of R. B. Hayes as President confirmed by Congress. April 10. United States troops withdrawn from South Carolina State-house, and the Democratic State government recognized as valid; troops also ordered to be withdrawn from Alaska; 19. Presidential commission visiting New Orleans report a valid legislature and State government in Louisiana; 24. United States troops withdrawn from Louisiana Capitol. May 29. Death of J. Lothrop Motley, historian and diplomatist, in London (born 1820). June 15. Canadian and United States Fishery Commission meet at Halifax. July. Gen. O. O. Howard's campaign against the Indians in Idaho; 16. Serious strike of railroad employes commenced at Baltimore: it affected especially the Baltimore and Ohio and the Pennsylvania Railroads; 22. Pennsylvania Railroad dépôt at Pittsburg burned by strikers; militia ordered out. Aug. 4. Railroad strike comes to an end; 16. Centennial of the battle of Bennington celebrated; 29. Death of Brigham Young, president of the Mormons (born 1801); his authority is assumed by "the Twelve Apostles." Oct. 15. Forty-fifth Congress met in special session; S. J. Randall speaker of the House; opposition to the administration developed in the Senate. Nov. 23. Halifax Fishery Commission awards \$5,000,000 damages to Canada.

1878.—Jan. 9. Death of Victor Emmanuel II., king of Italy (born 1820); his son Humbert succeeds; 31. Cessation of hostilities between Russia and Turkey. Feb. 7. Death of Pope Pius IX. (born 1792; became pope 1846); 20. Cardinal Vincenzo Pecci elected pope, assuming the name of Leo XIII. March 3. Pope Leo XIII. crowned; Treaty of San Stefano concluded between Russia and Turkey; 28. Lord Derby resigns as foreign secretary in the English cabinet. May 1. International Exposition opened in Paris; 28. Death of Earl Russell, English statesman (born 1792). June 12. Death of George V. ex-king of Hanover; his son, Ernest Augustus, claims the kingdom. July 13. Berlin congress of representatives from Turkey and the six Great Powers divides Turkey and rearranges her affairs; 29. Austrian army enters Bosnia, and the occupation is completed Oct. 4. Aug. 21. Independence of Servia proclaimed. Monetary conference at Paris favors bi-metallism. Oct. 2. Failure of City of Glasgow Bank; liabilities, £10,000,000;

11. Austria releases Germany from the obligation, by treaty of 1866, to surrender the Danish part of Schleswig to Denmark; 12. Death of Bishop Dupanloup, French theologian (born 1802); 24. Death of Cardinal Paul Cullen, Irish theologian (born 1802). Nov. 21. British army enters Afghanistan.

American.—Feb. 16. Bland's Silver bill passed over the President's veto. April 12. President Hayes appoints a court of inquiry in case of Gen. Fitz-John Porter. May 13. Death of Prof. Joseph Henry, scientist (born 1798). June 12. Death of William Cullen Bryant, poet and journalist (born 1794); 19. Death of Rev. Charles Hodge, D. D., Presbyterian theologian (born 1798). July 11. President Hayes removes Chester A. Arthur from collectorship of customs at New York, and appoints Gen. E. A. Merritt his successor. August–October. Yellow fever rages along the Mississippi. Oct. 14. Marquis of Lorne appointed governor-general of Canada. Nov. 23. American minister in London paid the Halifax fishery award (\$5,000,000) with protest. Dec. 17. Gold sold at par with legal-tender notes in New York for the first time since Jan. 13, 1862; 19. Death of Bayard Taylor, author and American minister to Berlin (born 1824).

1879.—Jan. 10. Death of Marshal Espartero, Spanish statesman (born 1793); 22. Battle of Isandlana, in South Africa; Lord Chelmsford defeated by the Zulus; 30. Marshal MacMahon resigns as president of France, and Jules Grévy is elected his successor; Gambetta is elected president of the Chamber of Deputies. Feb. 4. French cabinet formed under M. Waddington; 21. Death of Shere Ali, ameer of Afghanistan; his son, Yakub Khan, succeeds. April 28. Liberal Constitution adopted in Bulgaria; Alexander of Battenberg chosen prince. May 5. Death of Isaac Butt, founder of the Irish Home-Rule party (born 1813); 15. Death of Jacob Staempfli, formerly president of Switzerland (born 1820); 26. Treaty of Gundamak between England and Afghanistan, establishing "scientific frontier." June 1. Prince Louis Napoleon slain by Zulus (born 1856); 20. French Assembly and Senate order the seat of government removed from Versailles to Paris; 26. Ismail, khedive of Egypt, abdicated in favor of his son Tewfik. July 4. Lord Chelmsford defeats the Zulus under Cetewayo at Ulundi; 12. Germany adopts Prince Bismarck's Protective Tariff bill; 19. Baron Nordenskjöld sailed through Behring Strait, having accomplished the North-east Passage; 20. Jules Ferry's Education bill (anti-clerical) passed. Aug. 3. Russians evacuate Bulgaria; 27. Death of Sir Rowland Hill, the promoter of cheap postage (born 1795); 28. Cetewayo, king of the Zulus, captured by the British. Sept. 3. Massacre of English at Cabul. Oct. 8. Andrassy, prime minister of Austria, resigned; 13. English general Roberts enters Cabul and avenges the massacre. Nov. 10. Paris International Exposition closed; Prussian legislature authorizes the government to purchase private railroads. Dec. 21. M. Waddington's cabinet resigns; M. de Freycinet succeeds. 26. Conflagration in Tokio, Japan, destroys 15,000 houses; 28. Railroad bridge over the Frith of Tay, Scotland, blown down and train engulfed.

American.—Jan. 11. Death of Caleb Cushing, lawyer and diplomatist (born 1800); 26. Arrears of Pension bill becomes a law. March 1. Bill to restrict Chinese immigration vetoed; 15. Protective tariff adopted in Canada; 18. Forty-sixth Congress met in extra session; S. J. Randall of Pennsylvania chosen speaker of the House; 29. Death of Dr. George B. Wood, medical author (born 1797). March–April. "Exodus" of negroes from the Southern States to the West. April 6. Chili declares war against Peru and Bolivia; 21. Death of Maj.-Gen. John A. Dix (born 1798). May 24. Death of William Lloyd Garrison, the abolitionist (born 1804). July 1. Congress adjourned. Great difficulty had been experienced in passing the Appropriation bills, as Congress insisted on attaching conditions on account of which the

President had vetoed successive bills. The Jeannette Arctic exploring expedition sailed from San Francisco. Sept. 26. Business part of Deadwood, Montana, burned. Oct. 13. Death of Henry C. Carey, political economist (born 1793); 17. Death of W. R. Whittingham, Episcopal bishop of Maryland (born 1805). Nov. 1. Death of Zachariah Chandler, United States Senator from Michigan (born 1813); 4. Elections in eleven States, generally favorable to the Republicans. Dec. 16. Gen. William Mahone elected United States Senator (1881-87) from Virginia as a Readjuster.

1880.—Jan. 20. Death of Jules Favre, French republican statesman (born 1809). Feb. 17. Attempt to assassinate Czar Alexander II. at the Winter Palace; 29. St. Gothard tunnel pierced through after eight years' labor. March 30. President Grévy orders the French Jesuits to disband. April 28. Mr. W. E. Gladstone prime minister of England a second time. June 16. Berlin conference of the Great Powers on the boundary of Greece and Turkey; 30. Jesuits expelled from their establishments in France. July 1. British House of Commons allows Charles Bradlaugh, an atheist, to take his seat without taking the oath; 11. French Government proclaims amnesty to the communists; 18. Tewfik, khedive of Egypt, signs the liquidation law, required by the bankruptcy of the country; 22. British Government recognized Abdurrahman Khan as ameer of Afghanistan, and withdrew its army from Cabul, but hostilities were renewed under Ayoub Khan, July 27. Aug. 11. Gambetta's speech at the naval review at Cherbourg excited apprehension of war with Germany. Sept. 1. British general Roberts defeated Ayoub Khan at Candahar; Prince Bismarck takes the ministry of commerce and industry; 19. De Freycinet resigns as president of the French cabinet; Jules Ferry succeeds Sept. 22. Oct. 15. Celebration of the completion of the cathedral of Cologne (commenced 1248); 24. Captain Boycott compelled to leave Ireland by opposition of the people. Nov. Anti-Semitic agitation in Germany, especially in Berlin; 20. Death of Sir Alexander Cockburn, lord chief-justice (born 1802); 24. Dulcigno captured from Albanians by Dervish Pasha; 27. Dulcigno surrendered to Montenegro, which has thus a second seaport. Dec. 30,000 troops gathered in Ireland to repress the Land League agitation; 22. Death of Mrs. Cross ("George Eliot"), novelist (born 1820).

American.—Jan. 3. Death of Gilbert Haven, Methodist bishop (born 1821). May 9. Death of George Brown, Canadian statesman (born 1818); 27. Chilians defeated Peruvians and Bolivians at Tacna; Bolivia then abandoned the war. June 2-8. Republican National Convention at Chicago nominated Gen. J. A. Garfield of Ohio for President, and Chester A. Arthur of New York for Vice-President; 13. Death of ex-Senator J. A. Bayard of Delaware (born 1799); 23. Death of Dr. Constantine Hering, founder of homœopathy in the United States (born 1800); 24. Democratic National Convention at Cincinnati nominated Gen. W. S. Hancock of Pennsylvania for President, and W. H. English of Indiana for Vice-President. Sept. Convention of the Reformed churches (Presbyterian) in Philadelphia. Nov. 2. Presidential election: Popular vote, Garfield 4,439,415; Hancock 4,436,014; electoral vote, Garfield, 213; Hancock, 156; 8. Death of Col. E. L. Drake, who drilled the first oil-well in Pennsylvania; 11. Death of Lucretia Mott, Quaker philanthropist (born 1793); 17. New treaty concluded between United States and China, restricting immigration.

1881.—Jan. 21. Treaty between Russia and China defining their territory in Central Asia ratified at St. Petersburg. Feb. 3. Clôture adopted in the British House of Commons; 4. Death of E. Drouyn de Lhuys, French statesman (born 1807); 5. Death of Thomas Carlyle, philosopher and historian (born 1795); 25. British House of Commons passes the Irish Protection bill; 27. British general Sir G. Colley defeated and

slain by boers at Majuba. March 13. Czar Alexander II. of Russia assassinated; his son, Alexander III., succeeded; 17. Irish Arms bill became a law; 24. British Government recognized the independence of the Transvaal republic; 26. Prince Charles proclaimed king of Roumania; Anti-Jewish riots at Kiev and other places in Russia. April 3. Earthquake in the island of Scio; 7000 lives lost; 19. Death of earl of Beaconsfield (born 1804); Lord Salisbury becomes the leader of the Conservative party in England; 25. French army invaded Tunis. May 12. French army having surrounded the city of Tunis, the Bey signed a treaty with France; liberal constitution of Bulgaria abolished by the king. June 14. Greece reluctantly ratifies a treaty with Turkey, annexing Thessaly and Southern Epirus; 27. Death of Dufaure, French statesman (born 1798). July 13. Riot at Rome at the removal of the body of Pope Pius IX. from St. Peter's to the special tomb in the church of St. Laurence; 18. Death of Rev. A. P. Stanley, dean of Westminster (born 1815). Aug. 22. Irish Land Law receives the royal sanction; it first passed the House of Commons July 29, but was afterward amended. Sept. 9. The Egyptian army, led by Arabi Bey, compel the khedive to form a national cabinet under Sherif Pacha. Oct. 13. Charles S. Parnell, leader of the Irish Home Rule party, imprisoned in Dublin; 20. The lord-lieutenant of Ireland prohibits Land League meetings. Nov. 9. Jules Ferry resigns his ministry; Gambetta succeeds, taking the portfolio of foreign affairs. Dec. 3. Italian Reform bill passed, granting votes to all who can read and write; 15. Turkey makes a settlement with its foreign bondholders; 25. Serious outbreak against the Jews in Warsaw.

American.—Jan. 17. Chilian army enters Lima. February-March. Great floods along the Ohio and Mississippi. March 3. Apportionment of House of Representatives fixed by Congress, allowing 319 members; 4. President Garfield's inauguration. April 18. Law passed restricting Chinese immigration for ten years. May 5. New treaty with China ratified by the Senate; 16. Roscoe Conkling resigns his seat in the United State Senate, but seeks re-election by the New York legislature. June 11. Arctic exploring steamer Jeannette crushed in the ice. July 2. President Garfield shot by C. J. Guiteau in Washington; 16. E. G. Lapham and Warner Miller elected United States Senators from New York to succeed Roscoe Conkling and Thomas C. Platt. Sept. 4. Immense forest fires in Michigan, 300 lives lost; 19. Death of President Garfield at Elberon, N. J. (born 1831); 20. President Arthur takes the oath of office privately, and again formally Sept. 22. Oct. 10. United States Senate meets in special session; 19. Centennial celebration of the battle of Yorktown, Va. Dec. 3. W. H. Trescott sent by the United States Government to induce peace between Peru and Chili; 5. Forty-seventh Congress assembled; Gen. J. Warren Keifer of Ohio elected speaker of the House.

1882.—Jan. 1. St. Gothard tunnel opened to traffic; 26. Gambetta resigns his ministry; De Freycinet succeeds Jan. 30. Feb. 8. Death of Berthold Auerbach, German novelist, at Cannes, France (born 1810). March 6. Servia becomes a kingdom, Prince Milan II. taking the title of King Milan I. May 6. Assassination of Lord Frederick Cavendish, secretary of state for Ireland, and Thomas Burke, assistant secretary, in Phoenix Park, Dublin; 25. The representatives of France and England in Egypt demand the removal of Arabi Bey. June 2. Death of Garibaldi, Italian patriot, at Caprera (born 1807); 11. Several Europeans slain at Alexandria; the rest seek safety on ships in the harbor; 18. Treaties between Austria-Hungary and Servia ratified. July 7. Death of Russian Gen. M. D. Skobelev (born 1843); 8. France refuses to take part in the English intervention in Egypt; 11. British fleet bombards Alexandria; 12. Irish Repression bill becomes a law; 15. John Bright resigns from the British ministry on account of its foreign policy; 21. Gen. Wolseley

placed in command of the British expedition to Egypt. Aug. 1. Celebration of the 500th anniversary of the annexation of Trieste to Austria; Industrial Exposition opened; 2. Arabi Pacha proclaims the khedive of Egypt a traitor and himself the true representative of the sultan; 15. Cetywayo, king of the Zulus, prisoner in London, allowed to return to Africa; 17. Insurrection in Corea and massacre in the royal palace, the king escaping; 20. The Suez Canal seized by the British troops. Sept. 1. In Russia, courses of medicine closed to women; 9. Arabi Pacha attacks the English at Kassasin, but is repulsed; 11. Anti-Semitic congress at Dresden; Assembly of German Catholics at Frankfort-on-the-Main; Arabi Pacha defeated at Tel-el-Kebir, and British enter Cairo; 16. Death of Rev. Dr. E. B. Pusey, English theologian (born 1800); 18. Inundation on the Upper Danube; 25. Khedive of Egypt restored to power in Cairo. Oct. 17. Irish National conference at Dublin under C. S. Parnell; 31. Earl Dufferin sent to Egypt to assist in restoring order. Nov. 26. French Chambers sanction De Brazza's acquisition of territory on the Congo River; 27. Great floods along the Rhine, which continued during December. Dec. 3. Death of Rt. Rev. A. C. Tait, archbishop of Canterbury (born 1811); Arabi Pacha, condemned by court-martial, is banished to Ceylon; 6. Death of Louis Blanc, French historian and socialist (born 1813); 16. Changes in the British cabinet, H. C. E. Childers becoming chancellor of the exchequer; 27. In Austria, celebration of the 600th anniversary of the House of Hapsburg; 31. Gen. Wood's plan for reorganizing the Egyptian army is accepted.

American.—Jan. 4. Death of Prof. J. W. Draper, scientist and historian, in New York (born 1811). March. Great immigration of Jews from Russia; Report made to the Government that 85,000 persons have been rendered destitute by the Mississippi floods; 24. Death of Henry W. Longfellow, poet, at Cambridge, Mass. (born 1807). April 27. Death of Ralph Waldo Emerson, philosopher, at Concord, Mass. (born 1803). May 8. Bill to restrict Chinese immigration for ten years becomes a law. June 27. Constitutional amendment prohibiting liquor adopted by the people of Iowa; 30. Guiteau, assassin of President Garfield, hanged. Aug. 1. National Mining Exhibition opened at Denver; 2. River and Harbor Appropriation bill passed over the President's veto. August–October. Tariff commission visits various parts of the country. Oct. 24. Bicentennial anniversary of William Penn's landing celebrated in Philadelphia. Nov. 7. State elections highly favorable to the Democratic party, New York, Pennsylvania, Ohio, and Massachusetts being carried by them; 199 Democrats and 127 Republicans elected to Congress; 13 Democratic governors elected. Dec. 11. Death of Sir Hugh Allan of Montreal, in Edinburgh (born 1810). Business portion of Kingston, Jamaica, destroyed by fire.

1883.—Jan. 1. Death of Gambetta (born 1838); 5. Death of Gen. A. Chanzy (born 1823); 11. The foreign control in Egypt abolished, France protesting; 16. Prince Jerome Napoleon ("Plon-Plon") imprisoned for a futile manifesto; 28. Duclerc resigns the premiership of France, and is succeeded by M. Fallières. Feb. 5. Mr. Colvin is made financial adviser of the Egyptian Government; 8. Danubian conference at London enlarges the jurisdiction of the Danubian commission; 12. Coronation of King Kalakaua at Honolulu, Sandwich Island; Irish assassins of Lord Frederick Cavendish and Mr. Burke convicted on information of Carey, an accomplice; 13. Death of Richard Wagner, German composer of operas (born 1813); 16. In Russia, a commission appointed to investigate the Jewish question; 18. Fallières resigns the premiership of France, and is succeeded by Jules Ferry. March 7. Death of Rev. J. R. Green, English historian, at Mentone, Italy (born 1837); 10. Death of Comondourus, Greek statesman; 11. Death of Prince Gort-

schakoff, Russian prime minister (born 1798); 16. Death of Carl Marx, German socialist, founder of the International Society of Workingmen (born 1818). April 3. Congress of German socialists at Copenhagen; Von Bennigsen, German liberal leader, retires from public life; 10. Explosives act, passed in consequence of frequency of dynamite outrages in Great Britain, becomes law; 16. French vessels bombard ports in north-west of Madagascar; 19. Specie payment resumed in Italy. May. Pope Leo XIII. in a letter to the Irish bishops opposes the Parnell fund; 25. French defeated at Hanoi in Tonquin by the "Black Flags"; 26. Death of Abd-el-Kader, Arab general, at Damascus (born 1805); 27. Coronation of Czar Alexander III. at Moscow in the Kremlin cathedral; 29. James Carey, Irish informer, killed by O'Donnell at sea off the coast of South Africa. June 13. French Admiral Pierre bombards and captures Tamatave, in Madagascar; 16. British commission condemns project of under-sea tunnel from Dover to Calais; 20. Death of Bishop J. W. Colenso of Natal (born 1813); 28. British House of Lords rejects bill permitting marriage with a deceased wife's sister; 30. Prussian Landtag virtually repeals the May laws of 1873, which had been so obnoxious to the Catholics. July 28. Earthquake at Ischia, an Italian island, destroys Casamicciola; 3000 lives lost. Aug. 24. Death of Henri, comte de Chambord, head of the French Bourbons (born 1820); Comte de Paris, of the Orleans branch, succeeds to his claim on the throne of France; 25. French capture Hue, capital of Anam; 26. Great volcanic eruptions near Java; Mount Krakatoa submerged; immense loss of life and property. Sept. 1. French defeat the Black Flags near Hanoi, Anam; 3. Death of Ivan Tourguéneff, Russian novelist, at Bongival, France (born 1818); 11. Death of Henri Conscience, Flemish novelist, at Paris (born 1813); 28. Colossal statue of Germania, representing the new German empire, unveiled in the Niederwald. Oct. 20. Typhoon destroys large part of Manilla, in Philippine Islands. Nov. 10. Celebration of the 400th anniversary of the birth of Martin Luther, the German Reformer; Egyptian army under Hicks Pasha totally defeated by El-Mahdi in Soudan.

American.—Jan. 4. Gen. B. F. Butler installed as governor of Massachusetts; 20. Gen. Iglesias appointed president of Peru by a Congress at Catamarca with a view to peace with Chili. Feb. 4. Great floods along the Ohio River; Congress ordered the unexpended balance of the Japanese indemnity fund to be returned to Japan. March 3. G. F. Edmunds of Vermont chosen president of the United States Senate; 4. Death of Alexander H. Stephens, governor of Georgia (born 1811); 27. Insurrection in Hayti. April 4. Death of Peter Cooper, philanthropist (born 1791); 27. Irish Nationalist societies of America reorganize in Philadelphia, electing A. M. Sullivan of Chicago president. May 16. Treaty of peace concluded between Chili and Peru; 24. New York and Brooklyn bridge formally opened. June. Great floods in the Missouri and Mississippi Valleys; Gen. G. Crook crosses the Mexican boundary and destroys Apache camps. July 1. Reduced tariff goes into effect; internal taxes abolished except on tobacco and spirituous liquors; 4. Death of Archbishop J. B. Purcell of Cincinnati (born 1800); 16. Civil Service Reform goes into effect under a commission, D. B. Eaton chairman; 19. Strike of 12,000 telegraph-operators of the Western Union Company; 25. Centennial anniversary of the birth of Gen. Simon Bolivar, the South American Liberator. Aug. 1. Louisville Exposition opened by President Arthur. Sept. 19. Death of J. S. Black, jurist (born 1810). Oct. 1. Postage on letters reduced to two cents on each half ounce; Ohio State elections give a Democratic majority of 10,000; Prohibition amendment defeated by 70,000 majority; 23. Lord Lansdowne installed as governor-general of Canada. Nov. 1. Lieut.-Gen. P. H. Sheridan succeeds Gen. W. T. Sherman (retired) in command of the United States army; 10. Elections give

decided Republican majorities in the Northern States; 10. Centennial of Evacuation Day observed in New York; 18. New railway time standard adopted in United States. Dec. 3. Forty-eighth Congress meets; J. G. Carlisle of Kentucky elected speaker of House.

CHRYSANthemum ("Golden Flower"), a popular name for certain plants of the order *Compositæ*, species of which have been introduced from China and Japan during comparatively recent times, the date in England being fixed at 1764. The name is employed by Dioscorides when referring to what is now known as *Chrysanthemum coronarium*, a bright-yellow species which abounds along paths and by roadsides in Greece. The Chinese plant was referred to *Matricaria* by Sherard, Ray, and others in the early part of the last century, who were familiar with dried specimens received by way of the East Indies, and it was ultimately referred to the genus *Chrysanthemum* by Linnæus as *C. Indicum*. Later botanists, however, refer it to the genus *Pyrethrum*, which differs from *Chrysanthemum* in having a membranous border to the angular, wingless achenes. There appears also to have been some misapprehension in regard to the specific name. Mr. Sabine, an English botanist, pointed out in 1823 that among cultivated chrysanthemums there were evidently two species. These are known to florists now as the "large-flowered" class, and the "small," or "pompons." The Linnæan plant was believed to be the latter, *C. Indicum*, while Mr. Sabine named the large-flowered species *C. Sinense*. Though cultivated at the Chelsea Gardens in England in 1764, and in the Low Countries as early as 1688 (if we may credit Breyne), it was not till plants were introduced to France by M. Blanchard of Marseilles in 1789 that modern cultivation properly began. He had three shades of color. Few persons, however, seemed to note that the plant produced perfect seeds under culture, and hence new varieties seldom appeared. But about 1846 attention to raising seedlings became general, till, in 1860, we find Salter, a florist, had 750 varieties, 250 of these being of the *Pyrethrum Indicum*, or "pompons," class. It is believed that up to the present time at least 1500 varieties have been raised and named by different cultivators. The small-flowered kind, *P. Indicum*, was reintroduced from China in 1846 by Mr. Robert Fortune, under the name of the "Chusan daisy."

In the wild form the ray florets are strap-shaped and the disc florets tubular, with fine regular teeth, much as in the common ox-eye daisy; but the florists have so developed them that there are numerous subclasses or sections, such as those which have flowers like the normal form, though in varied colors, which are called anemone flowers. Then there are those with tubular flowers changed to strap-shaped, as in the ray florets, with some curving upward, others downward, and some fairly horizontal. Some have the petals rolled up like quills. Again, there are classes founded on the edges of the corollas. Some have the strap-shaped florets deeply cleft, and the tubular ones have also forms more or less deeply lobed; and there are quilled ones, which have the apices flattened and presenting a spoon-like character. Much skill is also employed in growing the plants in different forms. Often several stalks are permitted to come up from the earth in the pot, and then neatly spread out by almost invisible stakes. Plants perfect hemispheres of four feet across are often thus obtained. Some train them as pyramids, others on fan-shaped wire trellises; but the great effort with the best cultivators is to get the finest plant possible from only a single stem in one pot. The plant is made bushy by judiciously pinching out the ends of the young shoots as they grow. They endure a considerable amount of frost in the Northern United States, but are killed by unusually severe winters; and their popularity is chiefly when employed as pot-plants for rooms and conservatories in late autumn and the early winter season of the year.

It is generally believed that, notwithstanding the proverbial gardening skill of the Chinese and the Japanese, European florists have far exceeded them in the improvement of the chrysanthemum during the half century they have given to the task. But perhaps we have not learned exactly what the Asiatics have done for it. Kæmpher, who wrote of Japan in 1712, notes that under the name of "kik" it was everywhere under culture in that country. In China it must have been grown for ages, as not only does it afford a general type of architectural ornament, but seems to have a place in the ancient history of this country. One of the national honors is the "Order of the Chrysanthemum." It is one of the badges of the Japanese empire. In Corea the annual Chrysanthemum festival is one of the greatest national holidays. The Coreans have brought chrysanthemum culture to great perfection.

The chrysanthemum is said also to be the national flower of Siam. (T. M.)

CHUCK-WILLS-WIDOW (*onomat.*), a fissirostral bird of the family *Caprimulgidae*; the *Antrostomus carolinensis*, closely related to the whippoorwill (*A. vociferous*), inhabiting the South Atlantic and Gulf States. It is the largest species of the genus, about 12 inches long; the pointed wings, 8 or 9; the rounded tail, about 6; and distinguished from its congeners in the fact that the long bristles which fringe the deeply-cleft mouth are furnished with lateral filaments. The feet are extremely short and weak, as in all of the genus; the middle claw is pectinate, and the phalanges of the digits have the abnormal numerical ratio (2, 3, 3, 3 for first to fourth) of other *Caprimulginae*; the head is broad and flat; the horny part of the beak is extremely small in comparison with the depth of fission of the mandibles. The plumage is remarkably soft and lax, and singularly variegated with black, brown, tawny, and fulvous, the brighter of these tints giving the prevailing tone; there is a white bar on the throat, and several lateral tail-feathers are tipped with white on the male. It is nocturnal in its activities, and in all respects its habits are similar to those of the better-known whippoorwill; the name, like that of the latter bird, comes of the attempt to express its uncouth cries in a word. (E. C.)

CHURCH. In the New Testament *ecclesia*, signifying "convocation," is the only single word used for church. It was the name given to the democratic governmental assembly of the citizens of Athens, duly convoked by proper officers, and possessing all political power, including even juridical functions. The word is used by the evangelists and apostles with several applications—sometimes of single assemblies, sometimes of the places of habitual concourse for worship and preaching, and sometimes for all the congregations associated together in union, as in a city or province. It is also used simply to denote the whole united body of the faithful. It is then spoken of as a divine organization—viz. "the Church of God"—and called "the kingdom of God," "the kingdom of heaven," "my kingdom" by Jesus himself, and "the household of God." St. Paul describes the church as the body of which Christ is the Head, as the husband is the head of the wife, and, further, as the organic body of which his disciples are members in particular; "members of his body;" "the church which is his body, the fulness of him that filleth all in all." The original idea of the Church, therefore, contains several particulars: (1) It is an organism, and as such gives and nourishes the divine life. (2) It is an organization whose functions are disciplinary, defensive, and instructive. (3) It is a convocation, duly called, but voluntarily entered, and constantly open to free ingress or regress. There is yet another idea of the Church, modern in origin, but so prevalent as to constitute the common and most popular view of the Church entertained in America. This idea is philosophical, and will be considered later

The historical Church in America, must, of course, include all those aspects which are given to it in the New Testament. It must also be based upon "the foundation of the apostles and prophets, Jesus Christ himself being the chief corner-stone." The historical continuity of the Church, as a fact and a necessity, is generally accepted in America. Two distinct, and indeed antagonistic, schools of opinion, exist, however. They disagree as to what actually constituted the essence of the Church in the beginning, and they are divided upon all three of its distinctive points. Both agree that it is a spiritual body, but one so dwells upon the spiritual aspect that it regards the true Church as invisible even on earth; while the other regards its visibility as belonging to its essence, necessary both to its continuity and to the efficacy of its administration.

Under the second class may be placed the Roman Catholics, the Episcopalians, Moravians, Presbyterians, German and Dutch Reformed, and Lutherans. The first of these claim that to St. Peter was given supremacy over all the other apostles, and that the pope is the lineal descendant, in the episcopate of Rome, of St. Peter. They assert, therefore, that communion under the pope is necessary to membership in the Church of Christ. The others agree in rejecting this Roman claim, and in regarding the Church in America as necessarily continuous through visible transmission of authority. They differ as to one point essential for transmission. Episcopalians claim that the apostolic succession comes through bishops only, regularly ordained in unbroken line from the apostles' time to the present. The others hold that the apostles were not made a distinct and perpetual order in the ministry, but had an office which rested only upon the original twelve, with St. Paul, and came to an end at the death of St. John. Presbyters were at first, and are yet, they claim, the one divine order of the ministry that was intended to be perpetual in the Church. There are other Christian bodies in America holding a distinct, fundamental position, which are reserved for consideration when the philosophical idea of the self-evolute Church is discussed. They hold that the true Church even on earth is invisible, and they claim a right to exist, and act as parts of the living body of Christ, because of adherence to what they call the essential abstract truth of the gospel.

The historic churches—so designated for distinction's sake—claim visible continuity from the earliest Christian age to the present, and assert the necessity of this continuity until the end of time.

I. They agree in general that the Church is an organism, but a great variety of opinions prevail as to the functional operations of the organism. The authorized formularies of all declare that an actual personal union with Christ, the Head of the Church, is formally made by baptism, and that the one sacrifice is truly fed upon in the Eucharist. They differ, however, with one another, and even among themselves, in interpreting the meaning of their formularies. Those, occupying the extreme on one side look upon the sacraments as merely convenient badges and signs of the Christian profession, obligatory because divinely appointed; while those on the opposite extreme regard them as effective *ex opere operato*. Between these two extremes many various opinions are prevalent, and controversies, of course, are common.

II. While the historic churches agree in the position that a distinctive organization was given to the visible Church in the beginning, they differ as to the original form, the mode of its transmission, the seat of authority, and the extent of its powers. The extremes in these cases extend from the exclusive claims of the Papacy to that of a joint disciplinary authority vested in presbyters and people together, and acting through their conjoint concurrence. Among those that adhere to the Episcopal regimen, while rejecting the Papacy, the idea is common that bishops are the original depositaries, not only of the ordaining function, but of govern-

ment also. The former belongs to bishops alone, although presbyters concur and join in "the laying on of hands" by which orders are conferred. Of government, however, the bishops retain exclusively only the executive portion, having admitted priests, deacons, and even laymen, to the legislative functions, and to some extent even to the juridical. Some hold that this right of legislation belonged to all orders of the clergy, with the laity, from the first. These appeal to the first Council in Jerusalem (Acts xv.), in which "the apostles and elders and brethren" exercised legislative and judicial functions. Those who adhere to the Papacy retain all the functions of ecclesiastical government in the hands of the bishops, subject always to the pope. Those who reject the episcopacy confine these functions to their ministers and elders. The ministers receive authority with their orders, which comes by regular transmission through some who have themselves been duly ordained. The elders are chosen by the members of settled congregations, and constitute, with the minister, the "session." This session has all governmental power—legislative, judicial, and executive—in the congregation, and is the source whence delegated power is given to the ascending gradations of presbyteries, synods, and assemblies among the Presbyterians, or of consistories, classes, and synods among the German and Dutch Reformed, and of synods among the Lutherans, etc. There is nothing in the defensive and instructive functions of the historic ecclesiastical organizations which is distinctively American. The usual public preaching is done by those in orders, though laymen often take part in occasional meetings for missionary and educational advancement, or in those called for moral and social improvement.

The historical churches recognize the convocational character of the Church, and hence regard it, in some respects, as a voluntary association, but not so as to take away its primitive origin and consequent continuity. They hold that membership in the Church is essentially voluntary where persons "have attained to years of discretion." Those who baptize infants regard them as church members, who should take upon themselves the baptismal vows when they reach the years of due understanding and judgment. Those who hold high views of the sacraments teach that the baptized infant is, by the ever-present, unseen "Head over all things to his Church," actually then and there organically engrafted into himself and made a member of his body. They rely upon the promise of his continual presence, given at the institution of baptism. Even they, however, recognize the right and duty of voluntary acceptance of baptismal obligations, and provide for a confirmation both of the vows and the grace at an early period of moral consciousness and sense of duty. Those who have not retained confirmation, as a definite rite or sacrament, receive baptized persons to the communion upon examination as to faith and personal Christian "experience."

Those who retain the episcopacy, and claim organic identity with the primitive Church catholic through an unbroken succession of bishops in and to the apostolic order, and yet deny the exclusive catholicity as well as papal claims of the Church of Rome, constitute two prominent bodies in America and differ somewhat in administration. Their popular names are Episcopalians and Moravians.

Those generally called Episcopalians, but who in habitual language speak of themselves as "Churchmen," recognize bishops, presbyters, and deacons as holding distinct orders in the ministry, and as having each their own governmental and ministerial powers, rights, and duties. The bishop has the oversight of a diocese or of a defined missionary jurisdiction, presides *ex-officio* at all conventions, votes, or may give a casting vote. The judicial functions of the bishop are based upon the fundamental idea of chief-pastorship. He is over the pastors of the parishes, and is supposed to exercise a fatherly influence, and, where needful,

control. Hence in case of the trial of a clergyman the bishop only can pass sentence, which he may do or not upon revision of the evidence. Trials are always before a court, in most instances appointed especially for the case, though some dioceses have each a fixed and standing court. In every instance, however, a priest must be tried by priests, and a bishop by bishops. The rights of the brethren or "laity" to voice and vote in legislation are universally acknowledged. The clergy and laity, in a governmental capacity, meet first in the parish, which is a body politic as well as ecclesiastic, and is recognized by the State as a corporation. Its limits are defined by both statute and canon law. Essentially, it consists of two portions. The clergyman, or rector of a parish, has exclusive direction in spiritual matters and concurrent authority in temporals. The temporal affairs are administered by a vestry composed of laymen and presided over by the rector. This laical element is recognized in all diocesan conventions, which meet annually, and in the General Convention, which meets triennially. In diocesan conventions laymen sit as chosen delegates of parishes in the same house with clergymen, who sit by right of office, the bishop presiding. In the General Convention clerical and lay deputies from dioceses or missionary jurisdictions form a lower house, while the bishops constitute an upper house, wherein they sit by virtue of their office. There is no judicial system distinct from the legislative. Provision is generally made by canon for trial of a bishop or presbyter through specific courts appointed for specific cases as they arise, while certain methods and orders of proceeding are prescribed. Where, as in some dioceses, permanent courts for trial of presbyters exist, they are also fully governed by canons. Deacons are amenable to bishops only.

The laity are under the disciplinary authority of the rectors of their parishes, with appeal to the bishop, whose adjudication is final. They can, however, only be suspended from communion, and that solely for scandalous offences or for open enmity with one another.

Upon the whole, the position of the Episcopal Church in America is that of a body which claims historic continuity with the Church of all ages through the apostolic office perpetuated by the succession of bishops from the apostolic times, and possessing identically the same means of grace which, given by Christ in the beginning, are always accompanied by his effective personal presence, and made specifically effective to faithful receivers or partakers through the vivifying operation of the Holy Spirit ever present through Christ in the Church, which is his body.

While praying in their liturgy for the visible unity of the Church, and expressing commonly an earnest desire for its restoration, the Episcopalians do not generally favor any schemes for "evangelical alliance." The Greek Church, the Old Catholic, and by most the Moravian, are recognized as integral portions of the Church catholic, but the Protestant denominations are regarded as broken off from the organic continuity of the visible Church by their rejection of apostolic succession through the episcopal order. They fault the Roman Church for claiming papal supremacy and for additions to the Catholic Creed.

The Reformed Episcopalians are as yet a small body that seceded from the Episcopal Church, and held a convention first in New York, Dec. 2, A. D. 1873. George David Cummins, D. D., assistant bishop of the diocese of Kentucky, led the movement. Their distinctive peculiarity is an entire rejection of the organic idea of the Church, naturally accompanied with strong opposition to priesthood and the efficacy of sacraments. They hold that episcopacy is ancient and desirable as a form of government, but not of divine origin. Their bishops are without dioceses or defined jurisdiction. They exercise their office at large, and serve parishes as ordinary presbyters.

The Moravians, or United Brethren, do not differ

materially from the same body in Germany and Great Britain. They are divided into three provinces, that in this country being the American. They retain the episcopate, with the orders of presbyter and deacon. The bishop administers a diocese, but has assistants or conseniors, who sit with the bishops in the "Upper House of Synod." A primate presides. The lower house is composed of the priests, though candidates for holy orders and other laymen are admitted to seats without votes. The American Provincial Synod meets triennially, and elects a body, called "provincial elders' conference," to administer government in the intervals between Synods. It has power to appoint ministers over parishes. There are four district synods, that meet annually. Over all is the General Synod of the three provinces, which meets every ten or twelve years in Saxony, and elects a body of twelve bishops and other ministers, called "the unity's elders' conference," which exercises general supervision over the whole Moravian body.

The historic churches in America which reject episcopacy altogether, and hold to one order of ministry as established at first in the primitive Church, and since transmitted in unbroken succession, are the Lutherans, the German Reformed, the Dutch Reformed, and the Presbyterians.

The Lutherans do not differ materially from the same body in Europe. Swedish Lutherans seem to have been the first in this country. They settled at Wilmington, Del., A. D. 1638. Others from Germany settled in New York, in 1644. Still others, refugees from civil oppression and religious intolerance in Salzburg in Germany, settled in Georgia in 1734.

The first Lutheran Synod in America was organized in Philadelphia, Aug. 14, 1748, under the influence of Dr. Henry Melchior Muhlenberg, who had come from Germany upon urgent solicitation from the Lutherans in this country. Besides Dr. Muhlenberg, three German and two Swedish Lutherans composed this first synod. They "set apart" the first German Lutheran in America for the work of the ministry. The General Synod was organized Oct. 22, 1820, by delegates representing 135 ministers out of 170, and 33,000 out of 35,000 communicants. The Church grew slowly, and synods were established under the General Synod. After the late war between the South and North the Southern Lutherans came together, in what they styled the "General Synod of North America." In the North doctrinal controversies arose between the strict and liberal adherents of the Augsburg Confession. The Church, North and South, held a General Council in Fort Wayne, Ind., in November, 1867. Although divisions were not all healed, nor controversies terminated, the tendency among the Lutherans, like that among all the different Christian bodies in America, was from that time, and still continues, toward tolerance of differences and unity of action.

The German Reformed Church had a status in America early in the eighteenth century, having settlements in five of the Middle States, especially in Pennsylvania and Virginia. Under the influence of the Rev. Michael Schlatter, from St. Gall, Switzerland, the first synod or *cœtus* was organized in Philadelphia, Sept. 29, 1747, and placed under the direction of the Classis of Amsterdam. It remained thus until A. D. 1793, when an autonomous synod was organized, a constitution adopted, and the name taken, "High German Reformed Church." For some years the Church suffered for the want of educated ministers and from disorderly persons. The constitution was revised A. D. 1819, and the synod, which hitherto had consisted of one minister and one delegate from every parish, became a representative body. Its members were chosen by ministers and elders belonging to the classes. This has grown until the present order was fixed and settled. Now a *classis* is made up of the ministers and one elder from every parish within a given district. A *synod* is composed of delegates

from four or more adjacent classes. The *General Synod* is a delegated body of ministers and elders from all the classes. These bodies are all both legislative and judicial. In case of trial every minister and member has the right of appeal from the lower to the higher courts. Their form of government is presbyterian. Every congregation has its "consistory," made up of pastor, elders, and deacons. Elders and deacons are chosen for *one, two, or four* years by communicant members of the congregation. They are first ordained, then installed. If not chosen again, they retain their ordination, but if elected again in the congregation they must be again installed.

In accordance with the corporate idea of the Church, they baptize infants and then carefully catechise and train them as already in the "body of Christ." Catechumens, when of proper age, are examined in presence of the elders of the congregation before receiving the rite of confirmation. This is conferred by presbyters, as the one only apostolic order retained and transmitted through the perpetuated organism of the one Church.

The Dutch Reformed Church, is also presbyterian in order, and is Calvinistic in doctrine. It first appeared in America at New Amsterdam (now New York), where its first church was erected in 1619. When the Dutch colonies came under British dominion the Church retained its position with a landed endowment which has since made it very wealthy. The Classis of Amsterdam exercised complete jurisdiction until about 1737, when a *coetus*, a kind of lesser synod, was formed in America to meet yearly. Naturally, differences arose between those who wished for local liberty and those who wished to retain subjection to the authority of the mother Church. Through John H. Livingston, of New York, an adjustment of differences was effected, and a plan of union with the Classis of Amsterdam perfected about 1772. A General Synod was then organized in New York, with five subordinate classes. The doctrinal symbols were finally agreed to in 1792, and were adopted as the constitution of the Reformed Dutch Church in America. The constitution classifies the officers of the Church as—(1) ministers of the Word; (2) teachers of theology; (3) elders; (4) deacons. The ministers sign formularies declaring hearty belief and persuasion of the truth and authority of the theological standards, and promising to teach and defend them. Should doubts arise, they shall be submitted to the consistory of the proper parish, where liberty of conscience shall be respected and no judgment enforced arbitrarily. The abuse of this order is provided against by right of appeal. The office of the ministry is regarded as sanctifying the recipient for life, and setting him apart from all secular pursuits. The office of teachers in theology is given to presbyters by appointment of the General Synod, which is the supreme ruling body in the Church. Their work is that of professors in seminaries for theological or general instruction. They cannot hold a pastoral charge, though they may preach and assist pastors in public worship, and, with the consent of a minister and his consistory, administer the sacraments. Elders are chosen by the male communicant members of a congregation from among themselves. Their duties are general supervision of parish affairs, the examination and reception of communicants, maintaining discipline, and choosing delegates to the classis. They hold office for two years, half going out every year. Their number is left to the determination of each constituency. Deacons are chosen for two years, as above, and have care of the poor.

Every congregation has a primary assembly, composed of ministers, elders, and deacons, who have equal voices, and may elect to vacancies during their unexpired term of office. This body elects the minister. A separate legal board of trustees holds and manages the temporalities, and may contain members who are not church-members.

There are four gradations in the form of government: (1) The *consistory*, or government of a single parish, which consists of the minister and all who are or have been elders and deacons. They elect one or more elders to represent the parish in the classis. (2) The classis, which is composed of ministers and at least one elder from each parish within its district. It has the right to license, ordain, install, dismiss, suspend, and depose ministers, to try appeals from consistories, and to exercise general supervision over all church affairs within its district within limits prescribed by the "particular synod." It must report annually to the particular synod on all matters affecting the temporal and spiritual condition of the churches. (3) The *particular synod* is the next superior legislative and judicial body. It meets annually, and is composed of four ministers and four elders from each classis. As a court of appeal it reviews all cases brought up from the classes. It has power to form new classes and to transfer congregations from one classis to another. It confirms the nominations made by the classes of delegates to the General Synod. The provincial synod of New York and that of Albany were set apart in 1800, that of Chicago in 1850, and that of New Brunswick in 1869. They now comprise about ten classes each.

The General Synod is the superior governing body over the whole Church. It is at present composed of nine ministers and nine elders from each particular synod, though every classis containing over fifteen churches is entitled to send one extra delegate for every five churches over the fifteen. Its sessions are annual and continue about ten days. It has a general supervision over the whole Church, and is a court of appeal of last resort. It may form new or change old particular synods. It corresponds with various assemblies of other denominations. It may alter the constitution upon recommendation of the classes, a majority of whom finally decide. It elects annually a board of direction of corporation, which manages the fiscal concerns and holds all the property of the Synod.

These three churches—viz. Lutheran, German, and Dutch Reformed—are rather distinct from than influential in the development and progress of what is peculiarly American in the current ideas and aspects of Christianity. They are German in tone, and are materially influenced by the condition of the German churches from which they sprung and with which they maintain close correspondence. They form an almost separate element in the midst of the American religious progress. Like the Moravians, their weight and force, though great, are local, and they are more racial than national in character and tendency.

The Presbyterians proper in America, like their ancestors in England and Scotland, adhere to the Westminster Confession of Faith. This, together with the Larger and Shorter Catechisms, is commonly called the creed of Presbyterianism. There are several distinct bodies of Presbyterians, but they have all common characteristics and exert like influences in the progress of Christianity in America. Their points of difference are growing less and less. While visible corporate unity is, upon the whole, advancing among them, there is no very definite or persistent efforts to secure it. Indeed, the prevalence among them of the idea that the true Church is essentially invisible, known only to the Searcher of minds and hearts, causes them to desire visible unity rather for the sake of its manifestation to the world of Christian charity, than for any special faith in its necessity to the honor of God and the good of souls.

In ecclesiastical polity their position is, that there is one order only of ministers, originally called presbyters or elders, and that these have two functions—one of teaching and one of ruling. In common speech, as well as in the "Form of Government," the teaching elders are termed ministers, while the term "elder"

is confined to individuals in that class who in separate congregations are elected and "set apart" as "the representatives of the people chosen by them for the purpose of exercising government and discipline in conjunction with pastors or ministers" (chap. v.). These constitute "the session." In fulfilling their functions the elders assist at the examination of candidates for baptism or for reception to communion, and give both opinions upon the fitness of candidates and votes as to their admission to what is called "full membership in the Church." These elders may be elected—one from each congregation—to sit in the presbytery, which is the first and lowest common legislative and judicial body. The ministers, residing within the limits of the jurisdiction of a presbytery, sit by right of office. The presbytery exercises careful supervision over its congregations, receives appeals from church sessions, examines, ordains, installs, removes, and judges ministers, and, in general, performs whatever governmental acts it may think expedient or necessary for the preservation of the faith, the promotion of order, and the securing of good conduct, with proper administration of affairs and of doctrine, in the congregations subject to it.

A synod is the next higher body. It consists of ministers and elders elected as representatives of the presbyteries. It has like extensive powers over its constituency. It receives appeals from, and reviews the judgments and even the records of, presbyteries, redresses whatever is contrary to order, erects new or divides old presbyteries, and endeavors to promote the edification of the Church. The synod meets, at least, annually. "The General Assembly is the highest judicatory of the Presbyterian Church. It represents in one body all the particular churches of the denomination." Upon the principle that the majority rules, which is fundamental in the polity of the Church, the General Assembly, as the highest body containing the concentrated representation of the whole Church, receives appeals as a court of last resort and exercises entire control over all church affairs. It is composed of delegates from the presbyteries, "styled commissioners to the General Assembly." It meets annually, is presided over by a moderator elected every year, who may have a casting vote or vote as a commissioner, but cannot have two votes.

Besides minister, or pastor, or bishop, which are different names given to the one office of "teaching elder," and the elders proper, every congregation may elect and set apart one or more deacons, whose special duty is to look after the poor and administer the temporal affairs of the congregation. These, as also the elders, receive an ordination from the pastor and the right hand of fellowship from those already ordained to the same offices. This ordination confers the orders of elder or deacon in perpetuity, but in recent years the exercise of office within the congregation depends upon periodical—generally annual—election by a majority of members of the church.

The one order of the Christian ministry to which Presbyterians adhere as the original and perpetual form, they claim is a historical and natural succession from the eldership in the Mosaic Church. They frequently compare the Christian church to the Jewish synagogue, and their teaching eldership to that which existed among the Jews from early times. The sacrificial worship of the temple at Jerusalem they assert was wholly typical. Hence, when the antitype appeared in the real sacrifice of Christ on the cross, the sacrificial worship formally ceased. Thenceforward acceptable worship of God was to be wholly spiritual, and the offerings of men were to be merely spiritual sacrifices. These spiritual sacrifices they describe and define as offerings by man's spirit, through the grace and power of the Holy Ghost, of penitence, faith, and obedience, expressed in words of devotion and exemplified in holy living. They reject the whole idea of a continuous Christian priesthood.

In entire consistency with their fundamental idea, that the synagogue alone was the true type of the Christian church, Presbyterians strenuously maintain and practically enforce the view that the primary and almost engrossing office and work of the ministry is that of preaching and teaching the word of God. Their ministry holds position in the very front rank of dogmatic theologians, and their people are remarkable for knowledge of, and firm adherence to, the Presbyterian faith. They have had divisions among them, but the tendency now is strongly toward reunion. The chief obstacles to this grow out of the conservatism of the smaller bodies on minor points of usage, a disagreement due to the civil war, and the rejection of distinctive points of Calvinism by the body called Cumberland Presbyterian.

The Presbyterian Alliance is a voluntary congress, in which Presbyterians, of all kinds and from all parts of the world, meet triennially. Religious and moral questions of all kinds are freely discussed. Papers upon assigned or chosen subjects are read by men of note and special standing. Fraternal intercourse is promoted. No votes, however, are taken, and hence no decisions are attempted.

The Roman Catholics in America have no points that differentiate them from the same Church in Europe. They adapt themselves, here as elsewhere, to their environment, but still claim to be exclusively *the Catholics*. Instead of setting themselves against liberty of conscience, they dispute priority with the Baptists in the declaration of religious freedom in America, on the ground that Lord Baltimore in Maryland proclaimed this freedom before Roger Williams did the same in Rhode Island. Their members are chiefly foreign immigrants, with their descendants. Converts are not numerous from native Americans, but when made they are generally from among the socially influential and educated classes. They adhere strenuously to what may be called the mediæval theology. Their disciplinary system is most efficient, the confessional being the means through which its judgments are formed and sentences imposed and enforced. It reaches every bishop through the pope, every priest through the bishop, and every layman through the priest. Though rigid in constitution, the Roman Church is flexible in operation. It wields a vast and growing power for good in the conservation of Christianity—after its own type—in America.

This completes the list of the "historic churches" in America—*i. e.* of those which make it a distinct and prominent point that there has been a manifest continuity of the visible Church from the beginning of Christianity, and that it will continue until the end of time. Many even in this list, not only in the prevalent opinions among ministers and people, but even in their formulas of doctrine, hold that the true Church is invisible, consisting of those who are honest and true members of Christ, but they all adhere also to the constant visibility of some witnessing body of Christ.

The Methodists form a society of Christians in America which began its career as a distinct ecclesiastical body in this country. It holds the intermediate position between the "historical" and the independent or congregational churches. It is largely episcopal in form, but essentially presbyterian in order. It claims transmission of the apostolic succession through presbyters, and not bishops. While it has adopted some of the marked features of the Episcopal regimen, as well as set up a distinct office held by bishops, it holds essentially the Presbyterian position, that there was but one order originally in the Christian Church, named interchangeably bishops or presbyters, which order is perpetuated in and through a succession of elders, to whom, *ex officio*, all ministerial rights and duties belong.

The origin of Methodism dates from November, 1729, when John and Charles Wesley, Whitefield, and

others formed a religious society in Oxford, England, which soon attracted attention, in that age of Erastianism and coldness, on account of their grave and solemn demeanor and their zeal for promoting religion and good morals. The name "Methodists" was given them, partly in derision and partly in historical comparison. It described their fixed and regular habits of devotion, with persistency in all good works, and has become the name by which they are commonly known. John Wesley made efforts to keep the work and whole movement of the Methodists within the organization of the English Church. He even proposed to the bishop of London to ordain preachers for America. His efforts failed, however. Whitefield and Charles Wesley came to America, and the former especially preached with wonderful eloquence and effect. Whitefield was a strong Calvinist, while the Wesleys were both Arminian in doctrine. This led to a separation between them, and a division in their following both in England and America. The Wesleyan portion of the Methodist Church, however, so far prevailed that John Wesley has come to be the generally acknowledged head and originator of the whole organization. Indeed, his admirable talents as an organizer were such, that the ecclesiastical system he devised was accepted promptly, and has since continued without essential modifications. He remained a presbyter, having been ordained as had Whitefield also, by an English bishop. Still, he thought it necessary that the Methodist body in America should be under the control of an order that might exercise episcopal functions. He therefore himself, with the assistance of Thomas Creighton, an English clergyman, and others, ordained Thomas Coke bishop, or rather superintendent, and sent him to America to preside at the first General Conference, held in Baltimore in 1784. He directed that Francis Asbury, who remained almost alone in America during the Revolution, should be associated with Coke in the general superintendence of the whole body in this country. Asbury at first declined, but, being elected by the General Conference, was ordained. He was made deacon on the second day of the session, ordained elder on the third day, and on the fourth was made superintendent or bishop. John Wesley wrote: "As our American brethren are now totally disentangled both from the state and from the English hierarchy, we dare not entangle them again either with the one or the other. They are now at full liberty simply to follow the Scriptures and the primitive Church."

Several divisions exist among the American Methodists. The slavery question divided them before the late war. Now, however, like all other religious bodies, they exhibit a strong tendency toward visible reunion, as well as show a growing influence of reciprocal consideration, love, and charity. Some branches of this denomination have discarded the permanency of the superintendent.

The Methodist Protestant Church, organized in Baltimore in 1830, elects a president annually. The Wesleyan Methodist Church, which was organized in Utica, mainly in opposition to slavery, in 1843, at its General Annual Conference elects a president for one year. The Free Methodists, organized in 1860, elect a superintendent for four years. The others, including German Methodists, United Brethren (1800), and the African M. E. Church separated in 1816, have bishops in both name and functions of office.

In the preponderating body, the Methodist Episcopal Church, the general conference is the superior legislative body of the Church, and has great power. But it cannot change the articles of religion, nor change its own constituencies, nor do away with the episcopacy and the itineracy of ministers except on foreign missions, nor revoke or change general rules of the united societies. A judicial conference exists for trials of bishops, and for hearing appeals from decisions of annual conferences. Seven "triers" are elected by every

annual conference. The court for appeals consists of the seven triers of the conference in which the case arises, with seven other triers from contiguous conferences. The General Conference may review its decisions. The trial of a bishop must be held before the triers from five neighboring conferences. The annual conference consists of itinerant preachers only. The place of meeting is chosen by the conference, but the time is appointed by the bishop, who presides. This body does not legislate, but administers discipline to its own members and makes careful inquiries into the character and efficiency of every one. It gathers statistics and reports to the General Conference. The district conference includes the churches in a presiding elder's district. It is composed of pastors, local preachers, exhorters, one steward, and one Sunday-school superintendent from every pastoral charge. It licenses local preachers, recommends them to the General Conference for orders or admission on trial, and holds jurisdiction over them. It also exercises a general supervision of temporal and spiritual affairs within the district.

The most strict and peculiar institution among the Methodists is that of "class-leaders." Every parish or congregation is divided, if sufficiently large, into several classes, over each of which one man is appointed as leader. He has a kind of subordinate spiritual charge over every person in his class. He examines into and watches over his life and character, and is expected to meet the whole class once a week for the purpose of inquiries as to the personal religious experience of its members, the giving of needful exhortations, and the collection of contributions for church purposes and for other good objects. This, it will be noted, constitutes an organization of great power and great delicacy. There is hardly any assignable limit to the influence it may wield upon private character, or to the force it may exert toward any desirable end. The intimacy it causes, the knowledge it gives to one another of the several capacities and weaknesses of the various members, make it an engine of great power when used by a skilful leader and directed toward a given object.

Upon the whole, in respect to thorough organization, reaching every member, and utilizing all forces and opportunities, the Methodist Church holds a most prominent position among the religious and social powers in America. The slavery question disturbed it, as it did all other religious bodies, before the Civil War, and at the time of the attempted secession of the Southern States "the Methodist Church South" drew off and set up its distinct organization, which still continues; but on inferior political questions there has been no denominational movement.

The peculiar work of evangelism, with which Methodism commenced its public career, has left its stamp upon the whole development. From the beginning evangelists have risen and labored signally all along the line of church progress. Some have set themselves squarely against some crying abuse, or worked to promote some specific good, while others have devoted themselves generally to "religious revivals." The leading idea, and consequent common practical aim, of this whole religious organization is personal turning away from sin to holiness, from the service of the world and of Satan to that of Jesus. The tenacious and peculiar attachment of Methodists to "their own Church" is the expression of that strong social and religious, reciprocal, personal communion which is their remarkable bond of concord and most effective means of influence.

The Congregationalists proper, in America, are the historical descendants of the old Independents of England, who fled from persecution in England to Holland, and thence came to the American continent, where their first colony settled at Plymouth in Massachusetts in 1620. The first colonists were men of stern mould, and were guided by pastors of the same stuff as them-

selves, who knew well how to construct and conduct an organization that was at once religious, social, and political. The first apparent thought of the "Pilgrim Fathers" on establishing themselves along Massachusetts Bay was that they had come into the wilderness to obtain "freedom to worship God." Though they themselves succumbed to the spirit of the age, and became for a time persecutors of Quakers and Baptists, it is certain that the principle of both political and religious liberty was firmly established in New England, and has extended through the whole progress of that wonderful national development which characterizes the American nation. Indeed, every formative idea in our whole social and political evolution traces, if not its origin, certainly its very early acceptance and propagation, to the mind and energy of New England.

In church polity the Congregationalists take the lowest fundamental position. Their underlying, germ-idea is, that conscious, spiritual membership in Christ, with communion through the Spirit in the love of God, is the centre and source of salvation and of all good. This must of course be personal, and can be known only by personal experience. Whoever possesses this experience is a "child of God," being bound to all the duties of sonship and assured of all the privileges, honors, and blessings, both present and prospective, of the adoption into the "family of God." From this beginning the necessity of association leads on to Christian fellowship, and any number of these "adopted children of God" can form themselves into a society for the purposes of mutual edification, the observance of the sacraments and ordinances of religion, and the promotion of good works, missions, or whatever else the "cause of God" may demand. This association constitutes a true Church of Christ. They have ministers who perform pastoral duties, preach, administer the two sacraments of baptism and the Lord's Supper, and generally take the lead in acts of worship and works for general benevolence or for religious advancement; but the authority of the ministry is all derived from the suffrages of the congregation. The calling of the whole people is supposed to exclude the calling of a distinct order. In no other sense, are the Congregational ministers over the people in the Lord, than in that of delegates of the people chosen and authorized by the people to minister in holy things. The economic law of the division of labor is the ground of the existence and warrant for the support of the Congregational ministry. This ministry is not only for, but of, the people, and is directly amenable to the people. Although Congregationalists have a form, or rather custom, of ordination, wherein ministers from other congregations join in receiving and giving the right hand of fellowship, yet the authority to minister is received essentially from the consent of the congregation. By custom and courtesy a Congregationalist minister, once ordained over a church, retains his designation even when not occupied in official duties, yet no special grace of orders is supposed to remain in him.

It will thus appear that the very simplest religious element constitutes the ground, or rather the evolute germ, of the whole Congregational system or Church. It is not an ecclesia in any outward sense, for the acknowledged call is within, a spiritual voice from God responded to by the spirit of the man. There is no historic organization, constituted as a visible organism by Christ in the beginning and transmitted as such down the ages, but every church is simply a voluntary association of those who agree together in belief sufficiently to covenant together for common worship, the reception of a chosen minister, co-operation in missions and general good works, and for reciprocal spiritual, moral, and doctrinal advancement.

This, it will be observed, is the principle which has developed itself politically in the Constitution of the United States and in the national idea which governs the American people. The idea that all power is vested in the people, and that their voice carries authority

because it is the appointed way for the expression of the voice of God, is the essence of Congregationalism. As far as it exerts a direct power upon the national mind it is earnestly religious. While teaching the right, dignity, and glory of personal liberty, Congregationalists also insist upon its responsibility. While acknowledging the right not only to change but to choose rulers, this right involves, and should be exercised under, personal responsibility to the God of nations, before whom peoples and persons stand ever open and accountable. A sense of this responsibility makes Congregationalism possible, and saves it from the disintegration which would follow merely personal judgment and self-assertion. The perfection of this responsibility, aimed at devoutly and approached in greater or less degree, is the ideal toward which Congregationalism is working up. The progress made is regarded by the members as favorable when compared with other church systems, while the prospect is, they think, brighter than any promised through religious bodies of other names. The history of Congregationalism in America shows the natural steps of progress from Calvinism to liberal Christianity, and exhibits, all along the way, some churches which rest on one or another projection from the side of this ascent or descent, and some yet rising or falling.

The Baptists, though congregationalist in ecclesiastical order and church principles, have maintained a remarkable consistency of faith and practice from the first. They have been bound together by one common article of religion. Indeed, it was, and more or less yet is, almost a point of faith among them that βαπτίζω carried always the signification "to immerse, to cover completely with water." Their agreement in this interpretation promoted agreement in other things, and, as they came into existence in what is called a comparatively orthodox period, they have as a body escaped those wide wanderings through the open fields of all possible belief which have distinguished other congregationalists. Their origin in this country is peculiarly interesting, because it was the first bursting forth, out of the dormant stem of Puritanism, of that religious liberty which has grown so large and strong in America. Roger Williams, the originator of the Baptist Church in America, was probably the first to proclaim this principle to the world in "these last days." He did not pretend to have discovered it, but only to have dug it up out of the burial of years and proclaimed it again as a true principle of Christianity.

Baptists require that all persons, before full admission to church membership, shall pass through a satisfactory personal religious experience. This "experience," "change of heart," or whatever else it is called, is regarded as the turning-point in the religious life. He who has passed through it is considered "converted," and by that conversion adopted into the family of God through personal spiritual regeneration. Having thus become a member of the "invisible Church," he has the right to admission into some visible Church. This right involves also a duty on the part of the convert "to come out from the world and be separate," which he should do by joining some visible ecclesiastical organization or "Church." Every one is left free to judge for himself, and choose what society or congregation he will join, but his application is passed upon and he himself examined by the pastor and deacons or a committee of the people. Indeed, it is common for these new converts to make public declaration of their experience. This view of conversion and this mode of propagating the Church are not peculiar to the Baptists exclusively. They are found essentially, though in varied forms, among all the Protestant denominations, and come from the fundamental idea so prevalent in America that the Church is invisible, and hence that the one important test of membership is personal assurance of spiritual new birth unto God.

The Baptists have won for themselves distinguished position through their successful literary and theologi-

cal institutions, as well as through vigorous parochial work and earnestly-prosecuted missions both in domestic and foreign fields. They have run side by side with the Methodists, especially in the South, and have done remarkable evangelical work among the Americo-Africans.

They are divided into several sects—*e. g.* Seventh-Day, Free-Will, Free-and-Open Communion, Close-Communion, Disciples of Christ or Campbellites, and others. These hold fraternal relations with each other, although not intercommunion in all cases. They are all congregational in polity. Though varying in beliefs and creeds, they all strenuously adhere to the form of immersion as essential to baptism.

The Friends, or, as commonly called, the "Quakers," are a religious body whose idea of the Church is wholly that of an invisible, spiritual body. They have neither priesthood nor sacraments. Their organizations are the very simplest necessary for the promotion of united good works and for the cultivation of general and personal moral and religious growth or improvement.

In respect to Christianity, as in respect to politics, sociology, and all subjects of universal interest, America is working out its own distinct phase. If it fulfils its own promise, it will show more clearly and fully than ever it has been shown before, not only man's greatness and dignity in the world, but also his eternal, noble freedom in the very presence of God.

The progress of Christianity in America thus far has been prolific in variety of manifestation, and noted for the reproduction of every truth and every error which in the Old World has been scattered along the centuries. The State does not recognize Christianity under any definite form. It leaves devotional forms to the choice of chaplains, and the observance of its appointed days to the free direction of the various religious bodies in the country, which it refers to but does not distinctly recognize. Public opinion is the great power in America, and this has pronounced decidedly in favor of entire religious liberty. The representatives of the great forces which are developing the Christianity of America all look hopefully to the future. Whatever be its destiny, one thing is very evident: that America, as it is the most open religious field that history has yet known, will surely contribute a definite chapter of its own to the great chronicle which shall record the history of the Church on earth. (B. F.)

CHURCH OF GOD, a small body of Baptists, sometimes distinguished as "Winebrennarians," from the name of their founder John Winebrenner. He was born in Frederick co., Md., March 25, 1797. He became a minister in the German Reformed Church, settling in 1820 over four congregations in and near Harrisburg, Pa. Under his preaching a revival soon began, and as this was an innovation on the established usage of the denomination, the revivalist encountered an opposition so strong that the doors of his churches were finally shut against him, and the result was his separation from the Church. This separation appears to have taken place in 1825; and it was about this time that Winebrenner's views as to church government changed. He continued his evangelistic labors, preaching in school-houses, market-places, or dwelling-houses, and "multitudes" of the German people listened. The reasons which made it impossible for him to carry on his work in the Reformed Church also made it desirable for those who had been converted to form themselves into separate churches. The first of these organizations was formed in 1829 at the house of Andrew Miller, four miles east of Harrisburg. Jacob Rupp called the meeting, and invited Mr. Winebrenner to be present. By request the latter preached on the "scriptural organization and government of the Church," and a church was organized in accordance with the principles he laid down, which were—(1) that churches should be formed of Christian believers only; (2) without a sectarian or human name; (3) with no creed and discipline but the Bible; (4) subject to no

extrinsic or foreign jurisdiction; (5) governed by officers chosen by a majority of the members of each individual church. The church thus formed consisted wholly of people of German speech, and the denomination has drawn its constituency chiefly from Germans and their descendants. Several of the converts having become ministers holding views in accord with those of Mr. Winebrenner, it was deemed desirable to unite the various congregations in one fellowship; and the first eldership, or conference, was organized in Harrisburg in 1830. John Winebrenner was chosen speaker or chairman of this eldership, and he set forth in a sermon a plan for the co-operation of the churches; which plan was, in substance, adopted in four articles of agreement, six teaching elders subscribing to them. These articles declared—(1) that there is but one true Church, the Church of God; (2) that all God's people ought to belong to it, and to no other Church; (3) that it is right to associate together for the prosecution of the work of the Church; (4) that an eldership, consisting of teaching and ruling elders, should be held annually. For the title, "Church of God," authority was found in several places in the New Testament.

The new denomination did not extend itself rapidly nor widely. At the close of the first fifteen years of its existence (1845) it had 3 "annual elderships"—the East Pennsylvania (1830), the Ohio (1836), and the West Pennsylvania (1844)—93 ministers, 500 churches and preaching-places, and "about 100,000 members." Twenty-six of the ministers were in the Ohio eldership. In 1845 the ecclesiastical organization of the Church was completed by the constitution of the General Eldership, which meets triennially. Strong anti-slavery resolutions were adopted. The attitude of the General Eldership on this question caused, at the beginning of the war, the separation of the Texas eldership, the only annual eldership in the South. This eldership was received again as a member of the General Eldership in 1875. There has been but one distinctively German eldership, and this has been in a state of decline, some of its ministers and churches having left it and joined English-speaking elderships. The last meeting of the triennial General Eldership was held at Findlay, Ohio, in May, 1881, ten of the annual elderships being represented. The Church had in 1881 about 400 churches, 350 ministers, and 30,000 members. It has a book concern at Harrisburg, and publishes a weekly newspaper, *The Church Advocate*, and other periodicals.

The Church of God has no authoritative ritual, discipline, or creed, but the doctrines which it draws from the Scriptures, as defined by Winebrenner, may be thus summarized: It believes (1) the Bible to be the only authoritative rule of faith and practice; (2) in one Supreme God, consisting of Father, Son, and Holy Spirit, and that these three are co-equal and co-eternal; (3) in the fall and depravity of man; (4) in the redemption of man through the atonement of Jesus Christ; (5) in the enlightening, regenerating, and sanctifying influence and power of the Spirit; (6) in the free moral agency of man; (7) that man is justified by faith in Christ, and not by the works of the law or by works of his own righteousness; (8) in the necessity of regeneration, or the new birth; (9) in three positive ordinances of perpetual standing in the Church—viz., baptism, feet-washing, and the Lord's Supper; (10) that two things are essential to the validity of baptism—viz., faith and immersion—that faith should always precede immersion, and that where either is wanting there can be no scriptural baptism; (11) that the ordinance of feet-washing, according to the words and example of Christ, is obligatory upon all Christians, and ought to be observed by all the churches of God; (12) that the Lord's Supper should be often administered, and to Christians only, in a sitting posture, and always in the evening; (13) in the institution of the Lord's Day, or Christian Sabbath, as a day of rest and religious worship; (14) that the reading and preaching of God's

word, the singing of psalms and hymns and spiritual songs, and the offering up of prayers are ordained of God, and ought to be regularly and devoutly observed by all the people and churches of God; (15) in the utility of holding fast-days, experience-meetings, and other special meetings of united and protracted effort for the edification of the Church and the conversion of sinners; (16) that the gospel ministry, Sabbath-schools, education, and all other benevolent causes ought to be heartily and liberally supported; (17) that the Church ought to relieve and take care of her own poor; (18) that the manufacture, traffic, and use of ardent spirits as a beverage or common drink are injurious and immoral and ought to be abandoned; (19) that the system or institution of involuntary slavery is impolitic and unchristian; (20) that all civil wars are unholy and sinful, and that in them the saints ought never to participate; (21) that civil governments are ordained of God for the general good; that Christians ought to be subject to the same in all things except what is manifestly unscriptural; and that appeals to the law out of the Church for justice and the adjustment of civil rights are not inconsistent with principles and duties of the Christian religion; (22) in the necessity of a virtuous and holy life, and that Christ will save those only who obey him; (23) in the visibility, unity, sanctity, universality, and perpetuity of the Church of God; (24) in the future personal coming and reign of Jesus Christ; (25) in the resurrection of the dead, "both of the just and unjust;" that the resurrection of the just will take place at the beginning, and that of the unjust at the end, of the millennium; (26) in the creation of new heavens and a new earth; (27) in the immortality of the soul, in a universal and eternal judgment, and in future and everlasting rewards and punishments.

The polity of the Church of God is Methodist in some respects. The annual eldership corresponds to the annual conference, the General Eldership to the General Conference, of the Methodist system. The General Eldership, which meets triennially, consists of delegates from each annual eldership in the proportion of one teaching and one ruling elder for every ten members or fraction of ten. The speaker and two clerks of the General Eldership hold office three years. It controls all the common property of the Church and its publishing and mission interests; it elects editors of the Church press and boards of education, missions, and publication, and an executive committee empowered to remove officers of the General Eldership and fill vacancies between the meetings of the eldership; it has the exclusive right of establishing new elderships and defining their boundaries; it hears and decides appeals from decisions of annual elderships and of councils for settling difficulties between annual elderships. The constitution of the General Eldership also provides that no one shall be considered an accredited minister in the Church without a regular license; that the elderships shall renew these licenses annually; that no minister shall be transferred from one eldership to another without the consent of both bodies; that the itinerant polity of the Church shall be practised by the General Eldership in the employment of missionaries, no missionary to be appointed more than three years consecutively to the same charge. A board of incorporation, consisting of the officers of the General Eldership and members of its various boards excepting the board of education, holds all the property of the body.

Annual elderships are composed of the ministers and delegates of the churches within their respective limits. They license candidates for the ministry, renew licenses, provide a course of studies, receive from churches requests for preachers and appoint ministers to circuits and stations, and fix the boundaries of stations and circuits.

The churches are under the supervision of church councils, which consist of the preacher or preachers in

charge and of elders and deacons. It has control of the public worship, of the examination and admission of applicants for baptism or membership, and of the discipline of members.

CHURCH, FREDERICK EDWIN, an American landscape-painter, was born at Hartford, Conn., in May, 1826. He studied under Thomas Cole at Catskill, N. Y., and for many years he lived and worked in the Catskill region. Church made two visits to South America for the purpose of studying characteristic scenery, the first in 1853 and the other in 1857. The result of his South American experiences was a large number of canvases, of which *The Heart of the Andes*, *The Andes of Ecuador*, *Rainy Season in the Tropics*, *A South American Landscape*, *Cotopaxi*, and *A South American River* are among the most important. *The Heart of the Andes* was extensively used as an exhibition-picture, and it perhaps contributed more than any other one work to give the artist standing and popularity with the public. This picture is an extremely characteristic performance, and it is marked by all the merits and all the defects of Church's style. Although it does not profess to be a reproduction of any particular view, it does claim to be a faithful picture of the representative features of the region. The eye is carried from a tangled mass of rank vegetation in the foreground across a sun-baked plain to the huge snow-capped mountains. The different elements of the composition are delineated with fidelity, with the exception, perhaps, of the foreground, which is over-labored and seems more like a studied performance than any other portion of the picture; and the peculiar atmospheric effect aimed at is rendered with skill. The picture, however, although dealing with some of the grandest features of nature, fails to give an impression of grandeur or even of largeness. In this respect it is a typical work of the American landscape school, for the American-born and trained landscape-painters have from the first shown a greater predisposition for detail than for effect, with the result of belittling even large subjects. The same criticisms apply to Church's picture of the *Icebergs*, which was the result of a trip to the coast of Labrador made after his second visit to South America, and to his *Niagara*, painted some years later. Both of these celebrated works are very admirable in many respects. They are carefully and intelligently studied, dwelling perhaps with undue emphasis upon the iridescence of the icebergs and the rainbow which is sometimes seen at Niagara, but bearing the stamp of essential truthfulness and impressing the beholder with a sense of reality. The *Niagara* is a panoramic composition—the word "panoramic" being used in a strictly technical sense—and the claim which has been made for it, that it is the best portrayal of the great cataract ever made, may fairly be allowed. Nevertheless, it is a pleasing rather than a great picture, for it does not express the greatness of its subject. It is a correct portrait of Niagara, which makes much of such a pretty incident as the rainbow, but which gives scarcely a hint of the irresistible power of the cataract. In 1866, Church visited Jamaica, and made sketches and studies which supplied him with material for several important pictures. In 1868 he crossed the Atlantic, and after a sojourn in England—where several of his pictures had already been exhibited with great success—he went to the Continent, and extended his tour to Greece and Palestine. The pictures of the Parthenon, Jerusalem, and some minor works were the result of this journey. At the Paris Exhibition of 1867, Church received a medal of the second class for his *Niagara*; and at the Paris Exhibition of 1878 he was represented by *Morning in the Tropics* and *The Parthenon*. Of the works of Church not mentioned above the most notable perhaps are *Scene among the Andes*, *The After-Glow*, *El Khasné*, *Petrá*, *Evening on the Sea*, *Twilight in the Wilderness*, *A Tropical Moonlight*, *Chimborazo*, and *Jamaica*.

CHURCH, PHARCELLUS, D. D., an American Baptist minister, was born at Seneca, N. Y., Sept. 11, 1801. He was educated at Hamilton, N. Y., and in 1825 was ordained pastor of a Baptist church in Poultney, Vt. He afterward had charge of churches in Providence, R. I. (1828-34), in Rochester, N. Y. (1836-48), and in Boston, Mass. (1848-54). Retiring from pastoral labors on account of ill-health, he was editor of the *Baptist Chronicle*, in New York City (1855-65). His chief publications are *Philosophy of Benevolence* (1836); *Religious Discussions*, a prize essay (1837); *Antioch; or, Increase of Moral Power in the Church* (1842); *Pentecost* (1843); *Memoirs of Mrs. Theodosia Dean* (1851); *Mapleton* (1854); and *Seed Truths* (1868).

CHURCH, SIR RICHARD (1785-1873), a British soldier, born in the county Cork, Ireland, in 1785. He entered the army in 1800, served in the Ferrol expedition and in Malta and Egypt, and afterward joined Murat's Neapolitan army. In 1814 and 1815 he held a commission in a Zantiote corps of rifles in the English pay. He was wounded at Santa Maura in 1812, made a C. B. in 1815, was knighted in 1822, and rose to the rank of general in the British army. In 1827 he went to Greece and entered the revolutionary service. He was soon appointed generalissimo of the land-forces; but, though aided by Lord Cochrane with his fleet, he failed to save Athens from the Turks. He resigned the command in 1830, and soon after was ordered to leave the country, but this he would not do. In 1831, after the assassination of Capo d'Istrias, he again became generalissimo. After the kingdom was proclaimed he held various important positions in the ministry. He died at Athens, March 20, 1873.

CHURCH, RICHARD WILLIAM, D. D., an English clergyman and author, was born in 1815. After careful preliminary education he entered the University of Oxford, whence he graduated in 1836 with first-class honors. He won a fellowship in Oriel College, and still remains an honorary fellow. At once a student, a thinker, and an excellent writer, he has used his pen chiefly on topics connected with religion and morality. In 1854 he wrote a series of essays, two of which were afterwards expanded into a volume entitled *The Life of St. Anselm*. In 1869 he published a volume of university sermons on the relations between Christianity and civilization. His prominence as a sound scholar and eloquent preacher led to his appointment in 1871 as dean of St. Paul's Cathedral in London. In 1872 he published a dissertation on *Civilization Before and After Christianity*, and in 1873 *Some Influences of Christianity on National Character*. In 1874 appeared his *Sacred Poetry of Early Religions*; in 1877 (in the series of *Epochs of Modern History*) he wrote *The Beginnings of the Middle Ages*. His later works are a volume of sermons, entitled *Human Life and its Conditions* (1878), and biographies of *Spencer* and *Lord Bacon*.

CHURCH, SANFORD ELIAS, LL.D. (1815-1880), an American jurist, was born at Milford, N. Y., April 18, 1815. After receiving an academical education he studied law, and was admitted to the bar at Albion, Orleans county, in 1840. In the next year he was elected to the State legislature. In 1845 he was appointed district attorney for Orleans county. In 1850 he was elected lieutenant-governor of New York, and two years later he was re-elected. In 1857 he was elected comptroller of the State. In 1867 he was a prominent member of the State Constitutional Convention. In the Democratic National Convention of 1868 he received the vote of New York for President on several ballots. In 1870 he was elected chief-justice of the State court of appeals, and held this office till his death, which occurred at Albion, May 14, 1880.

CHURCHILL, RANDOLPH HENRY SPENCER, LORD, a British politician, second son of the seventh duke of Marlborough, was born Feb. 13, 1849. His mother was the daughter of the third marquess of Londonderry. He was educated at Oxford, where he

took his Master's degree. In 1874 he was returned to Parliament for Woodstock, which he has since continued to represent. In the same year he was married to a daughter of Mr. Leonard Jerome of New York. He is also a justice of the peace and deputy-lieutenant for Oxfordshire. Chosen as a conservative, he was in 1880, and for some time after, the leader of the so-called "fourth party," consisting of a small number of extreme Conservatives who have greatly annoyed and embarrassed the Liberal government by their keen and persistent attacks. Later, while still maintaining a position among the Conservatives, he has shown a disposition to move on lines of his own choosing, and has manifested a desire to create a Tory-Democratic party.

CHURUBUSCO. See MEXICAN WAR.

CIALDINI, ENRICO, duke of Gaeta, an Italian general, born near Castelvetro, province of Modena, Aug. 10, 1811. He studied medicine at Parma and Paris. Having taken part in an unsuccessful revolutionary movement in 1831, he went into exile. He entered the Spanish service in 1835, fought against the Carlists, and attained the rank of lieutenant-colonel. In 1848 he returned to Italy, which was then in a state of revolution, and joined the army of Gen. Durando, under whom he fought against the Austrians. He served with distinction at Novara (1849), and for his services in the Crimean war was raised to the rank of brigadier-general in 1855. At the end of this campaign he was appointed aide-de-camp to the king, Victor Emmanuel. Cialdini commanded a division at Palestro in 1859, and became a general of division in June of that year. In the campaign of 1860 he defeated the Papal army under Lamoricière at Castelfidardo (Sept. 18). He was promoted in 1861 to the rank of general. He besieged Gaeta, which he took in February, 1861, thereby winning his title. He was elected a member of Parliament in the same year, and became a senator in 1864. He commanded an army in the war of 1866 against Austria, and was appointed chief of the royal staff. In November, 1867, he became commander-in-chief of the forces in Central Italy. He was sent as ambassador to Paris in 1876, and resigned that position in 1881, during the trouble caused by the invasion of Tunis by the French.

CIBRARIO, GIANN' ANTONIO LUIGI, COUNT (1802-1870), an Italian historian, was born at Turin Feb. 23, 1802. He graduated with the degree of doctor in civil and canon law in 1824, and became the intimate friend of Charles Albert of Sardinia, who employed him on diplomatic missions to Switzerland, France, and Austria. In 1848 he was sent to take possession of Venice as the royal commissioner, and was made a member of the senate. After the battle of Novara (1849) he went into exile. In 1852 he became a member of Victor Emmanuel's cabinet as minister of public instruction, and in 1855 was made minister of foreign affairs under Count Cavour. He became minister of state in 1860, and soon after received the title of count. He died Oct. 1, 1870, at Salò, near Brescia. He had at an early age distinguished himself by historical research, and throughout his career he devoted much time to literary labors. His first work was a sketch of the princes of Savoy (1825), which was continued in his *History of the Kingdom of Savoy* (Turin, 1840-47) and completed by his *Origin and Progress of the Establishment of Monarchy in Savoy* (Turin, 1854-55). He also wrote an able work on the *Political Economy of the Middle Ages* (1839), which has passed through several editions. His *History of Turin* (1847) and minor historical and biographical works exhibit the same diligent research and literary skill. He also published some novels of less importance, and edited several Italian classics. His last important work was a treatise on *Slavery and Serfdom* (Milan, 1868-69), in which he discussed particularly and at length the condition of agricultural laborers.

CIGAR. The rolling of tobacco-leaves into a convenient form for smoking without the aid of bowl and tube is due to the aboriginal Cubans. As the habit of cigar-smoking spread through the civilized world there sprang up a demand for an orderly arrangement of tobacco-leaves into marketable form in which shape, color, flavor, and free burning qualities were taken into consideration, and this led subsequently to the recognition of cigar-making as a handicraft. In no part of the world, however, has the cigar-making industry developed as in the United States. This development is best shown by the fact that during the past decade the increase in cigar-production has been at the rate of 300,000,000 per annum, until it reached, during the fiscal year of 1883, the enormous amount of 3,227,888,900 cigars, with as many as 2000 cigar-makers employed in a single factory. The total number of cigar-makers employed during this same year was, according to the Cigar-makers' Labor-Union report, 75,000 men, women, and children. The United States census of 1880 puts the number of cigar-makers at 40,099 men, 9108 women, and 4099 children under sixteen years of age, making a total of 53,306. The chief centre of the cigar-making industry of the United States is New York City. Here the annual increase in the number of cigars manufactured has averaged 50,000,000 cigars for several years, and reached 840,807,650 cigars during the fiscal year of 1883. The United States internal revenue bureau reports that the number of cigar-factories in actual operation in the United States during the same year was 16,663.

The extraordinary development of this industry in the United States may properly be ascribed to three inciting causes: (1.) The protective tariff; (2.) The governmental internal revenue system; and (3.) The introduction of *forms* or *moulds* for shaping or fashioning cigars. (1.) The tariff laws have rendered the importation of cheap cigars—especially those of German make—impossible, and have restricted the importation of Cuban cigars to non-competing grades of high quality. It is claimed that cigars are now (1884) made in this country by Cuban workmen, and of Cuban tobacco, which compare favorably with the best imported brands. (2.) The governmental internal revenue system, by exacting a bond of \$500 from each cigar-factory and \$100 for each cigar-maker employed therein, and keeping a strict supervision of the raw tobacco material from the time it leaves the grower's hands until it reaches the consumer, thus necessitating the use of large capital in order to profitably manufacture cigars, has brought about the concentration of the industry in extensive factories. (3.) The introduction of the use of moulds has provided the means whereby the work in large cigar-factories can be properly subdivided, controlled, and the product rendered uniform. This method of making cigars is generally known as *mould-work*, in contradistinction to *hand* or *Spanish work*. The idea of compressing tobacco into the shape of a cigar by means of a mould originated in Germany. The material first used for moulds was stone, in which *cups* or *matrices* in the shape of a cigar were roughly hollowed out, into which the tobacco was pressed. The tobacco thus treated and shaped is termed a *bunch*. At present stone has given way to wood, and through the perfection of manufacture the wooden mould is so wrought that creases, wrinkles, and joint-marks are rendered impossible. The *bunch* consists of *filler* and *binder*. The filler, being first laid perfectly straight in the hand, is then held together by the binder, and is placed in the mould, where it is kept for several hours under pressure, and comes out in cylindrical form. This operation is termed *bunch-making*, and the operatives engaged in it are called *bunch-makers*. The next operation is to encase the bunch in the outside leaf, called *wrapper*, and to give the finishing touches to the *point*, or *head*, and to the *tuck*, or *end*, of the cigar. This is done by the

rollers, or cigar-makers proper. It will be readily perceived that the mould system of manufacture admits of the examination of each part of a cigar at every step of the process; besides which, it has the additional advantages of readily ensuring the desired shape, great economy in material, and the promotion of perfect combustion in smoking, this latter being a matter of paramount importance. Incongruous as it may seem, there are *fashions* in cigar-making which decide the style or shape of the cigar. There are, by actual count, no less than 2317 different shapes of cigar-moulds, varying in length from 2½ to 7 inches, in existence at the present time, and their number is constantly increasing.

The Spanish mode of making cigars still retains its primitive simplicity. The cigar-maker simply rolls one tobacco leaf over the other, dextrously forming with his hand the shape of the cigar as he proceeds, and finally places a wrapper around the whole, which in this instance takes the place of the binder. In hand, or Spanish, work only one grade of material is used throughout the entire cigar, care being taken only to select a fine-appearing leaf for the wrapper; while in mould work the filler, binder, and wrapper are generally of different kinds of tobacco.

The nature of the soil upon which tobacco is grown determines its availability for cigar-making. Tobacco grown in Maryland, Virginia, North Carolina, Kentucky, Missouri, and some parts of Ohio is too strong for cigars, and is almost entirely used in the manufacture of chewing and smoking tobacco. The Connecticut Valley, Massachusetts, Vermont, New York, Pennsylvania, Ohio, Illinois, Indiana, and Wisconsin, however, produce cigar-tobacco of excellent quality. It is called *seed-leaf*, to distinguish it from varieties grown in the same region of country from Havana and other imported seeds. The native or seed-leaf is used principally for fillers and binders, while the *Havana seed* is used for wrappers. Within the last five years a tobacco grown on the island of Sumatra, in the Dutch East Indies, has been imported into this country and is being largely used for wrappers. Cigar-tobacco from Mexico, San Domingo, Java, and Manilla is also brought here, but only in insignificant quantities.

Next to securing perfect combustion, the appearance and the color of the cigar are matters of the greatest importance to the manufacturer. Great skill has been displayed by manufacturers in giving the desired color to cigars by natural processes. The tobacco, after it has been cut in the field, is cured in sheds by the farmer, and after one year's fermentation in his hands is ready for market. The cigar-maker then *re-sweats* it, and by subjecting it to repeated baths of dry steam produces the desired rich dark color. It is then placed away for use, and as wanted is moistened, or *cased*, with water. Americans demand dark-colored cigars, while Europeans generally prefer light colors. Cigar colors range from *claro*, light; *colorado*, medium; *maduro*, dark, to *oscuro*, very dark or black. The colors are still further defined for intermediate shades as *claro-colorado*, *colorado-maduro*, etc., and the nicest regard is paid to the sorting of these colors prior to packing them in boxes. Sorting and packing are recognized branches of the cigar-making handicraft. Due attention is also paid by American manufacturers to obtaining desired *flavors*, and this is accomplished by the blending of tobaccos of different growth until the best combination is attained. The tobacco grown on the island of Cuba is, however, conceded to excel in aroma, and nowhere else has the soil produced such exquisite flavor as that from its *Vuelto Abajo*.

Many machines for cigar-making have been patented, but none have thus far achieved any marked success. In the production of the finer grades of cigars the cigar-making by hand will remain supreme, since human fingers are most adequate for the delicate task of manipulating the fragile leaf. (See TOBACCO, in AMERICAN AGRICULTURE, Vol. I. p. 120.) (A. F. H.)

CINCHONA. About 1820 a Brazilian surgeon called the attention of his countrymen to the anti-malarial virtues of certain small trees or shrubs which grow in that country. St. Hilaire grouped them with the true cinchonas, but by De Candolle they were erected into a distinct genus, *Remijia*. In 1857 a new cinchona-bark—the so-called cupræa-bark—began to appear in the London markets, and within a few years the annual supply has become enormous. It is a very hard bark, with a short not fibrous fracture, and is distinguished microscopically by its bast-cells being small, with their cavities wide open; in all of the true cinchonas the bast-cells are very large and have their cavities obliterated by numerous secondary deposits. Cupræa-bark yields as much as 2 per cent. of quinine in a very pure condition, owing to the absence of inferior alkaloid. In it has been found a hitherto unknown alkaloid, homoquinine or ultraquinine; but there is reason for believing that this is a double salt of quinine and quinidine. The *Remijas* abound in two distinct regions of South America. One is the lower part of the basin of the Magdalena River, where the trees grow in the mountain-range of La Paz; the other is the valley of the Orinoco, among the mountains which are the eastern branch of the Cordillera of the Andes. The commercial value of the bark is very great, and, as the genus is indigenous to a dry country not much above the level of the sea, it is very probable that some of the species could be successfully cultivated in certain parts of the United States. (H. C. W.)

CINCINNATI, the largest and most important city of Ohio, and the county-seat of Hamilton county, is the eighth city in size in the United States. It is situated in the S. W. corner of the State, lat. $39^{\circ} 6' N.$, long. $84^{\circ} 26' W.$, on the N. bank of the Ohio River, nearly midway between its head and mouth.

The ground on which the city stands belongs, geologically, to the formation known as the Cincinnati group. The hills which are included in the corporate limits rise to an elevation of from 400 to 465 feet, and are made up of alternate layers of clay and blue limestone. The valley at the foot of these hills is composed to a considerable depth of clay and gravel deposits from the river-bed. A gravel-bed underlies nearly the whole city, forming an admirable natural drainage. The blue limestone of the hills is a very beautiful building material, and it can be quarried in inexhaustible supply. The bluestone houses in the suburbs are among the handsomest residences in the United States. The site of Cincinnati is extremely picturesque. The views of natural scenery from its hills are scarcely surpassed in beauty. The district in which is the densest population lies in a basin entirely surrounded by hills. These part from N. E. to S. W. to admit the passage of the Ohio River, which flows between them in a double curve. Opposite the city, in Kentucky, is the mouth of the Licking River. Crawfish, Deer, and Mill creeks are the names of small water-ways flowing through the city into the river. Deer Creek has, however, been encroached upon by the growth of the population till it has nearly disappeared. The most thickly inhabited portion of the city occupies a district about $2\frac{1}{2}$ miles in length and 1 to 2 in width, between Mill and Deer creeks. Cincinnati is built upon three natural terraces. The first, known as "The Bottom," is nearest the river, and is some 60 feet in height. Along this plateau are located the large wholesale houses and many manufacturing establishments. Much of the wealth of Cincinnati is invested here. The second plateau, extending back towards the hills, is 112 feet high. The third terrace is the hills themselves, up which the city has climbed and over which it is rapidly extending. The heights are reached by horse-cars and by four inclined-plane steam railways. One has a freight- and wagon-elevator, besides that of passengers, and another conveys street-cars with horses attached bodily up the

hill. The hilltops at the head of the inclines are popular summer resorts. Even in periods of extreme heat they are cool and breezy. The climate of Southern Ohio is excellent in sanitary respects, and Cincinnati is one of the healthiest cities in the Union, its annual death-rate being 19.20 to 1000. The average summer temperature is $75^{\circ} 24$; the winter temperature, $34^{\circ} 28$; the yearly mean, $54^{\circ} 72$.

By the census of 1880 the population of Cincinnati was 255,139. The ratio of voters to the population, as shown by the Presidential election of 1880, is 1 in 4.8. The city has, however, grown with such rapidity within a few years that the population is now estimated from the school census of 1882 at 280,000. Including Covington and Newport (in Kentucky) opposite Cincinnati, there are some 350,000 souls in the hill-rimmed basin through which the Ohio River flows at this point. Of the 255,139 persons composing the inhabitants of Cincinnati in 1880, the native-born population was 183,480; white, 175,352; colored, 8128. The foreign-born population was 71,659. Natives of the German empire, 46,157; of Ireland, 15,077; total Great Britain and Ireland, 19,202. Persons above ten years unable to read, 7121; persons above the age of fifteen unable to write—males, 3052; females, 5106; total, 8158. Of these 2068 were colored; males, 936; females, 1132.

Architecturally, Cincinnati and its suburbs have been much improved and beautified within recent years. Building interests have manifested remarkable activity, and even the floods of 1883 and 1884 eventually intensified this activity. During 1882 the products of the various building trades amounted to \$25,524,240. The residence-flat system has been introduced. Large and handsome blocks, with business establishments and offices on the lower floors and suites of light, commodious living-rooms above, are common in the most thickly inhabited portion. Houses in the valley are built of brick, often with fronts of a handsome gray freestone found in the vicinity of the city. The U. S. custom-house and post-office is a magnificent structure of gray stone. Its length is 361 feet; breadth, 168 feet; and its cost is \$5,000,000.

The city extends along the river a distance of 10 miles, its average width being 3 miles, and covers an area of 24 square miles. There are more than 400 acres in public parks, several of the smaller ones being in the thickly-populated part. In Burnet Woods there are nearly 170 acres of natural forest. Eden Park, in the eastern part of the city, contains 216 acres, with hills and ravines and a great variety of natural scenery. In this park are two immense reservoirs, with a capacity of 100,000,000 gallons each, which supply Cincinnati with water. Powerful pumping machinery, with an average daily capacity of 43,277,283 gallons, raises the water to the reservoirs from the Ohio River. On one of the most elevated spots in this park is the Cincinnati Museum, which was founded by an association of ladies. Mr. C. W. West afterwards gave \$300,000 for its improvement, and by subsequent donations the fund has been increased to \$500,000. Valuable art-contributions have been made from time to time, among them a magnificent and unique collection of the works of Lessing from Mr. Joseph Longworth. The building resembles in its architectural features that of the South Kensington Museum, London, and the institution is modelled on the same plan as the English museum. Its object is to afford an art-education in all the various branches, and it includes departments in art, science, natural history, etc. The present structure is incomplete, occupying only one-tenth of its proposed dimensions. The style is the Florentine-Romanesque. The building lies east and west, fronting south, 354 feet long, 105 feet deep. The central and west wings are now in process of construction. The central entrance-hall is 50 by 60 feet, and the tower is 225 feet high.

Handsome public buildings in the suburbs are the city and county infirmaries, workhouse, house of refuge, and Longview insane asylum. Hamilton county erected

the insane asylum, an imposing edifice surrounded by a fine lawn and park and having accommodation for 661 patients. The workhouse is a house of correction for police-court prisoners of adult age who are convicted of minor offences. It has cells for 700, and 26 acres of ground are connected with it. The labor of the prisoners is let out by contract, and their annual earnings amount to \$14,854. Grounds and building together cost \$650,000. The yearly expenses are \$58,878; average number of prisoners, 445. The house of refuge is a place of correction for minors under sixteen. Homeless and destitute children may also be placed there for shelter. Spring Grove Cemetery is a mile beyond the present city limits, and was laid out by Adolph Strauch. It is a park cemetery, the fences between burial-lots being removed and graves levelled nearly even with the ground. It is well shaded by fine trees, and contains nine lakes, frequented by swans and water-fowl. There are 600 acres in the enclosure. It was formerly a body of unsightly swampy ground.

The district known as "Over the Rhine," the portion of the city between the canal and the hill, is inhabited almost wholly by persons of German birth and descent. It is greatly owing to this large proportion of German population that Cincinnati has become noted as a musical centre. Their Saengerfests and singing societies fostered the movement which resulted in the erection of Music Hall and the College of Music of Cincinnati. The first-named building is used for the combined purposes of a music hall and an industrial exposition building, and is the largest and handsomest building of the kind in the United States. It contains an organ, also the largest in the country, whose case was carved by the ladies of Cincinnati. The structure is a noble specimen of architecture, and was planned by S. Hannaford. It has a frontage of 500 feet from N. to S. and 300 feet from E. to W. When the esplanade in front is enclosed a space of 160,000 square feet is afforded for exposition purposes. The Music Hall can accommodate 7000 persons, and its acoustic properties are unrivalled. Dexter Hall is a smaller audience-room in the building, intended for chamber concerts. The entire building, including ground and organ, is valued at \$1,000,000. Towards the erection of it Mr. Reuben R. Springer contributed \$300,000. The College of Music of Cincinnati, which has also been permanently endowed by Mr. Springer, has a building on the same square on which Music and Exposition Hall is situated. It formerly occupied rooms in the hall, but outgrew its space so rapidly that new quarters were required. Besides this institution there are also admirable private schools for musical culture and many excellent instructors.

Clays for the manufacture of tiles and the finer grades of pottery are plentiful in the vicinity of Cincinnati. The artistic ceramic wares made here have justly a high reputation. The Rookwood Pottery, founded by Mrs. Maria Longworth Nichols, daughter of Joseph Longworth, was designed to advance artistic culture in the branch of ceramics. The establishment is an admirable one, managed wholly by ladies, and its products are sold mostly in New York and Philadelphia. Its decorators were educated chiefly at the Cincinnati School of Design. The Rookwood Pottery wares are unique, somewhat resembling Limoges. They display unusual richness and harmony of coloring. In style of decoration they are peculiarly American, the native flowers, plants, and other objects having been much used in its designs. Carving in clay is also a feature of the ornamentation. A specialty of this establishment is that the color of the body of the ware is utilized as part of the decoration.

With the School of Design, the new School of Technology, the Museum, annual exposition, Rookwood Pottery, Music Hall, and College of Music the future of artistic and industrial education is well provided for in Cincinnati, and all this provision has been made through the munificence of private citizens. A draw-

back to the city is the coal-smoke arising from her many manufacturing establishments, but with the success of the present movement for smoke-consumption Cincinnati will be in all respects one of the most attractive cities in the Union.

Among its ornamental features is the Tyler Davidson Fountain, a unique bronze structure, 45 feet high, costing nearly \$200,000. The bronze-work, consisting of fifteen large figures, was cast at the Munich foundry. The erection of this fountain was a favorite scheme of Mr. Tyler Davidson, and after his death his design was carried out and the work presented to the city by Mr. Henry Probasco.

Cincinnati has 201 churches of all denominations, the principal ones being as follows: Roman Catholic, 51; Methodist Episcopal, 26; Colored Methodist, 5; Methodists of all sects, 37; Presbyterian, 24; Protestant Episcopal, 19; Baptist (9 colored, 9 white), 18; German Evangelical, 15; Jewish synagogues, 7; Disciples of Christ (1 colored, 5 white), 6; Congregational, 5; United Brethren, 3; Lutheran, 2; Friends, 2; Hollandische Reformed, Church of the New Jerusalem, Universalist, Unitarian, 1 each. The Second Presbyterian Church, St. Paul's Methodist Episcopal (both built of blue limestone), the Jewish temple and synagogue, and St. Peter's Cathedral, Roman Catholic, are attractive specimens of church architecture. The spire of the First Presbyterian Church is 270 feet high.

Cincinnati is well provided with schools, public and private. St. Xavier's College, various seminaries, and numerous parochial schools are maintained by the Roman Catholic Church. Mount St. Mary's of the West is a Roman Catholic theological seminary. Lane Theological Seminary is a venerable and highly-prized Presbyterian institution. There is also an excellent law school. The city offers unusual facilities for the education of physicians, containing no less than six medical colleges. Three of these belong to the regular medical school, one is homœopathic, and one eclectic. The homœopathic and eclectic schools admit both sexes. In 1882 the six schools together graduated 304 physicians. There are a school of pharmacy and a dental college, both open to male and female students, also four schools of bookkeeping.

The public schools (free) are under control of a board of education, at present composed of 37 members, one elected from each of the 25 wards of the city and 12 elected at large. The superintendent of schools receives a salary of \$3500. The city school fund amounted in 1883 to nearly \$830,000. There are 40 school-buildings and 707 teachers—females 575, males 132. The German language and music and drawing are part of the course of study. In 1882 there were 85,402 children between six and twenty-one years of age. Of these 1976 were colored. Of the white children there were 2501 more females than males. For the school year ending in 1883 there were 34,388 pupils enrolled—males 17,608, females 15,778. About three-fourths of the colored children attend the separate public schools provided for them. Attending church schools—males 7273, females 7143; private schools—males 482, females 606; public night-schools—males 2589, females 468. Total attending other than day public schools, 15,504. Though Ohio has a compulsory educational law, yet more than one-third of the persons between six and twenty-one years of age are not in any school. There are three public high schools in Cincinnati—the Hughes and the Woodward for white pupils, and the Gaines for colored; also an admirable public normal school. Cincinnati University also belongs to the department of public instruction, tuition being free to residents. It includes six undergraduate courses of study and admits both sexes. Charles McMicken, a wealthy citizen, left a fund in 1858 to establish the university, and this fund has been increased by donations from other benevolent individuals and from the city of Cincinnati. An astronomical department and observatory belong to the university. The

observatory is at Mt. Lookout, near the city, and contains a Mitchell refractor of 28 centimetres aperture. The course of astronomical study extends over four years, after which the pupil passing satisfactory examination receives the degree of bachelor of science. The School of Design is a branch of the university. In 1883 this school had 274 pupils. The wood-carving department, established by Mr. Benn Pitman, is of especial excellence. The Ohio Mechanics' Institute, established in 1828 for the diffusion of useful knowledge, is in flourishing condition.

Cincinnati has 13 public libraries, the largest being the Free Public Library, under control of the board of education. It is maintained by bequest funds and by taxation, and possesses 137,972 volumes and 15,565 pamphlets. Connected with it are two handsome and commodious reading-rooms, which are amply supplied with periodicals, both American and foreign, in English and other languages. The Public Library has two branches, one in the Cumminsville, the other in the Columbia; division of the city. The Young Men's Mercantile Library is a useful and admirably managed institution, sustained by membership fees, donations, and bequests. It contains 43,667 volumes, has two reading-rooms, and a well-selected assortment of magazines and newspapers. A valuable law library was destroyed with the county court-house during the riots of 1884.

The Cincinnati Hospital, which is maintained by taxation, accommodates 700 patients. It consists of eight buildings grouped around a court and connected by corridors. It covers $4\frac{1}{2}$ acres and cost over \$1,000,000. Gas for the cooking and illuminating purposes of the establishment is made in the building. Destitute city patients are sent here, and there are also excellent accommodations for pay patients. Other hospitals are the Good Samaritan and St. Mary's, both under the management of Roman Catholic Sisters, the Jewish, and the Ohio Hospital (homœopathic) for women and children. All receive both pay and charity patients. The Sanitarium, on College Hill in the suburbs, is a well-kept private asylum for the treatment of nervous invalids and insane patients.

Other charitable institutions are numerous, maintained by bequests and by voluntary contributions. The Children's Home is a handsome building, with rooms for 150. Homeless, destitute, and mistreated children are received here and cared for in the best manner till adopted by suitable persons. A Kindergarten is connected with the home. The Women's and Young Men's Christian Associations are large and influential organizations, maintaining employment agencies, etc. There are five orphan asylums—one general, one colored, two Roman Catholic, and one German Protestant. The Home of the Friendless is a shelter and reformatory for women. The Widows' and Old Men's Home is a fine, substantial building on Walnut Hills. The Relief Union is a charitable organization for the aid of out-door poor. The Board of Associated Charities is a voluntary benevolent union for furnishing work, food, and clothing to worthy destitute persons. The Bethel, on the river-front, is maintained by Mr. David Sinton and other citizens. Large numbers of destitute and homeless persons are temporarily fed and sheltered here. Connected with it are a church and a Sunday-school for children of the poor, which has an attendance of 3000 and attracts many visitors.

The number of periodical publications of all kinds issued here is 133: daily newspapers, 14; weeklies, 46; semi-weekly, 1; tri-weekly, 1; monthlies, 47; semi-monthlies, 11; quarterlies, 10; semi-annuals, 2; annual, 1. The principal hotels are the Gibson House, accommodating 800; Burnett, Emery, Palace, Grand, and St. James. The principal places of amusement are the Grand Opera-house and Robinson's Theatre, each holding an audience of 1800 to 2000 people; Heuck's and the Coliseum. The principal clubs are the Lincoln and Duckworth, political; Cuvier, for the protection of fish and game interests; Elm Street (Ger-

man), Queen City, Allemania, Phoenix, Railway, the Commercial, and the Musical. For scientific and literary purposes there are the Ohio Philosophical and Historical Society, Natural History Society, and the Literary Club. The Society for the Prevention of Cruelty to Children and Animals is an influential incorporated organization. The Chamber of Commerce, for the advancement of mercantile interests, has 2000 members, its admission fee (since Jan. 1, 1884) being \$1000. The Board of Trade, for industrial and manufacturing pursuits, has 500 members, and there is also a produce exchange. Besides these, each important branch of industry has its own organization. Cincinnati is a port of entry. During the year 1883 the direct imports were valued at \$1,822,424, and the importations through other ports \$218,951.

The U. S. district and circuit courts for the southern district of Ohio are held in Cincinnati. The other courts are the superior, with 3 judges; district court; common pleas, 7 judges; probate, 1 judge; police court, 1 judge; and 10 magistrates' courts. The county court-house is 175 feet high, and with the jail occupies a square of ground. The municipal government is in the hands of a mayor with a veto power, two boards, 25 aldermen, 50 councilmen, who together constitute the common council, and a board of public works. The mayor is elected for two years; salary, \$4000. The board of public works has charge of the streets and public works. For municipal purposes the city is divided into 25 wards. The police department, which is directly under control of the mayor, consists of 1 superintendent and 351 men, including patrolmen, sergeants, lieutenants, and detectives. There are no mounted or harbor police. Ordinary patrolmen are paid \$800 a year, detectives and lieutenants \$900. The telegraph and telephone systems are in use. For militia purposes one regiment of National Guards, the First Ohio, has its headquarters here. The fire department is managed by a board of fire commissioners. There are 20 steam-fire companies, 21 steam-engines, 1 chemical engine, 1 reel company, and 5 hook-and-ladder companies. The electric signalling system prevails. Only seven to fourteen seconds are required to hitch the horses to the engine carriages.

The public landing, wharves, docks, etc. extend along the river-front a distance of 2 miles. Cincinnati has direct river communication from the head of the Ohio at Pittsburg to New Orleans, a distance of 2100 miles. This includes also river communication with all the intervening navigable tributaries of the Ohio and Mississippi, thus forming the largest river-system in North America. Since the opening of the canal around the falls of the Ohio in 1872, admitting the passage of boats 300 feet long and 80 feet wide, the large Mississippi River steamers ascend to Cincinnati. The river-trade is of great importance. Immense quantities of coal are annually shipped down the Ohio from Pittsburg and other places. Cincinnati alone consumes, for manufacturing and other purposes, nearly 1,000,000 bushels of coal per week. The steam-vessels plying between Cincinnati and other ports during 1883 numbered 217; tonnage, 75,344. Freight is conveyed up and down the river by means of powerful towboats, to which fleets of barges are attached. Steamers of 1500 tons capacity come up the river to Cincinnati. Value of leading imports into Cincinnati by all modes of transportation for the year ending Aug. 31, 1883, \$284,239,878; value of exports for same period, \$294,719,798. Of this, about one-fourth was moved by river, the rest by railway and canal.

At extreme low-water mark there are $2\frac{1}{2}$ feet of water in the river channel at Cincinnati; high-water mark is 55 feet above this. In the flood of 1832 the water rose to a height of 65 feet and inundated nearly the whole city, which was then confined to the low grounds. In December, 1847, the river reached nearly 64 feet; on Feb. 15, 1883, it reached 67 feet, and again on Feb. 14, 1884, it rose above 71 feet. By these floods the gas

and water works were submerged, and much suffering ensued to the residents. Cincinnati is connected with the opposite side of the river by three bridges and three ferries. The principal passage-way is the wire suspension bridge between Cincinnati and Covington, 2252 feet long and 103 feet above low-water mark. (See BRIDGES.) The second bridge is between Cincinnati and Newport, a mile up the river from the suspension bridge. It is of wrought iron, supported upon stone piers, and is both a railway and wagon bridge. Street-car tracks cross both bridges. The Cincinnati Southern Railway bridge, exclusively for the crossing of railway trains, was built in 1877. It has a span which opens for the passage of steamboats in high water. (See BRIDGES.)

The building of the Cincinnati Southern Railway at an original cost of \$18,000,000, increased by the accumulation of interest during construction to \$26,000,000, gave new importance to Cincinnati as a railway centre. The road runs south through Kentucky and Tennessee to Chattanooga, a distance of 336 miles, forming direct communication between the Northern and Southern railway systems. It was leased by the Erlanger syndicate in 1880 for 20 years. During 1883 this road carried 597,975 passengers and 843,737 tons of freight. Gross earnings for this period, \$2,427,568.89. Freight consisted largely of livestock, coal, iron, stone, lumber, bark, flour, whiskey, turpentine, grain, cotton, hemp, tobacco, fruit, salt, provisions, and beer. The other railroads reported, for 1881, \$20,446,054.99 aggregate gross earnings. Twelve lines of railway enter Cincinnati, being used by twenty-one companies: Cincinnati, New Orleans, and Texas Pacific; Louisville and Nashville; Cincinnati, Washington, and Baltimore; Pittsburg, Cincinnati, and St. Louis; Ohio and Mississippi; New York, Pennsylvania, and Ohio; Cincinnati, Hamilton, and Dayton; Cincinnati, Hamilton, and Indianapolis; Cincinnati, Richmond, and Chicago; Dayton and Michigan; Cincinnati Northern (narrow gauge); Indiana, Bloomington, and Western; Cincinnati and Eastern (narrow gauge); Cincinnati, Columbus, Cleveland, and Indianapolis; Grand Rapids and Indiana; Chesapeake and Ohio, controlling Kentucky Central; Cincinnati, Indianapolis, St. Louis, and Chicago ("Big Four"); Toledo, Cincinnati, and St. Louis (narrow gauge); Cincinnati, Georgetown, and Portsmouth (narrow gauge); Cincinnati and Westwood and Cincinnati and College Hill. The last two are local narrow-gauge roads of small importance. The other roads connect with all the railroad systems of the United States, most of which have offices in Cincinnati, and 310 freight and passenger trains arrive and depart daily at six stations. The Cincinnati branch (P., C., and St. L.) of the Pennsylvania Railroad Co. has a large passenger-station at the corner of Pearl and Butler Streets. It is a handsome and imposing building, and adds much to the appearance of that portion of the city. The Union Dépôt, in the central part of the city, admits six trains at one time. The Grand Central Station is also a splendid structure, and is used by five great lines of railway. The first railway leading to Cincinnati was the Little Miami, built in 1840.

The city is connected with Lake Erie by the Miami and Erie Canal, terminating at Toledo on Lake Erie. This water-way joins the Wabash and Erie Canal, the longest canal in the United States (467 miles). Comparatively a small amount of traffic is carried on by canal. Three telegraphic companies—the Western Union, the Mutual Union, and the Baltimore and Ohio Railway Telegraphic Co.—connect Cincinnati with all parts of the civilized world. Thirty-three insurance companies have offices here—fire 26, life and accident 7. There are three lines of street railway; the principal one, owned by the Cincinnati Street Railway Co., has in use 175 cars, 1593 mules and horses, and operates 65 miles of track. The par value of its capital stock and bonded indebtedness is \$4,773,900. Two other companies own and operate some 14 miles of track.

There are 13 national banks and 11 private banks. The combined capital of the national banks in 1883 amounted to \$9,100,000; that of the private banks to \$1,221,000. The clearing-house exchanges for 1883 were \$494,414,900. A large amount of capital and earnings of the working classes is invested in building and loan associations. These have in a large measure taken the place of saving banks. There are some 200 of them, a majority being in a flourishing condition. Most of them are established upon the perpetual basis.

Cincinnati is an important commercial and manufacturing centre. The first district of Ohio, in which Cincinnati is, pays to the U. S. Government more internal revenue than any other district in the country. The amount of internal revenue taxes paid by it in 1881 was \$12,674,546.60, those from liquors, tobacco, and beer being \$12,496,145.82. In 1883 the total internal revenue collected here was \$10,585,734.35. An immense quantity of malt and distilled liquors is manufactured here. Over 15,000,000 proof gallons of distilled spirits are manufactured, and about 25,000,000 gallons bought and sold annually, with an approximate value of \$29,000,000. Nearly 26,000,000 gallons of malt liquors are produced yearly, having a value of \$6,500,000. There are 27 malt-liquor breweries. A single one of the large breweries sometimes purchases stamps for 48,000 kegs of beer in a month. The tobacco interest represents one of the most important industries. The city is situated within the limits of an extensive tobacco-growing region. In round numbers, 100,000 hogheads and 20,000 cases and bales of leaf tobacco arrive at this market yearly; 415 establishments are engaged in the tobacco manufacture, employing 3982 persons. The cash capital invested is \$1,832,700; the annual value of product exceeds \$4,500,000, and in some years has exceeded \$5,000,000.

The annual value of industrial products of Cincinnati, with the capital employed and real estate occupied, amounts to \$316,000,000. In the branch of pork-packing, Cincinnati, which long stood first, is now second in the United States. There were 173 pork-packing establishments in 1882, employing 1950 persons. The number of hogs packed annually varies considerably, but during the winter season of 1882-83 it was 425,400, the value of product being \$15,000,000. During the four months beginning Nov. 1st, in favorable seasons, the average number of hogs slaughtered weekly is 38,000. Summer packing is carried on to some extent. The grain-trade is increasing; its value amounted in 1881 to \$10,420,630. More than 500,000 barrels of flour are manufactured annually, while upwards of 1,100,000 are received by shipments. In livestock the annual transactions range from \$20,000,000 to \$25,500,000. Connected with the railway-tracks are the extensive United Railway Stockyards, covering 60 acres of ground and having a capital of \$1,250,000. The trade in livestock at Cincinnati is largely in hogs, but there are also extensive transactions in beef-cattle, sheep, horses, and mules, as the city is connected by two railroads with the adjacent Blue-grass region of Kentucky, famous for stock-raising. The sales of horses and mules in 1883 amounted to 26,975. The grocery trade in 1883 aggregated \$19,000,000. In 1883, \$7,792,363 worth of furniture was manufactured, largely for the South. This industry employed 3364 persons. The city possesses peculiar advantages for this interest, being in the heart of a region which produces the best quality of both hard and soft woods. The manufacture of burial-cases is carried on more extensively here than in any other city in the Union. Besides reaching every part of this country, Cincinnati burial-cases and hearses are sent abroad to Egypt, Turkey, and other foreign lands. In 1881, \$1,329,200 worth of coffins and burial-cases were made, requiring the labor of 852 persons. In the manufacture of carriages, light wagons, and wheeled-vehicle materials Cincinnati is noted. This industry is steadily growing. Its products for 1883 amounted to \$9,935,112, occupying 4120 hands. Thirteen factories are engaged

in the manufacture of white lead and paints. More glycerine is made in Cincinnati than in any other city in the world.

Building materials of all kinds, stone, earth, and wood, of the best quality, abound in the vicinity of Cincinnati. Fine varieties of marble are brought from the quarries of Tennessee, South Carolina, and Georgia. Numbers of brickyards are in operation in the city limits. Some have been operated in the winter by means of artificial heat. During 1881, 60,000,000 bricks were made in the yards maintained by Cincinnati capital, all for local use. A variety of red pressed brick and ornamental tile-work gives a very attractive appearance to the newer buildings of the city.

An inexhaustible supply of bituminous coal for manufacturing purposes is easily obtainable. Besides the river-supply, coal is shipped by rail from mines in Ohio, Indiana, and Kentucky. The Southern Railway brings the city within easy reach of coal- and iron-mines now being opened. The receipts of coal of all kinds in 1883 were 2,025,859 tons. The annual value of the iron production is estimated at \$10,900,000. There are 43 mills, foundries, and other establishments engaged, employing 3500 hands. In the manufacture of machinery for 1881 the value of the product was \$3,913,813, occupying 1508 persons. The receipts of cotton for 1882 were the largest ever known—402,599 bales; the shipments were 396,783 bales. In 1883 the receipts were 383,131 bales; the shipments, 376,912 bales.

The net debt of Cincinnati is \$23,907,474, chiefly on account of the Cincinnati Southern Railway, which the city built and owns. Value of real and personal property in 1884, according to tax-duplicate, \$166,925,286; rate of tax-levy, \$2.05 on \$100.

The site of Cincinnati was occupied by an Indian town before the white man came. Important and interesting relics of the pre-historic Mound-builders have also been found here. In 1780 two block-houses were built upon the ground as a defence against Indians. In 1788 a permanent settlement was made. The town was first called Losantiville, a name said to mean "the town opposite the mouth of the Licking River." It afterwards received from Gen. Arthur St. Clair its present name, in honor of the Society of the Cincinnati, which had been recently formed. It was incorporated as a city in 1814. In 1816 the first steamboat was built in Cincinnati; in 1830, for the promotion of trade, the Miami Canal was constructed; in 1840 the first railroad was built. By thus steadily adopting improved facilities for commercial intercourse the city attained such marked prosperity that it became known as the "Queen City of the West." Even the outbreak of the Civil War hardly checked the steady growth of Cincinnati's commerce. In September, 1862, the city was menaced with attack by a Confederate force, but this was happily averted. In the closing years of the war trade received a remarkable stimulus, and since that time much has been done to improve intercourse with the Southern States, the beneficial effects of which are now manifest. Manufactures also have steadily advanced in number and importance. As the wealth of the city has increased great attention has been given to the cultivation of the fine arts, as has already been shown. This progress, however, has not been unattended by drawbacks. Lax administration of justice enabled criminals to escape the penalties of their crimes. At last, in March, 1884, a prisoner charged with an atrocious murder was convicted of manslaughter and sentenced to imprisonment. Great disapproval of the verdict was manifested throughout the community. A mob assaulted and broke into the jail March 28, but the criminal whom they wished to seize and execute had already been removed. The State militia were called out to suppress the riot, and in the conflicts which ensued 45 persons were killed and 138 wounded, and the courthouse and other buildings were burnt. After three days of terror order was restored. Since that time the tone of public morality has greatly improved.

(E. A. C.)

CINCINNATI, SOCIETY OF THE, was instituted in 1783 by the regular officers of the Continental army at their cantonments on the Hudson River. The Continental Congress had on April 11, 1783, proclaimed a cessation of hostilities against Great Britain, and the officers of the army saw that in a few months they would have to separate, perhaps never to be reunited. Many of them already had been obliged to sacrifice their estates for the support of themselves and their families, as Congress had been unable to pay them even in a depreciated currency, and they would have nothing to take with them to their several homes but the recollection of their services. Meetings were therefore called by Baron Steuben, Major-Gen. Henry Knox, and Brig.-Gen. Jedediah Huntington on May 10 and 13 and June 19, at which the society was instituted to perpetuate the remembrance of the independence of the American States and the mutual friendships which had been formed amid common dangers. The society was to consist of the officers of the American army and their eldest male posterity, and in failure thereof the collateral branches who should be judged worthy. It was named from Lucius Quintus Cincinnatus, whose example the officers proposed to follow in returning to the condition of private citizens. Its objects, as set forth in the "Institution," were to preserve the rights and liberties for which its members had fought and bled; to promote union between the respective States; to render permanent the affection subsisting among the officers. The general society was divided into State societies, each of which should have its own officers and meet always on the anniversary of the Declaration of Independence. The general society consisted of certain general officers and a representation from each State, not exceeding five, and was to meet at least triennially. All the commissioned officers who had served at any time in the American army were declared eligible to membership, and also the eldest male branches of officers who had died in the service. Each State society was authorized to pass on the qualifications of applicants for membership, and might take as honorary members for their own lives only men eminent for their abilities and patriotism, but the ratio of honorary members to other members should not exceed one to four. Officers of the French army above the rank of lieutenant-colonel who had served in the United States, and officers of the French navy who had commanded on the American coast, were also made eligible.

The original general officers of the society were Gen. George Washington, president; Major-Gen. Horatio Gates, vice-president; Major-Gen. Henry Knox, secretary; Brig.-Gen. Otho H. Williams, assistant secretary; Major-Gen. Alexander McDougall, treasurer. The successors of Gen. Washington in the presidency of the society have been Alexander Hamilton, elected in 1800; Charles Cotesworth Pinckney, 1805; Thomas Pinckney, 1825; Aaron Ogden, 1829; Morgan Lewis, 1839; William Popham, 1844; Henry A. S. Dearborn, 1848; Hamilton Fish, 1854. In each State society the first president was as follows: New Hampshire, Major-Gen. John Sullivan; Massachusetts, Major-Gen. Benjamin Lincoln; Rhode Island, Major-Gen. Nathanael Greene; Connecticut, Bvt. Major-Gen. Jedediah Huntington; New York, Major-Gen. Alexander McDougall; New Jersey, Brig.-Gen. Elias Dayton; Pennsylvania, Major-Gen. Arthur St. Clair; Delaware, Surgeon James Tilton, M. D.; Maryland, Major-Gen. William Smallwood; Virginia, Major-Gen. Horatio Gates; North Carolina, Brig.-Gen. Jethro Sumner; South Carolina, Major-Gen. William Moultrie; Georgia, Bvt. Major-Gen. Lachlan McIntosh; France, Lieut.-Gen. Count de Rochambeau.

The State society of the order in France was organized under the most favorable circumstances. King Louis XVI., having received a copy of the "Institution," permitted French subjects who were eligible to become members, and after passing the examination their names were sent to him for confirmation. As the

superior French officers who had served in America belonged to the higher French nobility, the order of the Cincinnati, by reason of its honorable character and the limitation on possible membership, became greatly prized and eagerly sought for. But the Revolution of 1792 so dispersed its members that no more meetings were held.

In the United States considerable opposition was manifested for a time, and it was feared by some that the members would use their association as a means of political advancement. Its only political object, however, was to obtain a stronger national Government than the inefficient Confederation of 1781, and after contributing largely to the adoption of the Constitution of 1787 its political mission was ended. Some of the State societies have become extinct, and persons who are entitled to claim membership in those States are allowed to prefer their claims in one of the existing societies. The following are the presidents of the State societies now existing: Massachusetts, Samuel C. Cobb; Rhode Island, Nathaniel Greene, M. D.; New York, Hamilton Fish; New Jersey, L. Q. C. Elmer; Pennsylvania, George W. Harris; Maryland, William S. Williams; South Carolina, Wilmot G. De Saussure.

The badge of the society consists of an enamelled gold bald eagle, bearing on its breast a blue enamelled medal with prescribed devices. The ribbon is deep-blue, watered, two inches wide, edged with white. The insignia of the order, set in diamonds, and presented by Count D'Estaing on behalf of the naval officers of France to Gen. Washington, has descended to each successive president of the society.

No other association in the United States has numbered so many of the most eminent citizens among its members. While the limitation put upon membership may have unduly circumscribed its usefulness, the society continues as a repository of the traditions and principles of the Revolutionary fathers and one of the most honorable organizations of a national character.

(A. B. G.)

CINNABAR. See CALIFORNIA.

CIRCASSIA. In many English and American

See Vol. V. works—the *ENCYCLOPÆDIA BRITANNICA* p. 688 Am. not excepted—a remarkable confusion exists with reference to the people which, under the leadership of Schamyl, offered

a long and spirited resistance to the conquest of the Caucasian range by the Russians. The people of the Western Caucasus—called by themselves Adighe, by the Russians Tscherkesse, and in Western Europe Circassians—are Moslems of the Sunni sect. Formerly they were Christians. As late as the seventeenth century the Genoese found Christian churches among them. And, while Moslems by profession, they were so ignorant of their own religion that it was found necessary to teach them the daily prayers after their wholesale emigration to Turkey in 1864. That emigration was not preceded by any extensive or spirited resistance to Russian authority. The fate of the resistants in the Eastern Caucasus seems to have satisfied them that a struggle would be hopeless, and they sought a home by emigration in preference to either defending their country or submitting to an alien rule. The atrocities they committed afterward in Bulgaria are not relieved by any background of heroism in their early history.

The principal districts in the Eastern Caucasus are Lesghestan and Daghestan. The people of both are Moslems of the Shiah sect, like the Persians and the natives of Oude in India. Early in this century the country witnessed a great awakening of religious zeal under a series of spiritual and military leaders, of whom Schamyl (Samuel) was the last and the bravest. The occupation of the coast of Daghestan by Russia as a necessary consequence of her annexation of the Christian kingdom of Georgia (or Gerusien) in 1800, intensified, if it did not cause, this Murid movement. For over half a century the Lesghians resisted Russian advances, and not until their country had been

pierced by great military roads did their last army under Schamyl surrender, in 1859. Of the glory of this resistance they have been robbed by a blunder which transfers it to a race alien from them in faith, in blood, and in character.

CIRCLEVILLE, the county-seat of Pickaway co., Ohio, is on the Scioto River, 24 miles S. of Columbus; on the Scioto Valley Railroad, the Cincinnati and Muskingum Valley Railroad, and the Ohio Canal, which here crosses the Scioto by an aqueduct. A coal railroad to the Hocking coal-fields, 30 miles S. E., is now in process of construction. The city is well laid out, with wide, shady streets and handsome residences. It has a good court-house, fine Masonic temple, two hotels, two national banks, three weekly newspapers, thirteen churches, and three public-school buildings, and there are two large pork-packing establishments, a tannery, machine-works, a flour-mill, two planing-mills, and vegetable-canning works. The city has two steam fire-engines, gas, and a telephone exchange. Its property is valued at \$3,300,000; its total tax is \$66,000, and it is free of debt. It was laid out in 1810, and incorporated as a city in 1830. The town derives its name from the celebrated circular earth-works erected here centuries ago by the Mound-builders. Population, 6046.

CIRCUIT PREACHERS. See METHODISTS.

CIRCULATION. The term circulation, in biology, refers to that function by means of which the nutritive materials supplied by absorption are distributed to the economy after being subjected to aëration, and by which the refuse and effete materials are carried where they may be excreted. Circulation is an organic function, being present in both the animal and the vegetable kingdom. In the simplest forms of life, both animal and vegetable, in which absorption takes place by imbibition from the entire external surface, no special circulatory apparatus is required; it is only when certain tissues become specialized organs for absorption, and others for aëration, that a necessity arises for some apparatus by which the materials absorbed are conveyed from the point of absorption to the respiratory organs and to the system at large. The development of the circulatory apparatus is therefore proportional to the degree in which absorption and respiration are limited to special tissues.

Circulation in Plants.—In the lowest forms of plants, such as the *Algæ*, which absorb by their whole surface, there is no provision for carrying on a circulation of fluid. In the *lichens*, in which absorption appears to be restricted to the sides least exposed to light, there first appears the capability—probably by imbibition, as no signs of tubular structure can be detected—of transmitting fluid absorbed at certain points throughout the entire plant. In the higher *Fungi*, as in the mushrooms, the nutritive matter which is absorbed by the mycelium at the base is transmitted through the elongated cells, and possibly also by the intercellular spaces, to the summit, where it is diffused in all directions. In this group is seen the first indication of what has been developed into the vascular system in the higher forms; for, while in species in which the transmission of fluid takes place in all directions the cells retain a rounded form, as soon as there appear the first signs of limitation of the absorbing surface the cells become elongated and arranged end to end, and the fluids are transmitted through these cells in the direction of their long axes. In the higher *Cryptogamia*, as the mosses and ferns, the signs of a vascular system become much more marked; in them there is a regular transmission of fluid from the roots to the leaves, partly through the cellular structure and partly through the scalariform vessels. As the power of absorption becomes limited to special tissues and a distinct axis of growth is developed, the last-formed cells of the roots—the so-called *spongioles*—before being converted into woody fibre possess the power of absorbing nutritive materials from the ground and of delivering the products of absorption to the cells next

above, which transmit them from below upward. In addition to this method of transference, we also find in the *ferns* and *mosses* systems of tubules which, in the active stage of vegetation, are also concerned in the transmission of fluid. In the *Phanerogamia* the fluids are transferred through a perfect system of tubules, and in two directions, the ascending sap consisting mainly of water absorbed by the spongioles, and the descending or elaborated sap after the fluids absorbed have been subjected to aëration and elaboration in the leaves. Even in the higher plants, however, circulation, in the sense of a continuous movement in a circle, is incomplete, as there is a steady upward flow at one time and a steady downward flow at another. In addition to this upward and downward movement, however, cross-currents, due to imbibition and osmosis, can be detected. The propelling forces in the circulation in plants are (1) the *vis a tergo*, resulting from continued absorption in the roots; (2) the *vis a fronte*, by which this fluid is drawn to the parts in which it is employed and to the leaves, where exhalation is continually taking place; and (3) *capillarity* and *osmosis*, which serve to maintain a continuous movement.

Circulation in Animals.—As might be expected from the definition of the circulation, in the lowest animals, as in plants, in which absorption takes place from the entire external surface, there exists no apparatus for carrying on a circulation of fluid, the contractile vesicles seen in many of the *Protozoa* having, probably, rather a respiratory than a circulatory function; it is only when the digestive organs become highly specialized that a circulatory apparatus appears. Thus in the *Cœlenterata* the somatic cavity is in free communication with the digestive cavity and with the exterior, and the fluid which it contains, representing the blood of higher orders, is moved by the contractions of the entire body and by the vibration of cilia lining the somatic cavity, there being no indication of either a heart or a vascular system. In the *Turbellaria*, *Trematoda*, and *Cestoidea* the lacunæ of the mesoderm and interstitial fluid of its tissues are the representatives of a blood-vascular system—a condition closely analogous to what has been already noted as the first indication of a circulation in plants. In *Annelida*, as is also the case in the *Rotifera*, we find a perivisceral cavity lying between the splanchnopleure and the somatopleure, communicating with the segmental organs, as the water-vascular system. In the former group there is also to be found a system of canals (the *pseud-hæmal* system), in some instances communicating with the perivisceral cavity, with contractile and often ciliated walls, and containing a clear, sometimes corpusculated fluid, which may be either red or green from the presence of a substance which resembles hæmoglobin and which is evidently of a respiratory value. These canals always communicate at some point by a tubular stem with the exterior. In the lowest forms of the *Arthropoda* the same general conditions noted in the *Turbellaria* are to be found—viz. a perivisceral cavity and an interstitial fluid, in which, however, colorless cells may be detected. In the lower *Crustacea* and in many *Insecta* we find a single elongated, sometimes segmented, contractile vessel, the *dorsal vessel*, provided with lateral valvular openings by which the blood enters from an enclosing venous space or sinus. In the higher *Crustacea*, as in the lobster, there is a single, well-developed, muscular, systemic *dorsal* heart, surrounded by a venous sinus and giving off a number of arteries, which pass into capillaries; but the venous system still remains more or less lacunar. In the *Mollusca*, also, the same gradual differentiation of the blood-vascular system is observable. In some of the lowest forms, as in *Polyzoa*, neither a contractile heart nor even vessels can be detected, circulation in them, as in lower forms, being carried on by mere imbibition. In the *Tunicata* the heart, whose position closely resembles its ventral situation in the *Vertebrata*, has no valves between its dilated chambers, and the blood is propelled by opposite peristaltic move-

ments, first in one direction and then in another; hence, here the heart is sometimes systemic and sometimes respiratory. The most perfect form of circulation found in the *Mollusca* exists in the *Cephalopoda*. In them there is a systemic ventricle provided with valves at its orifice, with systemic arteries, the blood being returned into a large venous sinus, from which it passes to the gills through contractile vesicles, the branchial hearts, which serve to propel the blood through the gills; from there it passes again into contractile venous sinuses, which, therefore, act as auricles, and is then driven to the heart.

Thus we find that in the *Invertebrata* the circulatory apparatus, even in the highest forms, contrasted with what we shall find in the *Vertebrata*, does not consist of a continuous series of tubes, but that the blood passes from such vessels into spaces (*lacunæ* or *perivisceral spaces*) without distinct walls. Connected with the vessels we often find several pulsating cavities more analogous to the lymphatic or venous hearts found in the *Vertebrata* than to a true respiratory or systemic heart. When a heart is present in the invertebrates, it is single, is, as a rule, placed on the dorsal aspect of the body, contrasted with its ventral position in vertebrates, and is of a systemic and not respiratory function. In the *Invertebrata* there is no trace of a portal system, the liver being supplied by the systemic arteries.

In the *Vertebrata*, *Amphioxus*, the lowest form of fish, has a system of blood-vessels with contractile walls, but no distinct heart, while in all the other vertebrates there is a heart with at fewest three chambers (*sinus venosus*, *atrium*, *ventricle*), arteries, capillaries, and veins, and a system of lymphatics connected with the veins. In many of the lower forms of vertebrates we still find large venous sinuses, but in the higher forms these are for the most part replaced by definite vessels with muscular walls. Important peculiarities, however, exist in the vascular systems of the *Vertebrata* dependent upon the character of their respiration, whether *pulmonated*, or air-breathing, or *branchiated*, or water-breathing; and further, as to whether their blood is warm or cold. *Mammalia* and *birds* are included in the group of warm-blooded *pulmonated* *Vertebrata*; *Reptilia* and *Amphibia* in the group of cold-blooded *pulmonated* animals; and fish constitute the group of cold-blooded *branchiated* *Vertebrata*. In all of these animals the character of the circulatory apparatus depends upon the manner in which the blood is oxygenated; therefore, in those animals, as some of the *Amphibia*, which commence life as *branchiated* animals and subsequently become *pulmonated*, we find that their circulatory apparatus becomes modified accordingly, and presents two different styles corresponding to the stage of their existence. In all forms of *Vertebrata* a portal system is present—that is, the liver receives a special supply of venous blood derived from the systemic capillaries of the abdominal organs.

In *Fishes*, the lowest forms of vertebrates, the heart consists of a single auricle with the sinus venosus, which is always present, and a single ventricle, the former receiving the dark venous blood from the body and transmitting it through an opening, guarded by a valve, to the ventricle, from which the blood is propelled to the *bulbus arteriosus*, and then through four or five branching vessels supported on the cartilaginous branchial arches to the gills. After being subjected to aëration in the capillaries of the gills, the blood is then collected by the branchial veins, which, uniting into a single arterial trunk situated on the dorsal aspect of the alimentary canal, and corresponding to the aorta of higher vertebrates, serves by a system of branching vessels to distribute the arterial blood to the system at large; whence it is again returned by the venous system, after passing through the systemic capillaries, to the auricle. In fishes, therefore, the respiratory apparatus forms a part of the general systemic circulation, the heart being, therefore, a branchial and not a systemic organ, and the circulation being *simple* instead

of *imperfectly double*, as in the Reptilia, or *perfectly double*, as in the warm-blooded Vertebrata. In the fish, as in all vertebrates, a portal system, composed of veins from the digestive apparatus, conducts the blood from the abdominal organs through the kidneys and liver; hence, in the fish both these glands receive venous blood.

In the *Reptilia* the heart consists of two auricles and one ventricle. The right auricle receives venous blood from the system at large; the left auricle receives arterial blood from the lungs; both discharge their contents into the single ventricle, which thus receives a mixture of venous and arterial blood. From the ventricle the blood is driven partly through the lungs and partly to the general system, so both lungs and system receive a partially aerated blood, forming an incomplete double circulation. In the Reptilia, as a rule, there is a distinct arterial and distinct pulmonary trunk arising from the ventricle, but in the Amphibia there is only a single trunk, of which the pulmonary arteries are branches, rising from the ventricle. In the crocodile there exists a partial ventricular septum, so placed that it serves to direct the dark venous blood entering from the right auricle chiefly into the pulmonary arteries, whilst the arterial blood coming from the left auricle is sent out into the systemic arteries, thus closely approaching the double circulation of birds and mammals. A portal circulation is also present in the cold-blooded pulmonated Vertebrata, and, as in the fishes, is connected with the renal veins.

In *Birds* the heart, as in man, consists of four cavities, two auricles, and two ventricles, and the general distribution of the circulation is the same—i. e., the right auricle collects the blood from the systemic veins, transmits it to the right ventricle, which by means of the pulmonary artery forces the blood through the lungs. From the lungs the oxygenated blood is carried by the pulmonary veins to the left auricle, from there to the left ventricle, and thence, by means of the aorta and its branches, to the system at large. There is therefore in birds a perfect *double circulation*—a pulmonary and a systemic circulation. The portal system is also present in birds, and, as in the lower vertebrates, receives branches from the kidneys and from the lower limbs.

The circulation in *Mammals*, of which man may be taken as a type, deserves to be treated at somewhat greater length than the circulation in inferior organisms. As in other vertebrates, with the exception of the openings of the larger lymphatics, the blood is contained in a completely closed system of vessels, whose course and general arrangement we will first trace in general outline. The circulation is carried on through a system of tubes of different functions and different properties. These are (1) the central organ, the heart, a hollow muscle which serves as both a pump and a reservoir, divided into four cavities, two auricles or receivers of blood, and two ventricles or pumps; (2) the arteries, a system of muscular and elastic tubes coming off from the heart, and which gradually subdivide, like the trunk of a tree, into branches, and which serve to carry oxygenated blood to the tissues; (3) the veins, another system of branching tubes, also elastic and muscular, but less so than the arteries, which conduct to the heart the blood collected from (4) the capillaries, a system of fine tubes situated between the arteries and the veins.

In *Man*, as in other mammals, we have to deal with a double circulation—the systemic circulation, and the pulmonic. Their general outline may be given as follows: Starting from the heart, the arterial blood leaves the left ventricle through the *aorta*, which immediately gives off two vessels, the coronary arteries, for nourishing the tissue of the heart itself; the aorta then divides into branches, which themselves become successively subdivided to supply arterial blood to the head, trunk, limbs, and all the organs of the body, the vessels becoming finally so minute as to allow merely the

passage of a single blood-corpuscle, forming then the so-called capillary vessels. From the capillaries the blood is again collected by converging venous radicals, which finally are united to form two main venous trunks—the *vena cava superior*, bringing the blood from the head and upper extremities, and the *vena cava inferior*, collecting the blood from the trunk and lower limbs. Both of these large veins empty into the *right auricle*, completing the circuit of the greater or systemic circulation. From the *right auricle* the blood is emptied into the *right ventricle*, from which it is forced by the heart's contractions into a single large trunk, the pulmonary artery. This artery, which, however, contains venous blood, soon divides into two trunks, one going to each lung, each of which divides and subdivides in the lung-tissue to form a second capillary network, in which the dark venous blood is subjected to the influence of the air contained in the air-cells, gives up its carbonic acid and certain organic impurities, and absorbs oxygen, becoming again bright, red arterial blood. It is then collected by the pulmonary veins and carried to the left auricle, thus completing the lesser or pulmonary circulation and bringing us back to the point from which we started.

We may now study the phenomena of the circulation more in detail. *The heart*, in man, is placed in the anterior mediastinum, between and partially covered by the two lungs, and contained in a serous sac, the pericardium. Its base is directed upward, backward, and to the right; it extends from about the fourth to the eighth dorsal vertebra, and rests upon the cordiform tendon of the diaphragm. The apex lies between the cartilages of the fifth and sixth ribs, about two inches below the left nipple and an inch to its sternal side. The heart is a hollow muscle containing four cavities—two auricles lying at the base, for the reception of blood, and two ventricles, for its propulsion, after delivery from the auricles. The walls of both ventricles are much thicker than those of the auricles, and the left ventricle is much more powerful than the right. The right auricle and ventricle constitute the respiratory heart; the left auricle and ventricle, the systemic. When the auricles become filled with blood, they suddenly contract and drive the greater part of the blood which they contain into the ventricles, which are at this moment empty and dilating, and thus offer less resistance to the entrance of blood than do the veins which are filled; consequently, the resistance being less in the direction of the ventricles, no valves are required at the openings of the veins to prevent regurgitation. Immediately after the contraction of the auricles, which requires about one-fifth of the time of a cardiac revolution, and the consequent distension of the ventricles with blood, the ventricles contract (the cardiac *systole*), and propel the blood into the large arteries, the pulmonary artery and aorta, reflux into the auricles being prevented by the action of valves situated at the auriculo-ventricular rings. Contrary to what occurs in the auricle, the ventricles contract slowly, but with great force, their time of contraction occupying about three-fifths of the time of complete revolution, during which time they empty themselves completely.

Immediately after the contraction of the ventricle is completed, they commence to relax (the cardiac *diastole*) and slowly to fill with blood from the auricles, regurgitation from the great arteries being prevented by the semilunar valves attached at the openings of these vessels. After a period equal to about one-fifth of the time of an entire revolution, during which the heart is in repose, the auricles again contract, then the ventricles, and so on indefinitely.

We thus see that, like all muscles, the heart is contractile; but, unlike nearly all other muscles, it contains within itself something which causes its different parts to contract in a definite succession and at regular intervals even when removed from the body, constituting what is called the cardiac rhythm. The rate of

this rhythm—or, in other words, the mean rate of the pulse—is, in adults, about 72 beats per minute; in the fetus, however, it is much greater (180). After birth the pulse decreases in frequency up to the twenty-first year, while in old age the frequency again appears to increase. The rate of pulsation is affected by various influences; thus, exercise increases the pulse, as does heat, the erect position and digestion, while cold and a horizontal position will tend to reduce its frequency; strong emotions and many drugs may also affect the rate of pulsation. When the ear is applied over the region of the heart, certain sounds are heard which succeed one another with great regularity at intervals corresponding with those of two sounds to every beat. First comes a long, dull sound, then a short, sharp sound, then a pause, then the long sound, the short, and the pause again. The first of these sounds is synchronous with the ventricular systole and the impulse of the heart against the chest-wall, and is produced by the musical note of muscular contraction, together with the sound produced by the closure of the auriculo-ventricular valves and the rush of blood out from the ventricles. The second sound is produced by the sudden closure of the semilunar valve, situated at the openings of the pulmonary artery and aorta.

Circulation in the Arteries.—The arterial system may be regarded as a cone whose apex is at the left ventricle, and whose base is the capillary apparatus; and the venous system, as a cone whose base is also at the capillaries, opposed to the arterial cone, and whose apex is also found in a muscular chamber, the right auricle, so completing the systemic circle. The pulmonic circle may be regarded as constituted in the same way, the apex of the arterial cone being in the right ventricle and the apex of the venous cone in the left auricle, the pulmonary capillaries furnishing a common base-line. By means of this simple conception of the circulatory apparatus, we can account for the pressure and velocity of the blood-currents in different situations. At each contraction of the ventricles the pressure in the arterial cone is increased from the injection into it of a new amount of fluid, and the pressure in the venous cone is reduced at each contraction of the auricle from the abstraction from it of a certain amount of blood; hence, circulation is maintained from the ventricle to the auricle, the velocity (and pressure in the arterial system) of the blood-current at any one point in these cones being inversely as the distance of those points from the apex of the cone. When the contents of the ventricles are suddenly forced into the arteries (which are already full), a shock is given to the whole mass of fluid which they contain. This shock (the pulse) is propagated almost instantaneously throughout the fluid, becoming fainter and fainter in proportion to the increase of its mass in the capillaries, and finally ceases to be discernible. If the blood-vessels were of rigid material, the fluid which the arteries contain would be transported forward as far as this impulse was competent to carry it, at the same instant as the shock, throughout their whole extent; and, as the arteries empty into the capillaries and the capillaries into the veins and these into the heart, there would be returned to the auricles, almost at the same moment that the ventricles contract, a quantity of fluid exactly equal to that driven out of the ventricles, and the current through the blood-vessels, both arteries and veins, would be intermittent. The blood-vessels, however, are not rigid, but are extremely elastic, from their muscular and elastic fibres; hence, when the ventricles contract, they force an additional amount of blood into a filled system of the tubes, which, from their elasticity, dilate to accommodate it, and the recoil from the over-distended condition during the diastole of the heart serves to maintain onward motion in the blood-current and tends to render it continuous. Thus we find that the large arteries near the heart contain the largest proportion of elastic tissue, and the vessels are here consequently

most distensible and the pulse is most marked; but from the very fact that they are so elastic they tend to overcome the intermittent action of the heart, and by the time the capillaries are reached the blood-current is almost continuous. In addition to the elastic tissue, the smaller arteries are richly supplied with muscular tissue, through whose degree of contraction the amount of blood supplied to any part is regulated.

As already mentioned, there are two capillary networks through which the blood must pass—the pulmonic capillary system and the systemic capillary system. The functional difference between these capillary systems depends upon the character of the changes which the blood which they contain undergoes. In the pulmonic capillaries the blood takes up oxygen and gives off carbonic acid; the reverse takes place in the systemic capillaries. Throughout the whole of the passage, therefore, from the pulmonic capillaries to the systemic, the blood is rich in oxygen (*arterial*); during its passage from the systemic to the pulmonic capillaries it is poor in oxygen and rich in carbonic acid (*venous*).

The Influence of the Nervous System on the Circulation—As already stated, the heart possesses the power of maintaining a regular and rhythmical pulsation even when removed from the control of the nervous system; it possesses this power in virtue of its intrinsic nervous ganglia, which, while capable of maintaining the pulsation of the heart, are nevertheless, in a normal state, controlled by the central nervous system. The heart is connected with the cerebro-spinal axis by two systems of nerves, the efferent and the afferent nerves. The efferent fibres, which proceed from the cerebro-spinal axis to the ganglia of the heart, are of two kinds, *inhibitory* and *accelerator*. The *inhibitory nerves* arise in the medulla oblongata, in the cardio-inhibitory centre, and reach the heart through the pneumogastric nerves. These fibres, like the centre from which they arise, are in a constant state of activity, and exert a controlling or inhibitory effect on the heart's pulsations. Thus, when they are stimulated, the pulsations of the heart are reduced in number, and the heart may even be arrested in diastole; when divided or paralyzed, the heart beats faster. They have been well compared to a brake. The *accelerator nerves* also arise in the medulla oblongata, pass down the lateral columns of the spinal cord, and reach the heart through the branches of the cardiac plexus derived from the last cervical and first dorsal sympathetic ganglia. These nerves are not usually in a state of activity, and a result of their intermittent activity is to accelerate the movements of the heart. The ganglia of the heart are also in communication with the medulla through *afferent fibres*, which appear to run mainly in the trunk of the pneumogastric nerves or in their branches. These nerves are of three different kinds: *first*, those of common sensibility; *second*, excito-cardio-inhibitory—i. e. nerves whose stimulation leads to an increased activity of the cardio-inhibitory centre in the medulla, and a consequent reflex inhibition of the heart through efferent vagus fibres; *third*, depressor fibres, which, when stimulated, lead to an inhibition of the vaso-motor centre in the medulla oblongata, and a consequent dilatation of the systemic blood-vessels.

In the blood-vessels are to be found two antagonistic tissues, the elastic tissues, tending to produce dilatation of the vessels, and the circular muscular fibres, which tend constantly to reduce the calibre of the vessels. The normal condition of partial contraction of the blood-vessels is due to a constant series of nerve-impulses originating in the vaso-motor centre in the floor of the fourth ventricle of the brain, and reaching the vessels through branches of the sympathetic system of nerves, the vaso-constrictors, and to the presence of local peripheral vaso-motor ganglia on the walls of the vessels. In addition to these nerves, the blood-vessels are also supplied with branches, mainly of the cerebro-

spinal nerves, which are not in constant activity, but which, when called into activity, serve to inhibit the peripheral ganglia, to prevent contraction of the muscular coat of the arteries, and allow expansion to take place through the tendency of the elastic tissue to regain its position of equilibrium. (R. M. S.)

CIRCUS.—This name is applied indifferently to the building or enclosure within which is contained a circular space or "ring" designed for the exhibition of feats of horsemanship, gymnastics, etc., and to the company of performers. Though the circus in its present form can claim an antiquity of little more than a century, it can easily be linked with the Roman arena. Ruins of the amphitheatres built during the Roman occupation of Britain still remain at various places, and an illumination of an Anglo-Saxon manuscript in the Harleian Collection shows an audience in such an amphitheatre diverted by a musician to whose music a man is dancing, while another performer exhibits a tame bear which feigns to be asleep or dead. In later periods we find anticipations of the modern circus in the exhibitors of dancing bears and of horses that beat the kettle-drum with their fore feet, and the gleemen, some of whom were tumblers and jugglers. One illuminated manuscript shows a juggler throwing three balls and three knives alternately; another represents a boy leaping through a hoop; a third, a female acrobat bending backward; while in others are seen dancing bears and apes, an ox balancing itself upon a horse's back, a horse on the tight-rope, another walking on its hind legs and engaged in mimic warfare with a man armed with sword and buckler, etc. Reginald Scot mentions among the tricks of the jugglers who frequented the fairs during the reign of Elizabeth "the decollation of St. John the Baptist," which is "the severed head" of modern conjurors; and the literature of the period abounds in allusions to similar shows. Banks and his famous performing horse Morocco, which danced and solved arithmetical questions, must have been known to Shakespeare ("The dancing horse will tell you," *Love's Labor Lost*, i. 2); that natural curiosities were then exhibited is proved by Trinculo's speech on the discovery of Caliban, and Jonson in *The Alchymist* testifies to the early use of the circus-poster. The shows, which had grown into favor despite their temporary discouragement by the severe Vagrancy Act of Elizabeth, suffered an eclipse during the Puritan ascendancy, but soon became once more the favorite attractions at the fairs. Puppets and "motions" are mentioned in 1641, though the earliest specific notice of Punch in London seems to be that found in the overseers' books of St. Martin-in-the-Fields, 1666-67. Evelyn in 1654 records that he saw a "tame lion play familiarly with a lamb," a six-legged sheep, and a four-legged goose; and in 1657 speaks of a famous rope-dancer who went through such feats as had been performed by a Spaniard in the presence of Edward VI., and of a hairy or bearded woman. Jacob Hall, the first lover of Nell Gwynne, was a noted acrobat and rope-dancer of the time, and threw his somersaults over naked rapiers and men's heads; Joseph Clark, the posturer, one of the wonders of London during the reigns of James II. and William III., seems to have been the original "boneless man;" and William Stokes, a famous vaulter, in the illustrations in his book published at Oxford in 1652 shows himself vaulting over horses and leaping upon them, in one case alighting on the horse's back, in one in the saddle—a feat re-introduced in modern times as a novelty. He seems to have been the first to introduce horses in the performance. Giants, dwarfs, monsters, and wild men had always been popular. The first menagerie seems to have appeared at Bartholomew Fair in 1708, in the "Collection of Strange and Wonderful Creatures" being included the Noble Casheware, a leopard from Lebanon, an eagle from Russia, a "posoun" (opossum?) from Hispaniola, a great mare of the Tartarian breed, and "a little black hairy monster bred in the Desarts of Arabia." "A sur-

prising young mermaid taken on the coast of Aquapulco" was shown in 1748.

Philip Astley, who was born in 1742, had served in a cavalry regiment with distinction, and on his discharge from the army, having already learned some feats of horsemanship, in 1770 began his open-air performances at Lambeth, which were received with such favor that he repeated them in various cities and towns. After a time he built a rude circus near Westminster Bridge, only the seats being roofed over, exhibiting his trick-horse at an earlier hour each day in a room in Piccadilly, where the performance was eked out with conjuring and a shadow pantomime. One of the earliest advertisements of Astley's that has been preserved mentions as the programme of the entertainment "horsemanship by Mr. Astley, Mr. Taylor, Signor Markutchy, Miss Vangable, and other transcendent performers," a minuet by two horses, a comical musical interlude, *The Awkward Recruit*, and "an amazing exhibition of dancing dogs." Out of the proceeds of these performances Astley built and opened the Amphitheatre in 1780, the programme of the time including the "Chinese shadows," feats of horsemanship, tumbling, performances on the slack-rope, ladders, and chairs, a burlesque equestrian act by the clown, and the "Egyptian pyramid of men piled on men." About the same time the Royal Circus (afterwards the Surrey Theatre) was erected in Blackfriar's Road by the elder Dibdin and an equestrian named Hughes, soon passing under the management of the first Grimaldi: it competed keenly with Astley's, combining with equestrianism burlettas, dancing, singing, pantomime, and fireworks. At this time (1783-84) Astley had made several successful visits to Paris, upon one occasion, according to Decastro, avoiding an infringement of the monopoly of a French performer by building a platform for his acrobats which was supported on the backs of horses—a real ambulant theatre; he soon after erected a large amphitheatre in the French capital, and built another in Dublin. The younger Astley (John) was, according to Walpole, a great favorite with Marie Antoinette.

Though the modern circus had thus been firmly established and had received its directing impulse, its development was so slow that for fully a generation after the opening of Astley's Amphitheatre "the performances did not differ in any respect from the usual entertainment of the smallest tenting company now travelling." A stag-hunt introduced in the Royal Circus was almost the only novel feature for many years. Astley's was burned down in 1794, and again in 1803, and each time rebuilt instantly by the courageous old man, whose boast was that he had built nineteen theatres. The era of "horse spectacles," began with *The Blood-Red Knight*, brought out in 1810, running a whole season and netting a profit of £18,000. Horses, elephants, and camels were introduced at Covent Garden in 1811 in *Bluebeard* and *Timor the Tartar*. Philip Astley died in 1814, and his son in 1821, when Davis succeeded to the management, which in 1830 was taken by Andrew Ducrow, for some time the star rider of Europe. Ducrow, who was born in Southwark in 1793, was famous as a pantomimist ere he became an equestrian. He was the originator of the *poses plastiques*, a series of studies of classical statuary on the back of a horse, and later, at Franconi's, was the first to introduce the equestrian pageant known as an *entrée*. After a single season at Astley's, Ducrow went to Paris, returning to London in 1824, where he made the fame of the Amphitheatre, introducing the then unparalleled feat of riding six horses at once. In 1828, Davis brought a performing elephant into the arena, and in 1831, Ducrow, one of whose new riders was the first of the famous Stickneys, produced the spectacle of *Mazeppa*. A mimic Spanish bull-fight was given a year later. Ducrow died in 1842 of the shock received at the burning of Astley's for the third time, and the Amphitheatre was rebuilt and reopened by William

Batty, a clever equestrian and a manager of great enterprise. In 1855 Astley's was taken by William Cooke, who retired in 1860; Batty then returned for a brief space; then, in 1862, Mr. Boucicault transformed the Amphitheatre into the unsuccessful Theatre Royal, Westminster; and in 1868 the place was finally sold.

Tenting or travelling circuses came into existence in England between 1805 and 1830. At first they were upon a most modest scale, and were met with chiefly at fairs. There were rarely more than three or four horses, of which perhaps two appeared in the arena, and the performances were short, consisting of two or three acts of horsemanship, some tumbling and feats on the tight-rope; but the programme was repeated as often as the tent could be filled from noon until midnight. But as the taste for equestrian and acrobatic performances increased, with the increase of wealth the travelling companies became stronger and more numerous, and permanent amphitheatres were erected at Liverpool, Birmingham, Sheffield, and other large cities and towns. Of the modern circuses in England, Hengler's and Sanger's have been among the most notable. The first Hengler was a rope-dancer at Astley's in 1807, and his descendants had been tenting for a long time ere they established themselves, first at Liverpool and other provincial towns, and finally, in 1871, at London. The Sangers, after performing for some seasons at Agricultural Hall, bought Astley's, or the Royal Westminster Theatre, and made it their headquarters during the winter months, spending the summer in visiting the principal provincial towns. The Newsomes, Cookes, Prices, and other families noted in English circus annals, and all the prominent companies, are fully described in Thomas Frost's *Circus Life and Circus Celebrities* (London, 1875). See also the same author's *The Old Showmen and the Old London Fairs* (London, 1874); C. W. Montague's *Recollections of an Equestrian Manager* (London, 1881), and, for the early history of Astley's, the Circus Royal, etc., the *Memoirs of J. Decastro* (1824). It may be added here that the introduction into the circus-ring of famous pugilists is not of recent origin, Astley having engaged "Dutch Sam" and other prize-fighters for the Olympic Pavilion about 1807. Of other European circuses, that of Franconi at Paris, established by Astley about 1804, has passed into history with the English Amphitheatre, and the Circo de Price of Madrid is probably the finest building of the sort in the world.

The history of the circus in America it is difficult to trace with even approximate accuracy. The profession has found no systematic historian, nor has there existed such an establishment as Astley's to facilitate the labor of investigation. The bills of early shows have not been preserved, and the recollections of early performers and managers even are very deficient in dates, while where dates are given they are usually inconsistent with other statements resting on similar authority. So far as records can be trusted, the circus business in the United States seems to have begun at about the same time as in England, and the final divergence between the circuses of the two countries is due to obvious causes. One Rickets seems to have been the American Astley, and his show in Philadelphia was, we are told, visited by Washington and his staff in 1780. With Rickets was soon afterwards associated a Frenchman named Boschard or Bouchard, who became sole manager upon Rickets's death. Several other companies were established before the close of the century, but it was not until the decade 1820-30 that the American circus attained to real importance. Even then the average show was a very modest affair. A company with eight horses and as many performers was a strong one. The "tent" was merely an enclosure of canvas, seats had not yet been devised, and the advertising arrangements were very primitive, a single poster of one sheet serving to awaken the curiosity of a village. The circus, travelling at night (evening performances being practically impossible, because of the absence of any device for illumi-

nating the ring), announced itself at daybreak, and the programme included only feats of strength, leaping, vaulting, rope-walking, riding without a bridle, and like simple performances, the place of the clown being taken by a comic vocalist. About 1830 more ambitious ideas began to prevail; the mammoth show of Purdy, Welch & Co. took the field with twenty-four gray horses and a brass band of eight pieces; the real tent was substituted for the canvas enclosure; a method of lighting the ring with candles in a frame around the centre-pole was devised; the corps of canvasmen, charged with the work of pitching the tent and preparing the ring, came into being; and an advance-agent was employed. His duties at first were to precede the circus by but a day or two, and by his conversational powers and popular manners work up the people of the town to a profitable pitch of excitement, the arrival of the troupe and its grand parade completing the work. In due time he attained to the dignity of a special vehicle, nor was it long before posters and advertisements were called upon to replace, and not merely to reinforce, his eloquence. The first circus-bills, in the proper sense of the word, seem to have been employed about 1840 to announce the performances of Van Amburgh. It is doubted by veteran managers whether the excellence of the circus-performer has grown as notably as the importance of the show. The earlier companies required that each of the members, so few in number, should possess more than one accomplishment, whereas now all the rage is for special performers. It may be doubted whether the rôle of the jester is of so great importance now, when the audiences are so large that his quips cannot be caught.

During the twenty years preceding the circus made a rapid advance in merit and in popularity. Bareback riding grew in favor, and more showy gymnastic performances—the *trapeze*, unknown to earlier showmen—came into vogue, and there was a notable increase in the splendor of the equipments and accessories. About 1860 the American circus entered upon the railroad period, and "the road" was abandoned by all the great companies. Within the last few years these companies have entered upon a new stage, owning their own railroad-trains and advertising-cars; and as the larger organizations are swallowing up the smaller ones or forcing them out of the field, the time seems near at hand when there will be a practical monopoly of the business, and, to avoid disastrous competition, arrangements will be made as to territory and dates at the beginning of the season. In one department an ambitious modern experiment has proved a failure—the mammoth combinations with double or triple rings being regarded as disadvantageous, as the spectators are unable to follow two or three simultaneous performances. Instead of the company being recruited under the apprentice system, the special performer now seeks his engagements independently, and, as a rule, brings with him his own stud of trained horses or his own troupe of performing animals.

A great American circus is a singularly complicated and costly enterprise. The route for the season having been selected—here the railroad system is of priceless advantage, as long runs can be made at night after the performance—the railroad-contracting-agent sets out to make arrangements for transportation and assure himself that the tunnels and bridges on each line will permit the passage of the cars. He may be said to precede the show by three months, and is followed by the contracting-agents, who a month or six weeks before its arrival have concluded arrangements for supplies of food and forage, leased sites, and obtained licenses and billboard privileges. A few days later comes the first advertising-car, gorgeous with paint and gilding and loud with a steam-organ or some similar musical apparatus, and containing paste-vats and posters (some made up of no less than 64 sheets), and a force of men who proceed to display the placards, mail circulars, and distribute lithographs. It is followed closely by the ex-

cursion-agent, who arranges for special trains from the neighboring towns on the day of exhibition, and advertises time and rates. A second advertising-car follows with a new set of posters, and all imaginable devices for obtaining publicity are resorted to by the press-agents, school visitors, distributors of bills and lithographs, exhibitors of stereopticons, etc., etc., who complete the work of advertising the performance. Where one contract for \$70,000 worth of posters has been made, and a single company has been preceded by 70 or 80 agents and subordinate employés, to say nothing of the intelligence-corps, charged with obtaining information as to all local affairs, such as the condition of crops and trade or the days on which wages are paid and fairs or gatherings are held, it is not difficult to understand that scores of thousands of dollars have been expended before the first performance is given.

The main body of the army, to carry out a military comparison, follows the scouts and advanced guard in one train or two or three trains, according to the size of the company. Everything has been packed with due regard to convenience and economy of space, and the men have been drilled in their duties till they have acquired military accuracy and promptitude. Where such a circus company includes from 500 to 600 men, 300 or 400 horses, 20 elephants, and some hundreds of show animals, and a number of tents, one of which is 500 feet by 300, the necessity for system and skill is apparent. The largest canvas outfit yet made for an American circus cost about \$43,000, the tents and their dimensions being as follows: Circus tent, 466 × 270; menagerie, 370 × 120; museum, 210 × 100; dressing-room tent, 170 × 90; cottage entrance, 40 × 40; seven horse-tents, each 40 × 90; two side-show tents, each 100 × 60; seven refreshment-tents, each 30 × 20; cook-house tents, one 100 × 40, and two others, each 70 × 38; kitchen-tent, 40 × 40; blacksmith-tent, 45 × 40; barber-shop, 45 × 40. To handle this canvas 300 canvasmen are required. As three performances are frequently given in the day, and always two, work is begun at the moment the trains arrive. The forage-wagon is first despatched, unless a local contractor has been resorted to, and the horse-tents and those for the graminivorous animals are set up, while simultaneously the cooks prepare breakfast and the smiths begin work upon jobs of horseshoeing or repairs. While the surveyors are laying out the canvas city their assistants follow them with tent-stakes, which are no sooner dropped than they are driven home, the work of clearing and levelling the arena proceeding while the poles are rising to receive the canvas. Even more important than the levelling and banking up with nicety and solidity of the ring is the work of setting up the machinery for the performances, solidity of construction being not of greater consequence than accuracy of adjustment, so that the same feat shall day after day be attempted under absolutely identical conditions. The morning parade is not merely an advertisement, but serves the purpose of giving the horses and other animals their desirable daily exercise. When the performance is concluded at night the work of removal is as swift and systematic, a notable gain of time resulting from the employment of sleeping-cars.

For the performance itself it is difficult to say what the programme of a great circus does not offer, the staple of course remaining feats of horsemanship and gymnastics and exhibitions of wild beasts in cages or of trained animals. In the department of sensational gymnastics notable progress has been made of late years by the introduction of machinery, such as powerful combinations of springs shooting the performer many feet into the air, cannon from which performers are shot by the force of springs or in some cases of gunpowder, and apparatus for "aërial dancing," with which, by the employment of springs, counterbalancing weights, and invisible wires, the dancer bounds down from or up to extraordinary heights. No little progress, too, has been made in training young equestrians by the

introduction of the "mechanic," a cord-and-pulley arrangement fastened to the rider's clothing, the cord running through an arm working freely about a central post, and being held by the trainer, who in the event of a fall or a misstep, prevents the rider from receiving any shock or injury that would at least impair his confidence. Not only is the process of education for the ring severe, but the business itself, when once mastered, demands sobriety and constant training, intemperance, or even indolence, being injurious to nerve and muscle, which must always be at their best. So exacting is the work during the season, which lasts from 24 to 30 weeks, that the performer, even if he could safely indulge in dissipation, lacks the time. Nor are the rewards of the profession great. Bareback riders may be set down as receiving from \$100 to \$200 a week during the season, and pad riders from \$70 to \$100. Clowns may obtain salaries of from \$30 to \$100. Giants, if well known and popular, may command \$200, but a new giant will not obtain more than a tenth of that sum. About the same salaries are paid to dwarfs, in whom intelligence is an important consideration. The prices paid to curiosities range from \$5 to \$500 a week, the double-headed woman commanding the latter remuneration, and the average "beautiful Circassian" the former. As for ordinary performers, their wages are moderate and are well earned. As the engagements close with the season, and many of the performers own their own studs or troupes, the manager's expenses are greatly reduced during the winter, though the cost of maintaining a huge stable and a large menagerie, with from 15 to 20 elephants, in idleness is still very great. The solution of the problem, How to utilize a great circus in winter-time? will probably be found in permanent buildings in the great cities, and performances from which the most costly special attractions will be eliminated, dependence being rather placed upon regular "acts," such as found favor at an earlier day. When it is remembered that the running expenses of a great circus are from \$3000 to \$4000 a day, that the menagerie will represent an investment of half a million or more, and that the accident of bad weather, a poor crop, a heated political campaign, or an epidemic is always to be looked for, the responsibility undertaken by a manager and the necessity for the employment of the greatest skill and the most careful economy will be apparent.

For a long time the circus in the United States, especially in New England, was placed under the ban as a thing disreputable, immoral, and vulgar. Through the cleverness and foresight of the most prominent of modern managers, who have skilfully kept in the foreground the educational influences of the menagerie, and have enlisted leading divines and local celebrities in the work of praising their "great moral shows," these prejudices have been overcome, and where the circus is not popular now it is upon economic rather than upon moral grounds. Thus, in some districts of Michigan the mining companies have placed the railroads under bonds not to bring circuses or menageries into their territory on account of the unsettling of the workmen. At Paterson, N. J., it has vainly been attempted to keep circuses out by putting the license-fee up to \$1000, and now, when the show approaches, the mills are shut down. At Newark the manufacturers estimate their loss through the visit of a circus at \$15,000 a day. At Montreal in 1882 circus parades were forbidden at the request of the Roman Catholic clergy. Bodies of sharpers and pickpockets are apt to follow a company on its travels, and to take advantage of the crowds and the laxity of rural police arrangements to ply their dishonest trades. However, since the great organizations have come into existence the more obnoxious classes of hangers-on have been driven away, and in so far as disorder and crimes of violence are concerned it is safe to say that the circus-men are much more frequently sufferers than aggressors. (See MENAGERIE.) (G. T. L.)

[NOTE.—The data for this article were completed in 1883.]

CISSEY, ERNEST LOUIS OCTAVE COURTOT DE (1810–1882), a French general born in Paris Dec. 23, 1810, of a noble Burgundian family. He studied at St. Cyr, 1830–32, became a sub-lieutenant, and then entered the school of the general staff (*état major*), becoming in 1835 lieutenant and aide-de-camp to Gen. Trézel, and serving with marked ability in Algeria for many years. He went into the Crimean war as a colonel, and in 1854, after the battle of Inkerman, was made a general of brigade; in 1863 he was made a general of division. He served under Bazaine in the Franco-Prussian war of 1870, and opposed the capitulation of Metz, where he was made prisoner after having striven in vain to mitigate the terms of the surrender. In 1871 he took part against the Commune of Paris, and by a skilful movement gained control of all that part of the city on the left of the Seine. Chosen to the National Assembly from Ile-et-Vilaine, he was (1871–74) minister of war, for a part of that time commanding also the seventh *corps d'armée*. In 1874 he succeeded Duc de Broglie as minister of the interior and vice-president of the council. In 1875 he again became war minister, and in the same year was made perpetual senator. He relinquished his portfolio in 1876, and in 1878 took command of the Eleventh Army Corps. He resigned his commission in 1880 in consequence of grave charges respecting his public and private conduct, and, although in 1881 the gravest of these accusations were declared by a committee to be unfounded, he was not thereafter allowed to resume his old position in the army. He died at Paris, June 16, 1882.

CISTERNs. These receptacles for the storage of water of course vary in size according to their requirements from the subterranean reservoir containing 100,000 gallons to the small house-tank of 200. To preserve the purity of the water it is especially necessary to cover them, so as to exclude the sunlight, which otherwise causes a rapid development of the inferior forms of life and soon causes the water to become unfit for use. In underground cisterns the bottom should be on solid or homogeneous ground, so that unequal settlement may not produce cracks. On this foundation a concrete made of stones of the size of a walnut and hydraulic cement, and if the depth of water is not over ten feet of a thickness of eight inches, is put on in two layers, the lower one being allowed to set before the upper one is put on. The walls may be made of stone, with a lining of bricks, well wet and thoroughly bedded in hydraulic cement. Their thickness at the bottom should not be less than three-sevenths of the height. The top may be covered with flag-stones or with an arch, leaving a man-hole, covered with a stone, for repairing or cleaning. On the outside a trench about two feet wide and three or four feet deep had better be filled with some porous substance like furnace-cinder, to prevent the evil effects of frost.

Cisterns in houses, when large, are made of a cylindrical form, of boiler iron, of a thickness of one-eighth of an inch for the top ring, reaching two and a half feet from the top, and with each lower ring one-sixteenth of an inch thicker than the one above. The rings encircle each other telescopically, and are riveted and caulked on the edges like boilers.

Large wooden tanks are made of cedar. They may be seventeen feet wide at the top and increase in diameter one foot in a depth of eight feet, so that iron hoops placed on top may be driven over them, and the tapering form will force together the staves of which the tank is composed. These staves are about two and a half inches thick and made to the proper shape by machinery, and the iron hoops, of one-quarter by three inches section, are placed, two close together at the bottom, one at the top, and three intermediate ones at distances apart increasing toward the top, so as to resist the additional pressure of the water due to an increased head.

The small cisterns in houses, principally used for

flushing drain-pipes, are usually made of wood lined with sheet-lead and contain about 200 gallons. If the water is used for drinking and is frequently changed, there is no objection to the lead-lining, which, however, is said to poison water which remains in contact with it for a great length of time. Sometimes these tanks are made of glazed earthenware, which is an excellent material. There should always be a waste-pipe near the top, to keep the water from overflowing the sides.

It may be mentioned that throughout Palestine cisterns have existed from the earliest times. The "pit" into which Joseph was cast by his brethren, as related in the book of Genesis, was no doubt a cistern for storing water for flocks, which is said to have been dry at that particular time, and many of the "wells" of Scripture were probably similar in character.

(T. M. C.)

CITIZEN (Latin *civis*), an inhabitant of a city who is entitled to all rights and privileges as such; in a broader sense, and according to modern usages, an inhabitant of a political division of territory owing allegiance to the government, and whose person and property the government is in turn bound to protect. The term took its rise from the peculiar privileges which were vested in freemen living within the limits of the ancient city of Rome. The Roman law, strictly speaking, was applicable to men only. All foreigners were governed by the *lex peregrinatus* or *jus gentium*. As the power of Rome extended over Italy, the inhabitants of many of the other Italian states became vested with the privileges of Roman citizenship. In process of time the privilege was conferred upon the leading men of the colonies, either as a reward for distinguished military service or for some other cause. In the time of the empire the right of citizenship might be purchased for a considerable sum. It was reserved for Caracalla, however, completely to prostitute the title of Roman citizen. He forced the inhabitants of all the provinces to assume it, and then subjected them to heavy taxation beyond what had before been imposed upon them.

The term "citizen" is not known to the English law; the term "native" is used as synonymous with it. A "native" was by the common law defined to be any person born within the king's dominions or born abroad of English parents. The statutes of 25 Edw. III. c. 2, 7 Anne c. 5, and 4 Geo. II. c. 21 have somewhat altered the law in this respect; all persons born within the king's dominions are natives, and any person born abroad whose father is an English native-born subject is in like manner a native.

All persons are citizens of the United States who are within the jurisdiction and allegiance of the United States, and a person may be a citizen of the United States without being a citizen of any particular State. A citizen of one State is by the Constitution guaranteed the rights and privileges of citizenship in every other State. Persons born within any part of the territory now belonging to the United States, but who withdrew therefrom prior to the acquisition of the territory in question by the United States, are not accounted to be citizens thereof. All persons born out of the limits of the United States whose fathers were at the time of their births citizens are entitled to the like privilege, but the right of citizenship does not descend to persons whose fathers never resided in the United States. An alien may become a citizen provided he has resided in the country for five years and is duly naturalized according to the provisions of the Act of Congress. (See NATURALIZATION.) Women, married and single, are citizens, and so are minors; but an Indian is not a citizen unless he has abandoned his tribal relations and been duly taxed. By the Fourteenth Amendment to the Constitution of the United States negroes and all other races born or naturalized in the United States are made citizens thereof, and of the particular State in which they reside.

Every person owes allegiance to the state whereof he is a citizen, and the question has been much mooted as to whether he is ever at liberty to shake off his allegiance. It was formerly well settled in England that no English citizen could by removal, naturalization, or otherwise renounce his allegiance to the British Crown. The same principle also formerly obtained to some extent in the United States. The doctrine of perpetual allegiance is now, however, generally abandoned among civilized nations. The right of personal expatriation is secured by numerous treaties, and is fast becoming, if it has not already become, an acknowledged principle of international law.

A citizen is entitled to claim from a state, in return for his allegiance, protection for his person and property. He has, therefore, always a right to sue in its courts and to demand police protection and such diplomatic negotiation with foreign powers as will ensure his safety and right of property. A wrong to the person or property of a citizen is by the law of nations a well-recognized *casus belli*. A citizen is not, however, entitled, as such, to exercise the electoral franchise. Women and minors, therefore, though citizens, are not entitled to vote. (L. L., JR.)

CIVIL DEATH, the state of a person who, though possessing natural life, has lost all his civil rights, and as to them is deemed dead.

In England, in ancient times, any one banished or abjured the realm, or who had entered into religion and become a monk professed, was regarded as civilly dead. So where a man was excommunicated by the proper ecclesiastical authority or attainted by due process of law.

The doctrine of civil death is generally considered obsolete. It is, however, said that in the State of New York any person convicted and attainted of felony and sentenced to the State prison for life is to be regarded as civilly dead. (L. L., JR.)

CIVIL RIGHTS are those which are accorded to a person simply as a member of a community or nation. By virtue of the provisions of the original Federal Constitution and the first twelve amendments thereof, certain rights are guaranteed which are in their nature almost purely civil. Such are the right to the writ of habeas corpus, immunity from *ex-post-facto* laws, equality of taxation, freedom of religion, of speech, and of the press, the right to assemble peaceably and to petition the Government for a redress of grievances, the right to bear arms, immunity from the quartering of soldiers in any house in time of peace, immunity against general warrants, the right to trial by jury, the right in criminal cases to a grand jury, immunity from being twice put in jeopardy of life or limb for the same offence, immunity from the obligation to testify against one's self, the right to a speedy trial, to have a copy of the indictment, to be confronted with the witnesses, to have compulsory process to compel the attendance of witnesses, and to have the assistance of counsel, immunity from excessive bail and from cruel and unusual punishments. In addition, it is provided that no persons shall be deprived of life, liberty, or property without due process of law, and that private property shall not be taken for public use without just compensation. Substantially similar provisions are inserted in the Bills of Right embodied in the various State constitutions. The civil rights thus guaranteed, though apparently ample at the time of their enactment to secure the rights of the people, were found towards the close of the War of the Rebellion to have become inadequate for that purpose. The ratification in the year 1865 of the Thirteenth Amendment to the Constitution, abolishing slavery and involuntary servitude throughout the United States, occasioned a great change in the whole social status of the population. Among the first acts of legislation adopted by several of the States in the legislative bodies which claimed to be in their normal relations to the Federal Government were laws which imposed upon the colored race onerous disabilities and burdens, and

curtailed their rights in the pursuit of life, liberty, and property to such an extent that their freedom was of little value. They were in some States forbidden to appear in the towns in any other character than menial servants. They were required to reside on and cultivate the soil, without the right to purchase or own it. They were excluded from many occupations of gain, and were not permitted to give testimony in any of the courts in any case where a white man was a party.

These circumstances forced upon Congress the adoption of some measures by which the rights of the freedmen, in accordance with the manifest intention of the Thirteenth Amendment to the Constitution, might be ascertained and enforced. Accordingly, on April 9, 1866, a bill was enacted designed to protect all persons in the United States in their civil rights and to furnish the means of their vindication. It was by the terms of this act provided that all persons born in the United States, and not subject to any foreign power, excluding Indians not taxed, should be deemed citizens of the United States; and that such citizens, of every race and color, without regard to any previous condition of slavery or involuntary servitude, except as a punishment for crime whereof the party should have been duly convicted, should have the same rights in every State and Territory of the United States to make and enforce contracts, to inherit, purchase, lease, sell, hold, and convey real and personal property, and to the full and equal benefit of all laws and proceedings for the security of person and property as were enjoyed by white citizens, and should be subject to like punishments, pains, and penalties, and to none other; any law, statute, ordinance, regulation, or custom to the contrary notwithstanding. The act then further imposed certain penalties for the violation of the rights therein declared, and gave appropriate criminal and civil remedies. The provisions of this act were no doubt sufficiently explicit, and, if valid, were admirably calculated to guard those rights which they were intended to secure. There was, however, serious reason to doubt the constitutionality of the measure. In the year 1856, Chief-Justice Taney had in the case of Dred Scott announced that persons of the African race, though free, were not citizens of the United States within the meaning of the Constitution, and were therefore not entitled to any rights and privileges as such. However much the current of popular feeling might have altered, this decision remained unreversed as the judgment of the supreme tribunal of the land. It was more than doubtful whether Congress could confer citizenship and the rights of citizenship upon a race whom the Supreme Court had pronounced not to be entitled thereto under the terms of the Constitution. Moreover, even if the validity of the act was admitted, it was thought that the rights of a class of persons still suffering under a ban of prejudice could never be deemed entirely secure when at any moment it was within the power of an unfriendly majority in Congress to strip them of those rights by repealing the act by which the rights had been conferred. It was evidently most proper to have those rights settled in the most authoritative and conclusive manner. A Fourteenth Amendment to the Federal Constitution was accordingly proposed by Congress to the legislatures of the various States on June 16, 1866, in the terms following: "All persons born or naturalized in the United States, and subject to the jurisdiction thereof, are citizens of the United States and of the States wherein they reside. No State shall make or enforce any law which shall abridge the privileges or immunities of citizens of the United States; nor shall any State deprive any person of life, liberty, or property without due process of law, nor deny to any person within its jurisdiction the equal protection of the law." Subsequent sections declared the mode in which representatives should be apportioned among the several States; prohibited the denial of the franchise to any male citizen twenty-one years of age, except for participation in rebellion or other crime; prohibited any

person who had taken an oath of fidelity to the United States, and who had subsequently engaged in insurrection or rebellion against the same, from filling any national or State office, unless Congress by a two-thirds vote should remove the disability; established the validity of the public debt; forbade the assumption either by a State or by the United States of any debt incurred in aid of insurrection or rebellion against the national Government; prohibited in like manner the assumption of any claim for the loss or emancipation of any slave; and conferred upon Congress the power to enforce all the foregoing provisions by appropriate legislation. This amendment was ratified by the legislatures of thirty out of the thirty-six States, and was accordingly, on July 28, 1868, duly promulgated as part of the Constitution.

The main purpose of the Fourteenth Amendment was to secure to the colored population of the country the rights and privileges of citizenship. Its operation was not, however, confined solely to such persons. It applied equally to persons of all other races born or naturalized in the United States. Congress has enforced the amendment by a very stringent enactment approved April 20, 1871, by the terms of which it is in substance provided that any person who shall, under color of law, subject or cause to be subjected any person within the jurisdiction of the United States to the deprivation of any rights, privileges, or immunities secured by the Constitution, shall be liable to the party injured in any action at law, suit in equity, or other proper proceeding for redress. Jurisdiction over all such proceedings is vested in the United States courts, and the right of appeal secured. Further stringent provisions are made in case of conspiracy or insurrection to deprive any such person of his rights or immunities, the President being authorized to employ the land and naval forces of the nation to suppress such conspiracy or insurrection, and even, if necessity requires, to suspend the privileges of the writ of *habeas corpus*.

Other and further provisions of the same kind have since been adopted. By the act of Feb. 16, 1875, it is provided that no person shall be disqualified for jury service on account of race, color, or previous condition of servitude, and it is made a misdemeanor for any officer charged with the summoning of a jury to make a discrimination illegal under the above act. The right of Congress, however, to legislate upon this subject is limited. It cannot establish rules of law for the regulation of private rights generally. This is the appropriate function of the States. It can only provide modes of redress against the operation of State laws and the action of State officers when these are subversive of the fundamental rights specified in the Fourteenth Amendment to the Constitution. It has been accordingly decided by the Supreme Court of the United States (Oct. 15, 1883) that a law providing that all persons within the United States shall be entitled to the full and equal enjoyment of the accommodations, advantages, facilities, and privileges of inns, public conveyances, theatres, and the like, subject only to the conditions and limitations established by law and applicable alike to citizens of every race and color, regardless of any previous condition of servitude, and imposing a heavy penalty for the violation of its provisions, is unconstitutional and void. Whether, however, Congress has a right by appropriate legislation to prevent such discrimination, should it actually occur or be sanctioned by State laws, has not been determined.

The provisions of the Fourteenth Amendment have received judicial construction in a great number of cases. It has been decided that they do not require merely equality of privileges and immunities, but that the same shall be absolutely unabridged and unimpaired. States may, however, pass laws regulating the privileges and immunities of their own citizens, provided they do not abridge the privileges and immunities of citizens of the United States. The States

may therefore, it seems, prohibit miscegenation, the sale of intoxicating liquors, and the like, and may restrict the right to practise law to the male sex. In California it has been decided that a State law is valid which excludes Chinese from testifying in any cause to which a white person is a party. It seems, however, that this law must, under the Civil Rights Bill, be so construed as to exclude the testimony of Chinese for or against negroes equally with whites. Any State may pass appropriate police laws for the protection of the health and morals of its citizens, and these will not be deemed invalid, even though they may incidentally restrict the immunities or privileges of citizens of the United States. Although it is clear that the right to serve upon juries must be enjoyed indifferently by the colored race and the white, it by no means follows that it is a portion of the privileges or immunities of a colored citizen to have a jury in a cause to which he is a party partly composed of his own race. The contrary has been decided by the Supreme Court of the United States. All State laws or parts of laws inconsistent with the provisions of the Fourteenth Amendment to the Constitution were abrogated by its adoption.

The rights secured by the Fourteenth Amendment were, it will be observed, solely the rights of citizenship in the United States. No rights, therefore, not necessarily appendant to citizenship were conferred by the constitutional grant. The right of suffrage is not necessarily implied from citizenship. Women, for example, have always been deemed citizens, and yet generally have been denied the right of suffrage. Hence this right is not regarded as having been conferred upon them by the Constitution where it is withheld by the laws of the State in which they reside. For the same reason the grant of citizenship to the negro was not deemed to carry with it the right of suffrage. Popular sentiment was, however, overwhelmingly in favor of conferring this right. Accordingly, on Feb. 26, 1869, a Fifteenth Amendment to the Constitution was proposed by Congress, and, being duly ratified, was on March 30, 1870, promulgated as part of the Constitution. This amendment reads as follows: "The rights of citizens of the United States to vote shall not be denied or abridged, by the United States or by any State, on account of race, color, or previous condition of servitude. The Congress shall have power to enforce this article by appropriate legislation." Very stringent acts to enforce the rights of citizens of the United States to vote in the several States of the Union in accordance with the provisions of the above amendment were passed on May 31, 1870, and Feb. 28, 1871, all of which still remain in force.

The provisions of the Fifteenth Amendment invest the citizens of the United States with a new right within the protecting power of Congress. They take away the authority of any State to discriminate against citizens of the United States on account of race, color, or previous condition of servitude, but leave the power of the States to discriminate upon all other grounds, including that of sex, intact. Without doubt, the adoption of this amendment "completes the greatest civil change and constitutes the most important event that has occurred since the nation came into life."

(L. L., JR.)

CIVIL SERVICE REFORM is the name given in the United States to certain changes in the mode of appointing subordinate officers and in the conditions of their tenure. These changes are—the substitution of some mode of securing admission to the service of the Government which shall be accessible to all for selection through the favor either of the President or of members of Congress; the substitution of tenure either during good behavior indefinitely or for a fixed term for tenure at will; and promotion through merit or seniority for promotion through the favor of either the President or members of Congress. As to what this mode shall be there is the preponderance of opinion among the advocates of the change in favor of com-

petitive examination, open to all within certain limits of age and with proper testimonials as to moral character, the questions to be so framed as to ascertain the possession of the elementary branches of an English education and of such special practical knowledge as the vacancy to be filled may call for. It is proposed also that success in the examination shall be followed by a period of probation in the office itself preliminary to a permanent appointment. There is, however, a considerable number of the friends of the reform who object to the competitive examination as likely to trammel the appointing officer in his choice, and shut him up to persons deficient in the moral or physical qualities needed for thorough efficiency. These would leave the selection wholly to the head of the department in which the vacancy occurs, but would make the tenure either for good behavior or for a fixed term, and deprive the superior of the power of dismissal except for cause. Those who are of this way of thinking believe that if the power of arbitrary dismissal were taken away, superior officers would, for the sake of their own reputation, be careful in the selection of their subordinates, and that their judgment would prove in practice a surer test of fitness than any examination. The friends of competitive examination oppose to this view the consideration that without the power of arbitrary dismissal no head of a department can be held responsible for the proper administration of his office, but that abuses of this power would not occur if he were not permitted to fill vacancies except through the examination. The superior officer, they maintain, in other words, would only make vacancies for the good of the service if he knew that he would have nothing to do with choosing those who were to fill them. So that the advocates of the reform may be said to be divided into two classes—one composed of those who would effect it by restrictions on the power of dismissal, and the other of those who would effect it by restrictions on the power of appointment. The former would guard the exit from the service, the latter the entrance to it.

Out of the system of appointment by favor and dismissal at will the theory that the offices were the property of the party in power grew naturally, and found expression in the practice which seemed to have sprung up at an early date of inviting or compelling the officers, under a thinly-veiled threat, to make contributions from their salaries to the election expenses of the party, under the name of "assessments." This practice was defended by the argument that if the party were defeated and expelled from power the servants of the Government would all be dismissed by the victorious opposition, and it was therefore the interest of office-holders to help to pay the costs of repelling the assaults of the opposition at the polls. Their livelihood, it was said, depended upon the result of the election, and therefore their concern in this result was greater than that of other voters. Their dismissal was of course made certain by the previous exclusion of voters belonging to the opposition, as such, from the public service. It could not be expected that if one party when in possession treated the offices as its property, the other party when it came into possession would distribute and hold them on any different theory. Accordingly, as soon as the doctrine that "to the victors belong the spoils" was adopted by one party, its adoption by the other became inevitable. The practice of "assessing" the office-holders—or, in other words, of exacting money from them to be used in electioneering expenses—rapidly came into use, being represented to them as a fund for the defence of their places. The prohibition of such assessments therefore also forms part of the reform of the civil service.

The "spoils system," as the present mode of selecting Government officers in the United States is called, is, in its main features, a system which has prevailed in Anglo-Saxon history from the earliest times down to our own day. It was not until the thirteenth century that ministerial offices in England ceased even partially

to be considered the personal property of the sovereign, to be bestowed as he pleased without regard to the fitness of the appointee for the duties of his place. During the whole Norman period, properly so called, the offices were sold freely to supply the needs of the royal treasury. In the thirteenth century the growing power of the people compelled some attention to fitness and restricted the practice of selling, but this practice did not wholly disappear from the civil service until the expulsion of the Stuarts, and a survival of it was found in the military service until 1870, and is still to be found in the Church in the right of selling the next presentation to livings not actually vacant. As the share of Parliament in the Government increased, the division of patronage with members of both houses gradually became to the minister of the day a potent means of influencing votes, until at the accession of Queen Victoria the power of securing appointments of followers and dependants was one of the well-recognized perquisites of Parliamentary supporters of the Government.

The system, however, worked better in practice in England than might have been expected, owing to the permanence of the tenure. Members of Parliament were able to procure the appointment of their protégés to places for which they were unfit, but they were not able to procure their dismissal without cause. There doubtless resulted from this the retention in office of large numbers of unworthy persons; but, on the other hand, the security in their places, by delivering them from certain kinds of temptation, gave free play to whatever was best in them. If it did not furnish a powerful motive for good behavior, it removed one of the most powerful motives for bad behavior. The rule of permanence was not always strictly observed, however. During the fierce party-contests in Parliament in the eighteenth century, opponents of the ministry or of the king were frequently punished by the dismissal from office of their protégés, and on one occasion during the ministry of Lord Bute in 1762 he was allowed to save himself from overthrow by making a wholesale dismissal of all Whig office-holders, high and low, and giving their places to the majority who had stood by him in the House of Commons. But this was not repeated. The theory of the office, which in some cases made it salable, that it was the gift of the Crown, favored permanence, and would have continued to favor it even if the growth of the reform sentiment in the later years of George III. and afterwards had not made the purchase of votes by the bestowal of office increasingly odious. The system began to be abandoned in 1853, and was by 1870 almost completely effaced by competitive examinations.

Such offices as were in the gift of the Crown in the American colonies were made, as those in Ireland were during the eighteenth century and down to the Revolution, the means of rewarding royal favorites or Parliamentary supporters of the ministry; but these offices were comparatively few in number, and the democratic constitution of colonial society, combined with the large share of the work of administration necessarily done by officers chosen by local election, prevented the English theory of the office-holder's position ever taking root on American soil. The offices never became in the popular eye anything but a trust, to be discharged solely for the public benefit. They never assumed the character of private property, or of a position to which any one could have a title not derived from fitness or good behavior. This was true even of the Southern colonies, in which great proprietors had preponderating political influence, though perhaps not to the same extent as of those of New England, in which equality of condition furnished the governing political principle.

After the adoption of the Federal Constitution the rule of tenure during good behavior was voluntary in regard to all officers appointed under it whose term of office was not fixed by the instrument itself. The removals made by the first six administrations, cover-

ing a period of forty years, were only seventy in all, all of them presumably on grounds of incompetency or misconduct. The question whether an officer's tenure should be affected by his political opinions did not, in fact, come up seriously for discussion until the accession for the first time of a new party to power through the election of Thomas Jefferson; and that it was raised then was due mainly to the bitterness of party feeling. The Federalists suspected the Republicans of hostility to social order itself, and the Republicans suspected the Federalists of hostility to the new Constitution. Under these circumstances the change had some of the characteristics of a revolution, and readily suggested to the victors sweeping dismissals among officers as necessary to the safety of the Government. Jefferson, however, resisted the temptation or the alarm, and laid down, and on the whole followed, the rule that he would rely for the introduction of a fair proportion of Republicans into the public service on "deaths, resignations, and delinquencies."

The rule of tenure during good behavior was not, in fact, set aside until 1820, when an act was passed limiting to four years the tenure of all accounting officers; that is, of all officers charged with the receipt and disbursement of the public money. The statute was intended to repress defalcation by compelling an accounting every four years on the part of the officers affected by it. But in practice it placed a large number of vacancies at the disposal of the President for the time being, without exposing him to the charge, which was still discreditable, of arbitrarily dismissing officers whose behavior had given no ground for complaint. Its real object was made still plainer by the provision that the terms of accounting officers whose commissions were dated Sept. 30, 1814, should expire on the day and month of their date next after Sept. 30, 1820. The act was condemned by the leading statesmen of the day, and its injurious effects were foretold. Jefferson in his retirement wrote "that it sapped the constitutional and salutary functions of the President, and introduced a principle of intrigue and corruption which would soon leaven the mass not only of Senators, but of citizens." In 1825, after practical experience of its working, an unsuccessful attempt was made to repeal it. This attempt was repeated ten years later, such Senators as Webster, Clay, Calhoun, Ewing, Southard, and White voting for the repeal and condemning the act in very emphatic language. But in the mean time Andrew Jackson had succeeded to the Presidency, and had formally treated the offices as the spoils of the victors by numerous arbitrary dismissals, amounting in the first year of his administration, according to one account, to 990, according to another to 690.

At all events, the principle of tenure at will was fully introduced into the practice of the Government and acted on for the reward of party services. It is true that Jefferson had laid down the rule that open opposition to the Administration for the time being would not be tolerated in the civil officers of the Government, but as long as he abstained from this no officer suffered from his opinions under him. Under Jackson dismissals took place either to punish obnoxious opinions or to make vacancies for persons with stronger claims on presidential favor. The power thus assumed by the President had very soon to be shared with the Senators and Representatives as a means of ensuring support in Congress for presidential measures and nominations, until the practice grew up, which has lasted down to the present, of making appointments mainly on the recommendation of members of Congress belonging to the President's party, and making dismissals also on their simple demand. The abuses generated by this system through the appointment of persons not possessing the necessary qualifications for their places became so gross that in 1853 an act was passed prescribing a pass examination for certain candidates for certain places, to be conducted under the direction of the department in which the vacancy was

to be filled; but this rapidly degenerated into a farce. When the appointment had been settled upon the examination was made such that the candidate could not fail to pass it.

After the war the great increase of offices necessitated by the growth of taxation and population caused fresh attention to be given to the spoils theory, and Pres. Grant appointed a commission to devise rules and regulations for admission to and promotion in the civil service. The commission made a report accordingly, prescribing competitive examination for admissions to the service, on which he acted in making appointments to some extent for a brief period from 1872. The pressure from members of Congress and politicians interested in the maintenance of the old system proved, however, to be more than he could resist, and he abandoned the experiment in 1875, before he left office. Pres. Hayes in 1879 revived the rules which were thus set aside so far as the New York post-office and custom-house were concerned, and in these establishments they have continued in force ever since.

The spoils system was, in the mean time, becoming daily more obnoxious through its operation in two or three States in which Federal officers were very numerous in aiding Senators to obtain and keep control of the nominating machinery of the party in power. The employment of the officers of the Government to manage the primary elections of the party and to fill the conventions with tractable majorities ready to carry out the wishes of a particular Senator, to whose hands the disposition of Federal offices within the State had been committed by the President, resulted in so much ostentatious indifference to the wishes and prejudices of the main body of the voters as to give a stimulus to the agitation for reform which it would probably never have received from any actual abuses in the transaction of the Government business. This stimulus was greatly increased by the open and persistent levying of contributions from office-holders by party committees for campaign expenses, by demands which the office-holders could not but consider as threats. To these agencies must be added the effect produced on the popular mind by the growing absorption of members of Congress in both Houses in the work of distributing patronage, and the resulting diversion of their time and attention from the work of legislation. The overwhelming defeats sustained by the Republican party in the States of Pennsylvania, New York, and Massachusetts in 1882 were construed as an emphatic popular condemnation of the system which had been in vogue since Jackson's day. Accordingly, an act of Congress was passed in January, 1883, providing for the regulation and improvement of the civil service of the United States by the appointment of a commission to draft rules governing appointments to the civil service, to be promulgated and enforced by the President. The commission has drafted the rules, and they are now (1884) in successful operation. They prescribe appointments by competitive examination to all subordinate places in all custom-houses and post-offices in which there are as many as fifty officials, and in the Departments at Washington.

We have confined ourselves to the history of the civil-service reform question in the Federal service, because it is in that field that it has attracted most attention and is most important, there being over one hundred thousand Federal officers placed after each Presidential election, according to the spoils theory, at the disposal of the victors. The same system has, however, crept into State administration also, but is prevented from attracting as much notice there by the comparatively small number of appointed officers in State governments. That a change in the mode of selecting these, and in the tenure of their places, would follow a similar change in the Federal service, is generally believed. In New York a beginning of reform was made by the passage of an act, in 1883, prescribing competitive examination for appointments to the

subordinate State offices, and to certain departments of the municipal government in every city having more than 50,000 inhabitants, to which the mayor should, in his discretion, direct its application. In 1884 the act was amended so as to make its application mandatory in all cities having over 20,000 inhabitants. There are numerous signs that the reform will gradually spread to all the States.

It is proper to add that the spoils system undoubtedly made its first appearance on this side of the Atlantic in New York, and prevailed in that State long before it was adopted by the Federal Government. The council of appointment which existed under the first State constitution was in the hands of the great families who for some time after the Revolution managed, if they did not constitute, the political parties within the State, and it used the offices without scruple to reward their friends and punish their enemies. The managers who arose under the Democratic constitution adopted in 1824, and who afterwards became a sort of political committee known as the "Albany Regency," inherited the traditions of the earlier period and continued its practices, and it was with their hearty support, and indeed under their auspices, that the spoils system was adopted in Washington by Pres. Jackson. (E. L. G.)

CLAIBORNE, WILLIAM CHARLES COLE (1773-1817), an American statesman, governor of Louisiana, was born in Virginia in 1773. Having studied law, he settled in Tennessee, then a Territory, and was appointed a judge. He was a member of the convention which framed the State constitution of 1796, and was elected to Congress in the following year. After serving two terms he was appointed by Pres. Jefferson in 1802 governor of the Territory of Mississippi. When Louisiana was purchased from the French in 1803, Gov. Claiborne and Gen. James Wilkinson were appointed commissioners to take possession of the territory. Claiborne was made governor of the new Territory, March 26, 1804, and the government was organized in October. His task was rendered especially difficult by the heterogeneous character of the people over whom he was called to rule, while the absolute power lodged in his hands caused fear among the thoughtful. Some trouble was caused by the indefinite statement of the boundary of the country ceded, especially in the West, and for a time there were apprehensions of a war with the Spanish. The expedition of Aaron Burr also produced great excitement in New Orleans, but Claiborne by his moderate measures did much to allay the disquiet. His prudent administration secured some degree of harmony between the Creole planters and the American adventurers who came into the Territory after the change of government. In spite of various difficulties arising from the conflict of the old and the new laws, Claiborne succeeded in gaining the esteem of the people, and when Louisiana was admitted as a State in 1812 was elected governor. During the war with Great Britain he exerted himself for the defence of Louisiana, and especially when Gen. Jackson was ordered to the command of the troops at New Orleans expressed his gratification and did everything to second the general's efforts. In 1816 he was chosen by the legislature to represent the State in the United States Senate, but was prevented by ill-health from taking his seat in that body. He died at New Orleans, Nov. 23, 1817. See *History of Louisiana, American Domination*, by Charles Gayarre (New York, 1865). Other members of the same family were elected to Congress from Virginia and Tennessee at various times.

CLAIRVAUX (Lat. *Clara Vallis*), a town of France, department of Aube, and on the river Aube, ten miles above Bar-sur-Aube. It is celebrated for its old Cistercian abbey, founded in 1116 by St. Bernard in a desolate gorge previously peopled by robbers and known as the "Vale of Wormwood," but afterward called the "Bright Valley." Like the other glens of its neighborhood, the valley was then utterly waste and barely accessible, but is now ex-

tremely fertile and beautiful. (Plans and a description of the buildings are given in the *ENCYCLOPÆDIA BRITANNICA*, article *ABBEY*.) The grand monastery, for centuries the finest example in the world of a conventual establishment, is now one of the model prisons of France.

CLAIRVOYANCE (Fr. from *clair*, "clear," and *voir*, "to see") may be defined as the power of perceiving, without the use of the organ of vision, or under conditions in which the organ of vision with its natural powers alone would be useless. It comprises the sight of things past, present, or future. The word is also used in a broader sense to include *clair-audience* and *clair-sentience*, or the hearing and feeling of that which is imperceptible to the natural senses. Various methods of clairvoyance are recounted—by direct vision of things at a distance (opaque substances being no hindrance); by looking into a black surface, by looking into water, into a crystal, etc.; or by laying the object to be described upon the forehead or chest of the clairvoyant. In the case of the seeress of Prevorst a paper could be read when laid upon the pit of her stomach; but clairvoyants now usually represent the cerebral region as the seat of illumination.

From remote antiquity the possession of such powers by favored individuals has been believed. In the Old Testament we find (2 Kings vi. 15, 16, 17) an account of the opening of the inner vision in the case of the servant of Elisha in answer to the prayer of the prophet. Clairvoyant powers were claimed for the Pythia at Delphi. Apollonius of Tyana and Diodorus Siculus testify to the clairvoyance of the Indian sages. Macrobius gives an instance of clairvoyance on the part of the oracle of the Heliopolitan god when consulted by the emperor Trajan. Tertullian speaks of a seeress who could prophesy and prescribe for the sick. Clairvoyance was known among the nations of antiquity, and is still generally accepted as an undoubted fact among Eastern nations. As instances of clairvoyants in later times may be mentioned Jacob Böhme (1575-1624) and Emanuel Swedenborg (1688-1772), the Swedish scientist and founder of the religious body called "The New Jerusalem Church."

The phenomena of clairvoyance have been carefully observed in the case of Madame Hauffé, the "Seeress of Prevorst," and recorded by her physician, Dr. Justinus Kerner, of Weinsberg (*Die Seherin von Prevorst*). From her childhood Madame Hauffé possessed peculiar powers, which increased as she grew older. She saw figures in crystal or in looking-glasses; by looking into a glass of water she could see forms and equipages, and describe them before they came in sight; she had prophetic dreams, possessed the second-sight, and predicted deaths by seeing funerals at houses where no one was ill at the time. She saw and conversed with spirits, and was conscious of what took place at a distance. Her clairvoyant powers were awake during what was termed her "magnetic sleep"—a state into which she fell spontaneously, but which might be induced by mesmeric passes over her body. The seeress was visited at Weinsberg by Schubert, Eschenmeyer, Görres, Werner, and others.

The clairvoyant state seems to be intimately connected with the mesmeric, the somnambulistic, and the so-called "biological." Mesmeric somnambulism and clairvoyance were first brought to notice by Puysegur in 1784. The clairvoyant is usually in a state of trance, which may be induced by mesmeric passes. In this state he is sometimes conscious only of his mesmerizer; in others, his clairvoyance is unrestricted. But the clairvoyant may enter the trance-state spontaneously, or he may even be in possession of his ordinary faculties, both of which characteristics are to be found in Zschokke, the German novelist. In "second-sight," as found in Denmark, parts of Germany, and especially in the Highlands of Scotland, the seer is not in a state of trance similar to that in other forms of clairvoyance. Whether the phenom-

ena of clairvoyance are objectively valid or merely subjective is a debated question. They are accepted as objective by those who accept also apparitions, spirit-communications, and all those phenomena usually classed together as "occult," "magical," or "preternatural." Many frauds on the part of professed clairvoyants have been discovered, as in the case of Alexis and Adolphe Didier, examined by Dr. Forbes and Dr. Carpenter in 1844.

The following works may be consulted on the subject: Reichenbach's *Der Sensitive Mensch*; Dr. Gregory's *Letters on Animal Magnetism*; Howitt's *History of the Supernatural*; A. J. Davis's *Great Harmonia*, vol. iii., *The Seer*; Rev. Robert Kirk's *Secret Commonwealth* (1691); Martin's *Western Isles and Voyage to St. Kilda*; White's *Life of Swedenborg*; W. B. Carpenter's *Mesmerism, Odylism, Table-Turning, and Spiritualism*. (G. S. F.)

CLAM, a term applied to species of several distinct genera of acephalous mollusks, inhabiting the waters of almost all portions of the earth's surface. The common land-clam of the European and American coast is the *Mya arenaria* (family Myidæ), with a transversely ovate, subequilateral, convex shell from 3 to 5 inches in length and gaping at both extremities. The siphons are combined and covered with a partially retractile epidermis; foot small, straight, and linguiform. This species is common wherever it is found, burrowing in sand between high and low water, frequently to a depth of a foot or more, and indicating its presence by small apertures on the surface of the sand, through which communication is maintained with the outer world. This species, which is extensively used as an article of food, enjoys a very broad distribution, being found throughout the Northern and Arctic seas over almost the entire circumference of the globe. Belonging to the allied family of the Glycimeridæ (or still to the same family, Myidæ, according to some authors) are the "clams" of the genera *Panopæa* and *Glycimeris*, many of which are noted for their large size and for the extraordinary development of the siphons. This last feature is remarkably exhibited in the "geoduck," or great clam of the North American Pacific coast (*Glycimeris generosa*), which frequently burrows to a depth of two feet or more. A specimen in the possession of the Academy of Natural Sciences of Philadelphia, from San Diego, California, has the siphons developed to a length of upward of 2½ feet.

The highly-prized round clam, or *quahog*, which is found along the Atlantic coast from Massachusetts to North Carolina, and from the colored margin of the shell of which the aboriginal American tribes manufactured their well-known specie currency, the wampum, is the *Venus mercenaria*, a member of the family Veneridæ. The shell is solid, obliquely ovate, and very subequilateral; surface bluish-white, with numerous concentric, laminated ridges, which become obsolete toward the middle; inner margin stained violet. Animal with the mantle margins fringed; siphons unequal, more or less separate; foot tongue-shaped. Length about 3 inches, but sometimes considerably more. This species abounds in all our bays, being found from a few inches below the water-surface to a depth of six fathoms or more. The genus *Venus* is world-wide in its distribution, and embraces upward of two hundred species. Numerous fossil representatives occur in the strata of the Mesozoic and Cainozoic formations. The giant clam (*Tridacna*), of the family Tridacnidæ, is an inhabitant of the China Sea and the South Pacific and Indian Oceans. This is the largest bivalve mollusk with which we are acquainted, the valves of *Tridacna gigas* being known to measure upward of 2 feet in length and to weigh 500 pounds. (A. H.)

CLAREMONT, a town of New Hampshire, in Sullivan county, beautifully situated on the Sugar River, near its junction with the Connecticut, 55 miles

west by north of Concord. It is also on the Concord and Claremont Railroad, which at Claremont Junction, near the village, connects with the Sullivan Railroad. The Sugar River near Claremont falls more than 150 feet in the course of a mile, and its power is utilized in cotton-, woollen-, and paper-mills, and other manufactories. Claremont has a national bank, a savings-bank, six churches, the well-endowed Stevens high school, three newspapers, a large book-printing and stereotyping establishment, and a free public library. Population of township, 4704.

CLARENDON, Constitutions of, the title by which is known the famous statute passed in 1164 by the Great Council assembled at Clarendon to regulate certain matters of dispute between Henry II. and the clergy. The efforts of the clergy to augment their power in civil as well as ecclesiastical matters led at different times in history to many conflicts between them and the civil authority. One great ground of dispute was in regard to the mode of filling ecclesiastical benefices, the pope claiming that the right was exclusively in him, and the kings, on the other hand, maintaining as firmly their right to a controlling voice therein. The kings having the right to the possession of vacant benefices, this question was one of great importance, and the kings most grossly abused their right by keeping the benefices vacant for long periods while they enjoyed their revenues. This contest raged on the Continent as well as in England, and had been generally compromised in a similar way, the kings retaining a large portion of the authority they claimed. In England it was provided at the Conquest that such appointments should take place before royal officers, in the king's chapel, and with his assent, and the prelate elect was to do homage for his lands and hold them as a barony from the king, subject to all the feudal burdens of taxation and attendance on the king's courts. Another and still more important difficulty was that in regard to ecclesiastical jurisdiction; and this formed the main point at issue in the great dispute between Henry II. and Thomas à Becket. The Church claimed that persons in orders could only be held to answer before the ecclesiastical tribunals, and by indirect means had gone far towards obtaining much of the purely secular jurisdiction. The most severe punishment that could be inflicted in these courts being excommunication, manifestly their power to enforce civil remedies was grossly inadequate, let alone their power to punish for serious crimes. It thus came that many crimes committed by ecclesiastical persons went without fit punishment; and this very immunity, of course, had the effect of largely increasing the number of crimes committed by persons of that class. These troubles came to a climax in England in the struggle between Henry II. and Becket. The latter had been Henry's chancellor, adviser, and close friend, and was appointed by him to the archbishopric of Canterbury on the death of Theobald. Becket was a man of unyielding will and fixity of purpose, and had warned the king that his appointment to that office would put him in the only place where he would be his opponent. So it turned out, for he immediately asserted to the full all the ecclesiastical claims, and aggressively acted upon them. These assertions caused minor conflicts with the king, and soon culminated in a contest over the question of jurisdiction of ecclesiastical offenders. A gross offence having been committed by a clerk, Henry demanded that he should be given up to the civil tribunals for trial and punishment after his degradation. This being refused on the ground that it was iniquitous to try a man twice for the same offence, Henry called an assembly of all the prelates and asked whether or not they would submit to the *ancient customs of the realm*. They unanimously replied that they would, *saving their own order*. The answer being clearly of no value to Henry, he called a general council (the name Parliament not yet having been appropriated to designate the legislative body). which

accordingly met at Clarendon in 1164. By this body was passed the statute known as the "Constitutions of Clarendon." The barons in the assembly being all in favor of the king, the bishops were overawed (some writers say coerced), and also gave their consent. Not satisfied with their mere assent, Henry required that the bishops should also set their seals to the instrument; and this was accordingly done by all. Becket at first refused, but finally consented, after much urging by some of his own party, who expressed the greatest fears as to what might otherwise happen to the Church.

The Constitutions thus enacted declared themselves to be the ancient customs of the realm, and were contained under sixteen heads, the most important of which were to the following effect: That in all civil and criminal causes the clergy should be subject to the king's courts, and should be tried therein; that in ecclesiastical questions appeals should lie from the archbishop to the king, and should be carried no further without the king's consent; that no archbishop, bishop, or other exalted person should leave the kingdom without the royal permission; that the revenues of vacant preferments should accrue to the king; that in elections for an archbishopric, bishopric, abbacy, or priory the king should recommend the best persons, the subsequent election be made with the king's consent, and the new dignitary should do homage to the king for his temporal rights. Many of these provisions were but a declaration of what was undoubtedly law—a good deal of it being founded, as already said, on the regulations of the Conqueror—but there seems to be no doubt that the provisions in regard to jurisdiction were new, and not founded, as they professed to be, on ancient custom. The pope's position being then weakened by the existence of an antipope, the king sent the Constitutions to him for his ratification, thinking that he had finally triumphed; but Alexander III. refused his assent to all the articles except six unimportant ones. Becket now expressed deep contrition for having given his assent, and was absolved therefrom by the pope. The hostility between Henry and the primate grew, and they endeavored in every most violent way to crush each other, until Becket, after two unsuccessful efforts, succeeded in escaping to France (1164), where he lived in great magnificence for some years at the convent of Pontigny. Becket was supported in the main by the pope, but the latter being then engaged in war with Frederick Barbarossa, and being opposed by an antipope whom Henry threatened to support, did not give his unqualified aid to Becket. During the latter's residence abroad Henry took the most violent measures against him and all that belonged to him in England, and Becket responded with equal violence from the Continent. At length, after several fruitless endeavors at reconciliation, one was effected, and Becket returned to England (1170), and was received in great triumph. But it was at once evident that the contest was still unsettled, and new difficulties soon arose. An entirely new face was put upon the matter, however, by the murder of Becket on Dec. 29, 1170, brought about by a hasty expression of the king in the presence of some courtiers. The whole Christian world heard the news with the utmost horror, and Henry had no course left but submission in order to escape far worse results. Becket's tomb was visited by multitudes of pilgrims; he was canonized and became a favorite saint; and Henry barely escaped excommunication. The cause of the contest had to be given up, and Henry at once renounced almost all he had claimed in the Constitutions of Clarendon, and so strenuously contended for. He later (1177) specifically promised that no clerk should be prosecuted in a secular court for any crime. Though Henry was thus obliged, temporarily at least, to give up so much of that which he had struggled for, the Constitutions were not formally repealed, and remained a part of the written law of the realm. While it is pretty sure that some of their provisions, especially that in regard to the filling of ecclesiastical benefices, were

acted upon even by Henry himself, it seems clear that they were not regarded as fixing the law on all the subjects they touched. Apparently, many of their provisions came gradually to be the customary law of the realm, and to derive their force from this fact, rather than from their prior enactment; but many of them also were not acted upon, and some of them were at a much later period formally enacted as statutes.

(W. M. M.)

CLARET. See WINES.

CLARINDA, the county-seat of Page co., Iowa, is on the Nodaway River, 63 miles S. E. of Omaha, on the Chicago, Burlington, and Quincy Railroad, the Wabash, St. Louis, and Pacific Railway, the Denver Short-Line Railroad, and the Humeston and Shenandoah Railroad. It has four hotels, two banks, one daily and three weekly newspapers, six churches, and good public schools. It has two foundries, carriage- and plough-factories, and three flour-mills. It has well-shaded streets and a park, and is free of debt. It was settled in 1852, and incorporated as a city in 1860. Population, 2011.

CLARK, ALVAN, an eminent optician and successful maker of optical instruments, especially of refracting telescopes of very large apertures, spectroscopes, chronographs, etc. His father, whose name was also Alvan, removed during the last decade of the last century from Cape Cod on the coast, and settled on a rough, stony farm at Ashfield, Franklin co., Mass., where, on March 8, 1804, the subject of this brief biographical sketch was born, being the fifth of ten children. As was generally the case in those days, his early education was neglected. In fact, all the schooling he ever received was obtained at the district school—then only an embryo of the public school of modern times—during the winter months, the larger part of the year being employed in assisting his father in farm-labors. Like most boys, the rod and gun, whose use in the then abounding streams and forests brought ample spoil, had greater attractions for him than had Webster's *Spelling-Book* and Daboll's *Arithmetic*, or than had the distasteful drudgery and routine of the farm. The bent of his mind was early shown to be for mechanics. Even while yet a little lad he had familiarized himself with the construction of the clocks, watches, and guns of his neighbors. He also took delight in studying hydraulics and hydrostatics at the grist- and saw-mills near by, for all of which a beautiful brook running through his father's farm supplied power. At the age of seventeen years he began to see clearly that there was no patrimony awaiting him, and that he must shift for himself; so, having saved a little money which he himself had earned, he procured some tools and materials, and without a teacher commenced at his father's house the practice of engraving and portrait-painting, which he followed until his twenty-second year, when he found employment at engraving for calico-printing at East Chelmsford (now the city of Lowell), at which he continued to serve for nine years, though part of the time in New York City. All the leisure he could command during this time he devoted to painting miniature portraits on ivory, and, having opportunity for studying choice specimens of the art, was enabled to attain such proficiency that greater remunerative prospects caused him to consider the advisability of altogether abandoning engraving. In 1835 he opened a studio in Boston, and a year later removed his family, consisting of a wife and four children, to a newly-purchased home in Cambridgeport, where he still resides. The room selected for his studio he continued to occupy for twenty years, at which time photography struck a deathblow to his business, and his brilliant anticipations of success were suddenly ended.

The manner in which he became a telescope-maker may not be inappropriate to mention as another illustration of an entire change in the affairs of one's life by an apparently trivial circumstance. His eldest son, George B., at the age of seventeen happening to read

an account of the process of casting and grinding specula for reflecting telescopes, had, unknown to his father, procured his metals and completed a casting for a five-inch speculum. Fortunately, his father not only encouraged him, but rendered him all the assistance in figuring and polishing of which he was capable; which, however, was but little, for he himself had never ground a speculum or a lens, nor had he ever witnessed the numerous and delicate processes resorted to by opticians to produce such an article; but being a firm believer in the adage that "Some things can be done as well as others," he procured an ill-corrected spy-glass, and in a rather desultory manner changed and rechanged the curves, and finally, after many trials, succeeded in freeing the object-lens from both spherical and chromatic aberrations. From this small beginning he has gone on increasing the size of his telescopes until he has achieved an aperture never thought possible by the great telescope-makers of Europe. From 1853 to 1863 he manufactured object-glasses of from 4 to 7½ inches in diameter, with which he discovered several new and difficult double stars. It was with a 4½-inch he discovered that the star 8 Sextantis was double. An account of it was sent to that veteran observer, Rev. W. R. Dawes of England, who, after verifying it, wrote and published an account of the surprising achievement, which secured for Mr. Clark from that country several orders for telescopes, and afforded him great pecuniary relief, which was then much needed. He sold Mr. Dawes two telescopes complete, besides three object-glasses, one of which was of 8 and another 8¼-inch clear aperture. It was with this latter glass, upon the occasion of its personal delivery, and while visiting Mr. Dawes at his home in Haddenham, that Mr. Clark discovered that 99 Herculis was also double, though its duplicity had escaped the notice of all previous observers. In 1856 he discovered the *companion* of Mu Herculis to be double, thus making the star a triple instead of a double, and all three physically connected and revolving around each other. In an autograph letter to the writer Mr. Clark says: "I have lived to see it through more than half a revolution." Otto Struve pronounces this one of the most interesting binary, or rather ternary, systems in the heavens.

As soon as the new business looked prospectively successful, Mr. Clark associated with himself his two sons, George B. and Alvan G., who by this time were prepared to assist him, under the firm-name of "Alvan Clark & Sons," or "The Clarks," as they are often called.

A strong desire to do whatever he attempted in the best possible manner has always been one of his marked characteristics. His telescopes are scattered throughout every civilized country—a strong attestation to their optical excellence and mechanical perfection. Astronomy owes him much, not only for important discoveries and valuable inventions of new and labor-saving methods of grinding and polishing object-glasses, but also in the production of a size which hitherto had been thought unattainable. The difficulties surrounding every process in making large object-glasses, from the melting-pot to the perfect lens, can be appreciated only by those who have made the matter a special study.

Mr. Clark is a member of the Philosophical Society of Philadelphia, and Harvard College has conferred upon him the honorary degree of A. M. Both he and his sons are members of the American Academy of Arts and Sciences.

As an illustration of his peaceful disposition and honorable character, although seventy-eight years of age he was never sued but once, and then settled the matter in dispute, so that it was not brought to trial. He, however, once brought suit against the collector of the port of Boston (his only aggressive legal affair), and in relating the incident he naïvely remarked, "I beat him."

The following is a list of some, though not all, of the large telescopes which the Clarks have made or are constructing, from 12-inch aperture and upward:

Imperial Observatory, Vienna, Austria.....	12	inch.
Prof. Henry Draper, private observatory, Dobbs' Ferry, N. Y.	12	"
Morrison Observatory, Glasgow, Mo.....	12½	"
Lick Observatory, Mt. Hamilton, Cal.....	12½	"
Washburn Observatory, Madison, Wis.....	15½	"
Lewis Swift, Warner Observatory (private), Rochester, N. Y.....	16	"
Dearborn Observatory, Chicago, Ill.....	18½	"
Princeton College Observatory, Princeton, N. J..	23	"
Naval Observatory, Washington, D. C.....	26	"
L. J. McCormick, for University of Virginia.....	26	"
Royal Observatory, Pulkova, Russia (object-glass only).....	30	"
Lick Observatory, Mt. Hamilton, Cal.....	36	"

A representative of the czar of Russia, in the person of the celebrated astronomer Otto Struve, in ordering the Pulkova glass, bound the Clarks to the following conditions—viz.: that it should in defining power equal the Washington telescope; that he (Struve) should decide what the ratio of focal length to its aperture should be, but that it should not be less than 13 nor greater than 20 to 1. The makers were not to deviate more than one-fortieth part from the focal length given. Struve is to decide which two rays shall be brought to the same focus, which, owing to the irrationality of the spectrum, cannot be done for them all. The amount to be paid for the object-glass alone is \$32,000, and for a trial-tube in which to test its performance an additional \$1000 is to be given.

The Clarks are now executing an order from the Lick Observatory of California. The object-glass of this telescope is a yard in diameter—the largest ever made or contemplated. This huge instrument, which, with all its accessories, will weigh about fourteen tons, will be mounted in the great dome of the Lick Observatory on one of the three peaks of Mt. Hamilton, 4256 feet above the Pacific Ocean, which is 40 miles distant. Here in a smaller dome of the same institution the 12½-inch already looks heavenward. For the object-glass in its cell alone, including the trial-tube, the makers are to receive \$51,000, and five years are allowed them for its completion.

It was with the Chicago telescope that Mr. Alvan G. Clark discovered the hypothetical and long-looked-for companion to Sirius, for which he was awarded the Lalande prize by the French Academy of Sciences. With the Washington instrument Prof. Hall found the two satellites of Mars, in some respects the most unexpected and remarkable astronomical discovery of modern times. With one of these telescopes—of only six inches aperture—Mr. S. W. Burnham of Chicago has discovered nearly one thousand double stars never before suspected of being duplex, some of them being among the closest and most difficult found in any catalogue of double stars. Many were less than "25" apart. This shows how almost absolutely perfect in figure and polish the four surfaces of the lenses of his instrument must be, and how delicately the aberrations are corrected and those of the secondary spectrum balanced. (L. S.)

CLARK, GEORGE ROGERS (1752–1818), an American Revolutionary general and Western pioneer, was born in Albemarle co., Va., Nov. 19, 1752. In his youth he was a land-surveyor, and in 1774 commanded a company of militia in Dunmore's war with the Indians. His adventurous spirit had led him to visit Kentucky in 1772, and for a short time in 1775 he commanded a force of armed settlers there. In the next year he returned to Kentucky, determined to make it his home, and soon called together an assembly of the people, which met at Harrodsburg June 6, 1776. By this meeting Clark and Gabriel Jones were elected members of the Virginia assembly, although it was uncertain whether the Kentucky colonists would be recognized as under the jurisdiction of that State. Though not admitted to the legislature, these delegates were received kindly by Gov. Patrick Henry, and secured the formation of the territory into Kentucky county, some provision also being made for its defence. The powder sent for this purpose was transferred to

Pittsburg, and thence down the Ohio amid great perils from Indians on the banks of the river. The military posts at Detroit, Vincennes, and Kaskaskia, originally established by the French, but then belonging to the British, were constant sources of Indian hostilities. Major Clark in Dec., 1777, obtained authority and means from Virginia to attack the fort at Kaskaskia, and by skilful management succeeded in surprising and capturing it, July 4, 1778. He then proceeded to Vincennes, and having, by the aid of a Catholic priest, gained the favor of the inhabitants of the town, compelled the commander of the fort to surrender. Leaving but two men at the post, he pushed on to the Mississippi. While engaged in negotiations with the Indians, he learned in the following January that Gov. Hamilton of Detroit had retaken Vincennes and was preparing for further enterprises against the Americans. Forthwith Clark plunged into the wilderness with 175 men, and after suffering dreadful hardships from wet, cold, and hunger in the drowned lands of Illinois, reached Vincennes Feb. 23, 1779, and capturing it the next day, sent Hamilton a prisoner to Virginia. When Louisville was founded Clark made it his headquarters. In June, 1780, in retaliation for an invasion of Kentucky by 600 Canadians and Indians, he gathered a force of 1000 men and destroyed an Indian town in Ohio. In December he formed plans for the capture of Detroit, and went to Richmond to obtain the approval of the Virginia authorities. While there he took a command under Baron Steuben in defence of the State against an invasion by a British force under Benedict Arnold. Clark was made brigadier-general in March, 1781, but on account of the movements of Lord Cornwallis the aid necessary to carry out his plans against Detroit was not furnished. After the battle of Blue Licks, in 1782, he gathered 1000 mounted riflemen and marched against the Indian towns on the Miami and the Scioto. Five of these were destroyed, and henceforth no formidable body of Indians ever invaded Kentucky. In 1786 he took part in an unsuccessful expedition against the Indians on the Wabash. About 1794 he accepted from Genet, the French minister to the United States, a commission as major-general in the French army to conduct an expedition against the Spanish possessions on the Mississippi. When Genet was recalled this commission was annulled. Gen. Clark lingered long in infirm health and poverty. He died at Locust Grove, near Louisville, Ky., Feb. 13, 1818.

CLARK, THOMAS MARCH, D.D., LL.D., an American bishop of the Protestant Episcopal Church, was born in Newburyport, Mass., July 4, 1812. He graduated at Yale College in 1831, studied divinity at Princeton, in 1835 became a Presbyterian licentiate. He had charge of the Old South Church, Boston, for a few months, and then he took orders in the Episcopal Church. He was rector of Grace Church, Boston 1836-43; of St. Andrew's Church, Philadelphia, 1843-47. He was afterward an assistant in Trinity Church, Boston, and then rector of Christ Church, Hartford, until December, 1854, when he was consecrated bishop of Rhode Island. In 1850 he received the degree of D.D. from Union College, N. Y., and in 1867 the degree of LL.D. from the University of Cambridge, England. Among his works are *Lectures on Formation of Character* (1852), *Early Discipline and Culture* (1852; republished as *The Dew of Youth*), *Primary Truths of Religion* (1869), *The Efficient Sunday-School Teacher*.

CLARKE, CHARLES COWDEN (1787-1877), an Englishman of letters, born Dec. 15, 1787, at Enfield, in Middlesex. His lectures on literary subjects were popular, and he was an intimate friend of Shelley, Keats, and Lamb. Among his works are *A Hundred Wonders* (1814), *Adam the Gardener* (1834), *Tales from Chaucer* (1833), *Riches of Chaucer* (1835), *Carmina Minima*, a collection of verses (1859), *Shakespeare Characters* (1863), *Molière Characters*

(1865), and series of *Essays on the Comic Writers of England* (1871, in the *Gentlemen's Magazine*). He lived for many years at Genoa. He died March 13, 1877.—His wife, MARY VICTORIA COWDEN CLARKE, a daughter of Vincent Novello, the composer, was born in London June 22, 1809. Her intellectual powers were early developed, and she was an intimate friend of Charles and Mary Lamb and of the literary celebrities closely associated with them. She was married to Mr. Clarke in 1828. In 1846 she published her admirable *Concordance to Shakespeare*, the result of sixteen years of hard work. Among other works of hers are *The Adventures of Kit Bam* (1848), *The Girlhood of Shakespeare's Heroines* (1850), *The Iron Cousin*, a novel of merit (1854), *World-Noted Women* (1857), *A Rambling Story* (1874), and translations of Catel *On Harmony*, and of Cherubini's *Counterpoint and Fugue*. She also contributed largely to periodical literature, and with her husband's aid prepared an annotated edition of Shakespeare.

CLARKE, JAMES FREEMAN, D.D., a Unitarian clergyman, was born in Hanover, N. H., April 4, 1810. He was named for his grandfather, Rev. James Freeman, long the minister of King's Chapel, Boston, who led his congregation to adopt Unitarian views. He was educated at the Boston High School and Harvard College, graduating from the latter in 1829. He studied theology in the divinity school of Cambridge, and graduated in 1833. He then went to Louisville, Ky., where he preached for seven years, and after spending a year at Meadville, Pa., returned to Boston. Here, in 1841, he began a free Church movement against the prevailing tendency of his Unitarian brethren, but with the hearty approval of Rev. Dr. Channing. The new organization, called "The Church of the Disciples," was formed "to learn and practise Christianity" in the simple faith that "Jesus is the Son of God," and has continued ever since under Dr. Clarke's charge. It has become one of the leading religious institutions of Boston, noted alike for the high character of its membership and its activity in all good works. The "Service Book of the Church of the Disciples" combines features of worship rarely found united, including responses on the part of the congregation, extemporaneous and silent prayer. In like manner Dr. Clarke combines in his teaching firm belief in the supernatural with attention to the currents of public thought and to the practical needs of every-day life.

While at Louisville he edited for three years *The Western Messenger*, and he has ever since been a frequent contributor to newspaper and magazines, discussing with marked ability the social and political as well as the religious questions of the time. He has occasionally been a delegate to political conventions, and in 1873 his defence of the right of "bolting" when unsuitable nominations were made attracted the attention of the nation. His influence has extended far beyond the bounds of his Church or party, tending to promote sincerity, courage, devotion to principle, and the highest moral and spiritual aims.

His published works are numerous, the earliest being a translation of De Wette's *Theodore; or, The Sceptic's Conversion* (1841). In vindication of Gen. William Hull he published *A History of the Campaign of 1812* (1848). In company with R. W. Emerson and W. H. Channing he prepared *Memoirs of Margaret Fuller Ossoli* (1852). Among his works treating of religious subjects are *The Christian Doctrine of Forgiveness of Sin* (1852), *The Christian Doctrine of Prayer* (1854), *The Hour which Cometh* (1862), *Orthodoxy: Its Truths and Errors* (1866), *Steps of Belief; or, Rational Christianity maintained against Atheism* (1870), *Common Sense in Religion* (1873), *Go up Higher; or, Religion in Common Life* (1878). His work called *Ten Great Religions* (1870) is a valuable contribution to comparative theology, intended to show the place, use, and true worth of

these systems of belief and practice and their relation to human progress. Part Second of his work, published in 1883, is called *A Comparison of all Religions*. Another notable work is *The Legend of Thomas Didymus, the Jewish Sceptic* (1881), in which Dr. Clarke attempts to set forth in a narrative the opinions, beliefs, and prejudices of the Jewish sects in the time of Jesus and the characters which surrounded him. Dr. Clarke has also published a volume of *Memorial and Biographical Sketches* (1878), *Self-Culture, Physical, Intellectual, Moral, and Spiritual* (1880), and *The Ideas of the Apostle Paul Translated into their Modern Equivalents* (1884). His writings on every subject are clear, earnest, and inspiring.

CLARKE, JOHN SLEEPER, an American comedian, was born in Baltimore, Md., in 1835. At an early age he lost his father and was thrown upon his own resources. While still a boy he developed a strong inclination for the stage and became a member of a company of amateur tragedians, of which Edwin Booth, who subsequently became his brother-in-law, was also a member. By the desire of his mother he took up the study of law, reading industriously for about a year in the office of Elisha R. Sprague, in Baltimore, Md. But after a brave effort to meet his mother's wishes, he abandoned law and turned his attention earnestly to the stage. Although tragedy had attracted his boyish fancy, it soon became evident that low comedy offered the most inviting field for the exercise of his peculiar powers. Not wanting in pathos, and, indeed, having a nature singularly alive to emotional influences, he yet possessed that keen sense of the ludicrous, conjoined with an extraordinary mimetic faculty, which fitted him for comic activity. His first regular engagement began at the Old Chestnut Street Theatre, in Philadelphia, Aug. 28, 1852, the play being "She Would and She Would Not," in which Clarke assumed the rôle of Soto. He rose in favor, and in January, 1853, became leading man in the Chestnut Street stock company—a position which he held for a year. In 1854 he went to Baltimore, taking the place of first low comedian at the Front Street Theatre in that city. He became so general a favorite that the Baltimoreans forced upon him a complimentary benefit in the autumn of 1854, which became, indeed, a popular ovation. In August, 1855, he returned to Philadelphia, and took the position of leading comedian at the Arch Street Theatre until 1858, when he entered into partnership with William Wheatley and became joint-lessee of that house. The business was successfully conducted until 1861, when the partnership was dissolved, and Clarke arranged to appear as a star in New York. He made his *début* in this capacity at the Winter Garden and secured an instant and unequivocal success.

The critics with one accord hailed him as a great artist and the legitimate successor of W. E. Burton, whose loss had been felt as nearly irreparable. Clarke's fame was now secure, and he began a starring-tour of the principal American cities, rapidly acquiring fortune. He became part-proprietor of the three leading theatres of the country, the Boston Theatre, the New York Winter Garden, and the Walnut Street Theatre, Philadelphia, from each of which he reaped large financial returns. In 1868, Clarke went to England, making his appearance at the St. James's Theatre in the autumn of that year. London received him with an enthusiasm equal to that accorded him by New York, and, with the exception of a brief visit to his native country in 1881, he has since made England his home. He has played at nearly all the leading English theatres.

Mr. Clarke married a sister of Edwin Booth, and has always been noted for his strong domestic attachments and exemplary personal character. As an artist he may be said to have created a school of his own, although he approaches in his methods more nearly to the late William E. Burton than to any other actor.

He has been called the pupil and follower of Joseph Jefferson, but is more pronounced in his action than Jefferson, and hence more purely a low comedian than that artist. Clarke's repertoire covers a wide range of character, his most noted impersonations being Toodles, Pangloss, Waddilove, and Major de Boots.

(F. H. W.)

CLARKSBURG, the county-seat of Harrison co., W. Va., is on the west fork of the Monongahela River and on the Parkersburg branch of the Baltimore and Ohio Railroad, 122 miles S. of Wheeling and 82 miles E. of Parkersburg. It has a court-house, six churches, a female college, two weekly newspapers, a national bank, one other bank, two foundries and machine-shops, a woollen-mill, two flour-mills, and gas-works. There are coal-mines in the vicinity. Population, 2307.

CLARKSVILLE, the county-seat of Montgomery co., Tenn., is on the N. bank of the Cumberland River, at the mouth of Red River, 60 miles below Nashville. It is on the Louisville and Memphis Railroad, which here crosses both rivers. The city has a fine court-house, a hotel, two national banks and two other banks, one semi-weekly and two weekly newspapers, thirteen churches, and six schools. The South-western University (Presbyterian) was established here in 1874, the citizens contributing liberally for its endowment. There is also a female academy. The industries comprise a foundry, several flour- and planing-mills, and manufactures of ploughs, wagons, carriages, and ice. The city was incorporated in 1830, and, though it suffered severely by a fire in 1878, has revived and presents a fine appearance. It is lighted with gas, and supplied with water by public water-works. The surrounding country furnishes a large amount of tobacco and other products for shipment by river or by rail. Population, chiefly of American birth, 3880.

CLAUSEN, HENRIK NICOLAI (1793–1877), a Danish theologian, was born April 22, 1793, in Marebo, where his father was pastor. The father, who was a man of ability, became afterward chief preacher in the Lady church at Copenhagen, and published several volumes of sermons. The son distinguished himself at the University of Copenhagen, and after graduating, in 1818, travelled extensively in France, Italy, and Germany. While in Berlin he came under the influence of Schleiermacher. In 1821 he began to lecture on theology at Copenhagen, and in the next year was made professor in the university there. He soon took part in the agitation for a constitutional government, and in 1840 he became a member of the provincial assembly at Roestilde, of which from 1842 to 1846 he was president. He was afterward elected to a constitutional assembly, and from 1848 to 1851 was a member of the state council. In 1876 he resigned his professorship, and he died at Copenhagen March 28, 1877. His reputation as a writer was first established by his *Catholicism and Protestantism in their Ecclesiastical Organization, Doctrine, and Ritual* (1825). This work involved the author in a famous controversy with Bishop Grundtvig, one of the results of which was a libel suit against the latter. Clausen published several other works against Grundtvig and his followers. He was also the author of numerous exegetical and dogmatic works. Among these are treatises on the *Synoptical Gospels* (1847–50), on *John* (1855), on *Romans* (1863). After his death a volume of autobiography was published.

CLAUSIUS, RUDOLF JULIUS EMANUEL, a German physicist, was born at Köslin, Pomerania, Jan. 2, 1822. He studied at the University of Berlin, and became a *privat docent* there, as well as professor of physics in a military school. In 1855 a polytechnic school was established at Zurich, and Clausius was appointed to the chair of physics. He also obtained a professorship in the University of Zurich. In 1867 he accepted a call to a similar position at Würzburg, and two years later became professor at Bonn. Besides

some investigations in optics and on the elasticity of bodies, Professor Clausius's labors have been chiefly directed to the subject of heat, which he maintains to be a state of matter in motion. His essays on this subject appeared first in Poggendorff's *Annalen*, but he afterwards published separate treatises—*Ueber das Wesen der Wärme* (Zurich, 1857), *Die Mechanische Wärmetheorie* (Brunswick, 1864; 2d ed. 1876), *Ueber den zweiten Hauptsatz der mechanischen Wärmetheorie* (Brunswick, 1867). His work *Die Potentialfunktion und das Potential*, first published at Leipsic in 1850, reached its third edition in 1877.

CLAVICLE (Lat. *clavis*, a key, *clavicula*, a small key), the collar-bone. In man this bone is rather slender for its length, curved somewhat like an italic *f*, and extends from the acromion process of the scapula to the manubrium of the sternum; it is movably articulated at each end, and the sternal end furnishes the only bony connection of the arm with the trunk proper of the body. From its exposed situation in the neck the collar-bone is peculiarly liable to fracture. In nearly all Mammalia the clavicles, when perfect, repeat the same connections they have in man, but they are frequently defective or wanting altogether. They are consequently of little value in morphological classification, being present and perfect, or in varying imperfection, or absent, in closely-related animals, even of neighboring genera. They are best developed, as a rule, in those quadrupeds which use the fore limbs as arms and hands, rudimentary or lacking in those which the same limbs are exclusively devoted to ordinary locomotion. In birds the clavicles are usually present and perfect, but very seldom join the sternum, being united with each other on the middle line of the body to form the furculum or merrythought, usually developing at their junction a special process called the *hypocleidium*. They are absent or rudimentary or separate in *Ratitæ* and some parrots; ankylosed with the keel of the sternum in some *Steganopodes*, as the pelican and frigate-bird; with the body of the sternum in *Opisthocomus*. When perfected they serve to bear the shoulders apart; and their degree of curvature and solidity bear some relation to power of strong or protracted flight. (E. C.)

CLAY, in its purest state, is a mineral substance of perfect snow-white color; it feels to the touch like soap, is very soft and brittle; it sticks to the tongue, and emits a peculiar odor when the moist breath is blown upon it. Kneaded together with water, it absorbs the latter in considerable quantity, and passes into a peculiar condition which is designated *plastic*. In this state the clay has lost its brittleness, the particles adhere with considerable force and yet possess a remarkable freedom of motion against each other, and may thus receive any arbitrary shape from the moulding hand of man. This is a quality not possessed by any other mineral substance, and gives to clay its great importance as raw material in the arts. Clay, however, is not a uniform mineral matter.

The above characters belong only to one of its composing parts, which may be named the *clay-substance*, or, in conformity with mineral nomenclature, *kaolin*. Kaolin is made up of minute loosely-aggregated particles invisible to the naked eye and impalpable to the touch—that is, without grit. Under a magnifying power of 1100 diameters these particles look like globules, and in appearance their aggregate is not unlike to fish-roe. The writer's observations harmonize in this respect entirely with Aron's, who examined them under a power of 760 diameters. They differ from those of other observers, who conclude that the clay-substance is composed of fragments of crystal. The writer could not observe any effect which this material is said by some to have on polarized light, which would be a proof of their crystalline nature. This substance, on the contrary, resembles much more the globules of starch, being capable of absorbing water, of swelling, and of passing into a plastic paste. The extreme mobility of the particles is accounted for

if they possess a spherical instead of an angular form, and we state it as the result of numerous examinations that the ultimate particles of the clay-substance proper are of spherical shape. Being so very small—that is, less than the $\frac{1}{10000}$ part of an inch, a diameter for which the ratio of surface to mass is very large—it follows that this substance can remain suspended in water for a long time. The peculiar milky opalescence which river-water shows many days after the subsidence of a freshet is owing to the suspension in it of these minutest clay-globules.

The other components of clay are best designated *in common* as *sand*. They are fragments of different mineral species—quartz, felspar, mica chiefly, tourmaline, hornblende, magnetite, ilmenite or titaniferous iron, rutile, and others. These minerals are hard, their fragments angular and of all degrees of fineness. They may be reduced to grains not much larger than the globules of the clay-substance and remain suspended with them in water, whilst the sand proper settles very quickly, and may be thus separated from the kaolin. The mineral nature and chemical composition of the sandy portions of a clay and their relative quantity determines whether a given clay is serviceable for a specified purpose. Besides the sand, there are other compounds present in clays, such as coaly matter, the red, brown, and yellow oxides of iron, pyrite, fossil resin, bitumen, black oxide of manganese, alum, gypsum, calcite, dolomite. They produce the many colored varieties of clay, and are either quite harmless or more or less hurtful to the uses to which clay may be put.

According to their place of occurrence, clays are divided into those of *primary* and *secondary* deposits. According to structure, physical condition, and comparison, clays are said to be *fat*, *lean*, *plastic*, *argyllites*, *clay-slates*, *marls*, and *loams*. To gain a proper idea of these differences we must consider the—

Origin of Clay.—The so-called primitive rocks, which have been proven by all deep mining and by the study of the sequence of rocks to underlie all other rocks, are composed chiefly of three species of minerals, quartz, felspar, and mica. Quartz is pure silica (SiO_2), very hard, compact, and very indifferent toward chemical agencies at ordinary temperature. Felspar is a more complex compound, containing at least four elements—i.e. potassium (K), aluminum (Al), silicon (Si), and oxygen (O). These elements are combined in the ratio $\text{K}_2\text{Al}_2\text{Si}_6\text{O}_{16}$. Potassium may be replaced by sodium wholly or in part, and also by calcium, in felspar. It is a white, vitreous, easily cleavable substance only one degree less hard than quartz. Mica is composed of the same elements, with the addition of iron and magnesium. But the ratio of combination is different, likewise, for the several species of mica: muscovite, the white mica; biotite, the dark-colored mica. The micas crystallize in the same system with the felspar, but possess only one eminent cleavage. The cleavage laminae are flexible, elastic, and much softer than felspar. The same or very similar minerals form the component parts of a number of igneous or volcanic rocks. When these minerals are aggregated in more or less parallel layers, they form *gneiss*, whose structure is schistose or slaty; when in granular, irregular aggregation, they form *granite*; when developed with porphyric structure, they compose the volcanic rocks *porphyry* and *trachyte*. The researches in chemical geology have proved that all other rocks have been formed by the chemical and mechanical destruction of those just mentioned. It is not asserted by the writer that they are *original* rocks; they are merely the oldest and deepest we have any cognizance of. At all places where the felspathic rocks have been at the surface for any length of time a peculiar change becomes noticeable. Especially the coarse-grained granite, in which the felspar is found very pure, and often in large masses, shows this change more markedly. The

glassy surface of the mineral turns to a pulverulent chalk-like substance, and this is due to its conversion into the clay-substance, or kaolin. In chemistry the law prevails that the more complex a composition a given compound possesses, the more ready it is to succumb to the action of chemical agencies. Likewise, the more a ternary compound or salt is acid—that is, the more the ratio of that acid portion increases over that of normal saturation—the less will be its chemical stability. In the felspar we have a case exactly corresponding. The composition of the *orthoclase* felspar has been stated as $K_2Al_2Si_6O_{16}$. This formula may be written $K_2O + Al_2O_3 + 6SiO_2$.

Under the action of water, which penetrates into the smallest cracks and by its freezing in wintertime expanding with irresistible force, the most compact minerals are finally broken and ground into the finest powder. After this physical disintegration the chemical action begins. Many writers of high authority ascribe the principal rôle in this action to the carbonic dioxide contained in the air to the amount of 0.03 of one per cent. They believe that a body of acid chemical nature is indispensable in the decomposition of mineral compounds, and this fractional percentage of carbonic dioxide is the only available body of this kind. The writer does not share in this belief. The observation in the laboratory that pure water (obtained by distillation) alone will slowly decompose—*i. e.* destroy and rearrange the molecules of a substance like hard Bohemian glass if the latter be very finely pulverized—seems entirely sufficient to account for the decomposition in nature of a body like felspar by water alone. Water acts in the capacity of an acid as well as a base, and the strongest affinity undoubtedly exists to exert this capacity, especially toward supersilicated minerals like felspar. In this case the attack by water is supported by the possibility of forming a compound soluble in water—potassium silicate; for if the white pulverulent substance forming from the felspar be examined, it is seen that only fractions of one per cent. of K_2O are left, whilst the fresh felspar contains sixteen per cent. The result of the completed decomposition may be represented by an equation: $K_2Al_2Si_6O_{16} + H_2O = Al_2Si_2O_7 \cdot 2H_2O$ (kaolin or pure clay-substance) $+ K_2Si_3O_7 \cdot 3H_2O + SiO_2 \cdot 2H_2O$: of these three products, the first and last are insoluble in water; the middle one is soluble in it. The silicic hydrate may be separated from the clay-substance by digestion with a dilute solution of sodium carbonate. (It is not proper to take the hydrates of sodium or potassium, because they will decompose and dissolve the clay-substance also.) The above formula for the first-named body, $Al_2Si_2O_7 \cdot 2H_2O$, gives the percentage composition: silica (SiO_2), 46.40; alumina (Al_2O_3), 39.68; water (H_2O), 13.92 (Rammelsberg *Mineral Chemie*, 2d edit., 642). But this formula is not generally accepted. C. Bischof, in his excellent treatise on *The Refractory Clays* (Leipzig, 1876), assumes a more basic silicate: $Al_2O_3 \cdot SiO_3 + 2H_2O$ or $2Al_2O_3 \cdot 3SiO_2 + 4H_2O$ (when silica = SiO_2). This yields the percentage composition: silica, 39.33; alumina, 44.93; water, 15.73. The percentages of alumina and silica are very nearly reversed in the two formulas. Bischof follows Malagutti, who treated the kaolin with potassic hydrate and then analyzed the residue. But this method is incorrect, as stated above. There are, however, certain very refractory clays whose analysis leads nearly to Bischof's formula; they are exceptions, and it must be assumed that they contain aluminic hydrate mixed with the silicate. The whole subject, however, is by no means clear. Investigations of a still more critical character and more comprehensive than those on record might possibly shed a better light upon the true composition of this highly useful mineral.

Such, then, is the process of the hydration and kaolinization of the felspathic rocks. It is plain that the bulk of the insoluble residue cannot be pure kaolin, but must be a mixture of this with grains of fresh or

partly altered felspar, quartz, and the fragments of all other and less easily decomposable minerals of the original rock. It will be understood that this residue as a whole is therefore a *rock—i. e.* an aggregate of minerals—and not a species of *mineral*—that is, a uniform and homogeneous substance. Among the minerals in the granite and gneiss are black tourmaline, black hornblende, and black mica, or biotite. These are silicates containing ferrous oxide (protoxide of iron). Undergoing the process of hydration like the felspar, this iron becomes altered into ferric hydrate or brown hydrated sesquioxide of iron—iron-rust; sometimes, also, into the red oxide. This imparts to the kaolin its color and produces all shades, from the faintest buff to a deep-brown color. Owing to this cause, few localities furnish a pure white kaolin, which alone is desirable in the arts, and commands a ready sale.

The word *kaolin* is accepted as the Chinese term for designating an earth serviceable in the manufacture of porcelain. In England and this country the word *China-clay* is mostly used to designate a deposit of kaolin which is still *in situ*—that is, above or between the granite or gneissic rocks from whose decomposition it was derived. One of the most notable deposits of this kind is that of St. Austel in Cornwall, where it has been mined for many years in a huge open quarry along the tops of a long hill. In Delaware and Chester counties, Pa., in the neighborhood of Wilmington, Delaware, and around Baltimore, Md., are examples in this country. Neither of these compares in extent with that of St. Austel. All these deposits may be looked at as products of the present geological periods, during which the rocks have been exposed to atmospheric agencies. Their bulk is constantly decreasing, under the washing energy of rains and floods. Suspended in the current, both kaolin and mineral fragments are carried into the rivers. As soon as the carrying-power of the current decreases by reason of lessened velocity the heavier sandy materials fall out, mostly along the banks of the rivers, if they have risen above those banks, whilst at a distance, on the so-called *flood-plain*, the velocity decreases apace, and more and more the finer grains fall out, until at last, in nearly quiet water—that is, in the bays and estuaries, where the counter-current of the tide checks the river-current—the deposition of the clay-particles takes place together with the very finest sand. These are the mud-bars at the mouth of very large rivers. As the dredgings show, they are composed of clay, not of sand. Instead of emptying into the sea, the waters may empty into a large lake or fresh-water basin, or into huge swamps. At all events, these are Nature's settling-vats. And thus we account for the numerous clay-strata which are encountered in all geological formations, from the earliest palæozoic to the most recent tertiary and quaternary. These deposits are *clays*, in the more restricted sense of the word. They occur mostly in beds of varying thickness as well as purity, which follow the stratification in *dips* and *strike* of the surrounding rocks, sandstones, limestones, etc. Containing the kaolinized product of the entire geologic time, their magnitude in superficial extension is very great. But there can be no doubt that many of the late clay-formations are made by redepositing the material of one or more older deposits, through which stretches the drainage of a river-system. According to collateral circumstances, the repeated transportation and deposition of clays may result in a purification or in a degeneration; the probability is in favor of the latter. The structure and general physical condition of these transported, or *secondary*, clays is very varying, as well as their ultimate chemical composition. All have preserved the one common stamp of their origin—that is, a decided bedding or separation in layers, each of which undoubtedly corresponds to one flood. But pressure and the influence of surrounding or penetrating volcanic rocks has largely modified the original bedding. In the older clays these layers

are so much compressed and hardened that they form *slates*. The well-known black roofing-slates of the Blue Mountain, belonging to No. 3, or Hudson River, group-formation, are simply highly compressed and hardened clay. This slate, when finely ground and in contact with water, returns after a time into plastic clay. Between this hard slate and the soft clays of tertiary or quaternary age we find all degrees of slaty structure. The whole of these are comprehended under the generic term "argillites." They are *clay-slates* at the one extreme end, and *slaty clays* at the other. It is well known that the outcrops of roofing-slate beds are too rotten for serviceable material. The slate must be gotten by underground mining at a considerable depth. Being exposed to rain and frost, the slate absorbs water along the outcrops, swells, and becomes a lean clay.

Properties of Clay.—Under this head we shall speak of the qualities of the clay as a rock-mass—not so much of the clay-substance as of the various modifications which the properties of that substance are subject to by the admixture of the sandy fragments. As such, we mean the fragments of all possible minerals. In absolute quantities the quartz always predominates in the sandy part.

Physical properties are such as may be at once noticed by the eye—color and lustre; opaqueness or horny translucency; touch, sectility; the dimensions of the granular admixtures; the presence or absence of efflorescences, of concretions; the fracture and general structure. Other physical properties, or at least their causes, are not at once observable. Among them the most prominent and important is the *plasticity*, in whose train many other phenomena may be considered—the shrinkage; the binding capacity, the cohesion; the fatness or leanness; the capacity for absorbing water—capillarity or porousness; the stiffness or resistance against water, etc.

Plasticity is the most valuable property of clay. It means the power to pass with water into a dough which may be moulded into any convenient and desirable shape. This power decreases with the percentage of increase of the sandy admixtures. It is strongest in the *fat* and weakest in the *lean* clays. A clay may be, however, too plastic; it dries very slowly and unevenly. Objects after moulding will warp and crack. Lean clays absorb water readily and become plastic; fat clays rather resist the water. Many of the latter class show the peculiarity which may be called *water-tightness*—that is, they will not take up any more water after a certain quantity has been absorbed. Such clays are used with advantage in the construction of temporary dams and weirs, in making a shaft water-tight when sinking through loose or swimming rock. When first taken from the deposits near the surface, the clays are mostly in this condition of water-saturation.

Experimenting upon the purest clay-substance obtained by careful washing in Schöne's apparatus, Dr. Jul. Aron found that the linear shrinking does not progress apace with the drying of the clay, as might have been expected, but only follows up to a certain point, which he calls "limit of shrinkage;" the water evaporated to this point is "the water of shrinkage;" the remainder of the water given out until the weight of the sample remains constant at a temperature of 130° C. as the "water of pores." The sum of both is the total water. Under the supposition that the smallest material particles of clay-substance possess globular shape, this behavior is explicable. In a measure, as the water which separates those particles passes off, these will approach until they touch each other. But each particle will be touched only at six points of its surface, and therefore the interstices between all the other points will still be filled with the water of the "pores;" its evaporation cannot produce any further shrinkage of the clay. It follows as an important rule for the potter that *the number and size of the pores is*

independent of the water contained in the clay and is constant for all plastic clays; and, further, that the cubical shrinkage is equal to the volume of water lost by evaporation up to the limit of linear shrinkage. Aron found further that if the purest clay-substance is mixed with very fine quartz sand the shrinkage will increase up to a certain point, which he calls the point of "greatest density." From this point the shrinkage decreases again, with increasing leanness, while the porousness increases.

Exposure to red heat destroys the plasticity of clay, because the two molecules of water are eliminated from the aluminum silicate at that temperature, and as a consequence the clay shrinks a second time; that is the "fire-shrinkage." Addition of quartz sand neutralizes this second shrinking, and even reverts it into expansion. Aron found that a clay-mass made lean with quartz sand shows a larger volume at a red heat than it had shown in the air-dry state, and that from a given point of leanness the volume will grow inversely as the temperature. Finely pulverized pure limestone is an excellent means to counteract the fire-shrinkage, since it imparts to the burnt mass a certain uniformity in expansion and porousness within temperatures of considerable range. If the temperature be carried to a white heat, these facts suffer a modification, because new chemical affinities are provoked; the materials of a clay-mass lose their former identity more or less completely. This leads to the consideration of the most important physical property of pure clay-substance and of clay, its *resistance to the action of very intense heat*.

The two proximate components are alumina (Al_2O_3) and silica (SiO_2). Both are found in a very pure state as crystallized minerals, the first as corundum, and with water as diaspore ($\text{Al}_2\text{H}_2\text{O}_4$); the second as quartz, hornstone, chalcedony, flint, and opal. Exposed to highest temperature which can be realized in furnaces, at which pure platinum fuses, neither corundum nor diaspore shows the least change or tendency to fusion. Artificially-prepared alumina purified to the utmost behaves in the same way. Exposed to the same heat, quartz (as rock-crystal) becomes rounded at the sharp edges and corners, while its whole surface appears covered with a lustrous glaze. This mineral is therefore less refractory than corundum. The other varieties mentioned are always more or less impure from admixture of other bodies. They are decidedly more fusible than the pure rock-crystal. The glazing takes place at the temperature of melting wrought iron, and some varieties even fuse to a transparent or milky glass.

There is a general law that if two bodies enter into chemical combination the resulting compound will have a lower fusing-point than the arithmetical mean of their individual fusing-points. The combination of silica and alumina is no exception to this. Its fusing-point is lower than that of quartz; it glazes readily as it approaches melting heat of wrought iron. It remains to be seen now how the relative proportions of the two compounds affect the fusing-point. The concordant results of extended experiments by C. Bischof and Richters show that the refractory character increases with the preponderance of alumina. Up to a certain point the addition of silica increases the fusibility (about 1:6); beyond this point it decreases again toward the same as in the ratio 1:1.

The natural clays are rarely or never pure Al_2O_3 , $2\text{SiO}_2 + 2\text{H}_2\text{O}$. As explained above, they contain fragments of a number of other minerals with varying composition, but generally silicates, and carbonates of the metals iron, calcium, magnesium, and manganese; more rarely sulphates of calcium, magnesium, iron, and aluminum; phosphates of calcium and aluminum, chloride of sodium, oxides like those of iron, as hematite (Fe_2O_3), limonite ($\text{Fe}_4\text{H}_6\text{O}_6$), ilmenite or titaniferous iron ($\text{Fe}_2\text{O}_3 + \text{TiO}_2$), magnetite (Fe_3O_4), rutile (TiO_2); sulphides, as pyrite (FeS_2); rarely galenite (PbS) and blende (ZnS). Materials of organic origin

are, seldom wanting in clays. They are hydrocarbons (bitumen), sometimes in such quantities that they impart a very peculiar and disagreeable odor when the clay is rubbed (stinking clays). They are oxidized hydrocarbons, such as humic acid. Graphite and amorphous carbon are very often present in clays. All these materials have little influence on the fusing-point as they are destroyed in the furnace, except graphite, which rather raises the fusing-point. The potassium which is always present in clays is contained in the fragments of orthoclase. These substances more or less modify the refractory character of kaolin and secondary clays; they lower the fusing-points, and are most properly comprised under one term as "fluxing agents."

Richters mixed one part by weight of pure alumina with two parts of silica, and exposed the mixture for considerable time to the highest heat attainable in the furnace until a partial fusion took place, showing that the two bodies had formed a chemical union. The product was again pulverized, and equal portions of it were intimately mixed with four per cent. of the fluxing oxides, one part with percentage of magnesia, one with oxide of calcium (lime), one with ferric oxide, and one with potassium oxide (potassa). When the four mixtures, made into small cylinders, were exposed to the same highest heat, the experimenter

found that No. 1 (containing magnesia) had completely melted to a vitreous slag; Nos. 2, 3, and 4 followed, so that portion 4 (containing potassa) had been least melted. But the order of these samples corresponds to the atomic weights of these oxides in ascending series: $\text{MgO} = 40$; $\text{CaO} = 56$; $\frac{1}{2}(\text{Fe}_2\text{O}_3) = 80$; $\text{K}_2\text{O} = 94$. Richters formulates this result as a law, thus: *Equivalent quantities of different fluxing oxides produce the same effect upon the fusibility of a clay.* For example: If the analysis had shown that a certain clay contains magnesia = 0.3 per cent., and that another clay contains potassa = 0.70, we could deduce with certainty that both would stand equally in the fire, all other conditions being the same. According to the same observer, the presence of several fluxing oxides in a clay does not influence the effect produced by each singly; the fusibility increases only with the higher sum of their equivalent weight. As the manufacture of fire-resisting bricks and vessels of many descriptions forms the foremost use of clays, the properties of clays just described are practically the most important.

The following table is taken from C. Bischof's work (*l. c.*). It gives the composition of seven clays which he takes as types of seven classes as far as refractoriness and plasticity are concerned:

	I.	II.	III.	IV.	V.	VI.	VII.
Alumina	36.30	38.54	34.78	36.00	35.05	27.97	28.05
Silica } combined..... {	38.94 } 43.84	40.53 } 45.68	39.69 } 49.64	41.00 } 47.74	39.32 } 47.33	33.59 } 57.49	30.71 } 58.32
Sand } {	4.90 } {	5.15 } {	9.95 } {	6.74 } {	8.00 } {	24.40 } {	27.61 } {
Magnesia.....	0.19	0.38	0.41	0.33	1.11	0.54	0.75
Lime.....	0.19	0.08	0.68	0.40	0.16	0.97	0.72
Ferric oxide.....	0.46	0.90	1.80	2.57	2.30	2.01	1.89
Potassa (K_2O).....	0.42	0.66	0.41	1.05	3.18	0.53	1.39
Loss by ignition.....	17.78	13.00	12.00	11.81	10.51	9.43	8.66
	99.18	99.24	99.72	99.90	99.64	99.44	99.78
Deg. of refractoriness...	100	70-50	50	45	30	20	10
Degree of plasticity.....	1-2	3	10-11	9-10	8	9	8-9
100 parts of steam-dry clay absorb water....	3.26	8.90	10.73	10.46	7.43	6.88	6.55

CLASS I. *Clay from Saarau, in Upper Silesia.*—The tests were made with carefully selected pieces from several hundredweights of clay from this locality. They represent a slaty material of deep-blue color, not easily friable. It looks somewhat hornlike, is of very uniform and mild grain, and shows no admixtures to the eye. The clays belonging to this type are very compact; the pores are reduced to a minimum (absorbing only three per cent. of water), and are not plastic. They become slightly plastic when soaking in water for a greater length of time. The clays of the coal-measures belong to this class more than others—notably the celebrated prime-quality clay from Garnkirk and Gartsherie, in Scotland. The New Jersey clay-beds of the cretaceous formation include a few localities furnishing a quality very little inferior to this Number 1. The celebrated Stourbridge clay is notably inferior. This prime quality is only used for glass-pots, steel crucibles, and the best grade of fire-brick.

CLASS II. *Kaolin from Zettlitz, near Carlsbad, in Bohemia.*—This material is found in the highly felspathic granite. It is a china-clay, and does not come to market in its crude form. It is first subjected to a washing process. The crude kaolin is grayish-white; it feels rough and gritty between the fingers. The refined material, when dry, forms very uniform pieces with a conchoidal fracture. It shows mild touch and somewhat soapy; it cuts smoothly, and the cut surface is lustrous. When heated, it turns black at first (from organic woody admixtures); but soon the fine carbon burns, and the clay is almost snow-white. This china-clay is used almost exclusively in the manufacture of porcelain (on account of the white color). Of similar grade are some washed china-clays of Delaware and Pennsylvania, and the well-known product of St. Austel, in Cornwall.

CLASS III. *Best Belgian Clays.*—These clays are found in irregular elliptic basins in the limestone formation which underlies the coal-measures in the province of Namur. There are several belts of such basins. The best quality is furnished by the second belt, touching the villages of Wez, Moget, Coutisse. The clay has a blue or black-blue slate-color and is remarkable for its binding power—that is, the large amount of sand that it will take up without losing its plastic force. It has a very soap-like touch and assumes a vivid lustre on the face of a cut, almost like graphite. Placed in water, it falls to small pieces, while large numbers of air-bubbles escape with a hissing sound. Rubbed in the mortar, it shows grit (one per cent. of small quartz-grains). This clay is mined by shafts (140 feet) and underground workings.

CLASS IV. *Clay from Mühlheim, near Coblenz, on the Rhine.*—It lies at the bottom of the brown-coal or lignite formation, and is mined by means of so-called "hoop-shafts." They are sunk from 30 to 80 feet, and pass through a layer of pumice-sand before reaching the clay. In all physical properties it is like the Belgian clay, except that the degree of fusibility is lower.

CLASS V. *Clay from Grünstadt, in the Palatinate.*—Occurs in nests in the tertiary limestone, probably derived from the decomposition of porphyry, which constitutes the Donnersberg Mountain, some miles distant, the kaolin being carried thence by floods. It is of light-bluish color, is free from grit, and otherwise is like the two preceding clays. After burning has a yellowish- and grayish-white color.

CLASS VI. *From Oberkauffungen, near Cassel, in Prussia.*—This and the next class are characteristic representatives of clay-beds from the brown coal, lying

either above or below a coal-bed. Clay VI. in the air-dry state has a bluish-gray color, shows remnants of coal-plants and patches of coal, contains pyrite, cuts smoothly, and is quite plastic.

CLASS VII. *Clay from Niederpleis, on the Sieg, in Nassau.*—It has a greenish-gray color and a mild, soapy touch, falls to pieces in water without hissing, quite plastic, turns black when heated, and finally takes a light-yellow color.

All these classes represent *refractory* or fire-clays, but those of the first-class are ten times as refractory as those of the seventh class.

The United States are well supplied with clays of all grades and descriptions, eminently fitted for the finest pottery and the most refractory brick. The most developed among these are the beds occupying a belt, five miles wide, stretching across the State of New Jersey from Trenton north-east to Perth Amboy. The best deposits are around the latter town, especially near the village of Woodbridge. This belt is bounded on the north-west by the New Red Sandstone, and to the south-east by the greensand marl. The few fossil plants found in the clay, together with the dip of the beds, indicate the geological position of lower cretaceous of this country, but upper cretaceous of Europe. The beds lie above the red sandstone, but no pebbles of these rocks are found in them. The pebbles found contain fossils which belong to the upper Silurian and lower Devonian and point to a large land-surface, whence the clays were washed to their present place—a land-surface to the south-east which lies now beneath the Atlantic. A section near Woodbridge shows the thickness of the entire clay-formation to be 347 feet. Of this, however, only 165 feet are good workable clays; the rest are sands and sandy clays. The dip, being very slight—only 60 feet to the mile—points to south-east, and this flatness explains that the formation crops out over an area of over six miles at the widest portion of the belt. The clay-formation appears to lie in eroded portions of the red sandstone, and is generally covered by sands and gravel of the glacial or ice-period. The best fire-clay is obtained around Woodbridge. It supplies the raw material to the potteries and firebrick works at Trenton, Philadelphia, Newark, and New York City.

Of the many analyses for which we are indebted to Prof. Cook and his able assistants on the geological survey of New Jersey, only one is here selected, showing that the clay is quite equal to those of Bischof's Classes I. and II., especially in high percentage of alumina:

Alumina.....	38.24		Ferric oxide.....	0.96
Silica, combined..	43.90	} 46.30	Potassa.....	0.15
“ sand.....	1.10		Soda.....	0.00
Titanic dioxide...	1.30		Water, combined...	14.10
Magnesia.....	0.11		Hygroscopic water.	0.70
Lime.....	trace.			

Locality, H. Cutter & Son's pit at Woodbridge.

This clay forms a layer six feet thick and is overlaid by a dark-colored sandy clay. It is quite white and much used for paper-sizing. It is very plastic, but somewhat water-stiff. Lignite coal lies in the dark clay. The economic importance of these clay-beds may be inferred from the product, which was in 1874 about 260,000 tons, valued at \$927,500. The price varies from \$1.50 to \$13 a ton (George H. Cook, *Geological Report on Clays*, 1878). Pennsylvania, although not quite so rich, is yet well provided with good clays. In the south-eastern portion—Chester and Delaware counties—we find kaolin in place upon the coarse granite portions of the gneiss-rock. This material, after refining, is mostly used for sizing in paper-mills. On the northern side of South Mountain, in Lehigh county, we find an excellent clay lying in eroded cavities of the lower Silurian limestone; white, red, yellow, and brown clay in close proximity to limonite iron ore-deposits. Good clays are found in the coal-measures of the anthracite

and of the soft-coal basins. They are generally sandy, and will not stand higher than Class VII. Others of the drift-formation are too high in fluxing oxides to be utilized.

The following analysis shows a good quality from the clay which accompanies coal-bed A. It was from the neighborhood of Clearfield (McCreath's *Report* in the *Second Geological Survey of Pennsylvania*, 1879):

Alumina.....	37.51	Lime.....	0.49
Silica.....	44.05	Magnesia.....	0.181
Titanic dioxide.....	1.84	Potassa and soda.....	0.065
Ferrous oxide.....	0.82	Water, etc.....	15.21

Chemical Properties of Clay.—Clay can be decomposed by sulphuric acid and by hydrochloric acid when digested with these acids for some time at the boiling heat of water. If enclosed in a strong air-tight vessel, so that the heat generates pressure, the decomposition is more rapid and more complete. In either case the alumina is dissolved, and the silica separated as a flocculent hydrate. The sandy portion remains unaltered, except when it contains carbonates of iron, calcium, magnesium. These metals will enter the solution, whilst CO₂ escapes in bubbles. If the clay has first been heated for some hours at a cherry-red heat, whereby it loses its water and plasticity, the action of the acids is more rapid. This property is utilized on a large scale for the manufacture of alum, whose valuable component for dyeing and printing is the aluminium sulphate (Al₂S₃O₁₂ + Aq). This sulphate is combined in alum with either the sulphate of ammonium (NH₄)₂SO₄, or the sulphate of potassium, K₂SO₄. This double salt is very little soluble in cold water, and may be obtained by crystallization in great purity. But the potassium and ammonium go to waste in the applications of alum. In later years the sulphate of aluminum has been produced by itself. As no purification by crystallizing can be employed, this manufacture requires a very pure clay to start with—one which is notably free from iron compounds. The *alum clays* may be inferior as refractory material containing alkalis, lime, and magnesia. The application of clay in paper-mills is not based on chemical foundation. The fine particles of the white clay are simply cemented to the fibre by means of aluminic hydrate. It serves to give body to wall-paper.

The manufacture of china porcelain rests on observation of the fact that certain white clays will form a semi-transparent, hard, ringing, and impermeable body when exposed to a white heat. Analysis has shown that this property rests upon a certain proportion of fluxing oxides in combination with the pure clay. Some clays have naturally this composition, but in most cases it is necessary to compose the mixture artificially. The German porcelain is made by addition of finely pulverized felspar; the English, by adding calcium oxide in the form of chalk or gypsum. The French use both.

Another very important property of clay is that when heated with the proper proportion of pure limestone (carbonate of calcium) at a high red heat, it will form a hard, ringing, cinder-like body—that is, the calcium has combined with the silica and alumina, the carbonic acid has been expelled. If this mass be finely ground and the powder stirred with water, it will soon set, and by degrees become of stony hardness, and be insoluble in water. This compound is artificial hydraulic, or Portland, cement. Some limestones are naturally mixed with the right proportion of clay (65 : 35); they are the material for the natural hydraulic, or Roman, cement, and are usually called “hydraulic marls.”

Examination of Clay.—A complete examination to establish the value of a given clay, or the relative value of portions of one and the same clay-bank, embraces: 1. The estimation of the ratio between sand- and clay-substance, and, again, the proportion of coarse to fine sand; 2. The determination of the degree of refractoriness; 3. The degree of porousness; 4. The degree of binding power; 5. The color of the clay after burning it; 6. A complete and very quantitative analysis.

The first five tests may be made by any intelligent person; the methods will therefore be described. The sixth test can only be made by a very competent chemist if it is to be of any use at all; the methods of analysis are therefore not of general interest, and will be omitted.

1. *Determination of Sand- and Clay-Substance.*—The sample must be taken so as to represent the average of a lot or of a clay-bed. It should be allowed to become thoroughly air-dry (plastic clays should be cut into thin plates to expedite this process). Five grams (80 grains) of the dry substance will then be placed in a porcelain dish and thoroughly disintegrated with water by boiling for at least one hour, replacing the evaporated water. Thus prepared, the sample is washed through a 50-inch sieve into the funnel-shaped glass vessel ABDEFC (represented in the adjoining



figure). This vessel was first used and described by E. Schöne (*Schümmanalyse und ein neuer Schümmapparat*, Berlin, W. Müller, 1867), and of all proposed it is the most perfect. It can be bought for about four dollars from any of the larger houses dealing in chemical glass-ware. The dimensions are given in centimetres and millimetres. It must be securely fixed to stand in a vertical position. The space BC is exactly cylindrical; the inner diameter at D, 4 mm.; DEF is a correct semicircle; the tube DEFG must not be less than 4–5 mm. in inner diameter. The end of G has been connected by a rubber tube of equal diameter with a sheet-tin water-reservoir, constructed as a *Mariotte flask* to ensure equal constant outflow. The rubber tube carries a clamp-screw. Into the neck A the bent barometer tube HJKL is well fitted with a good cork. The bends at J and K must be sharp (without reducing the diameter), and JK is inclined 40–45°. At K the tube has a hole, not larger than 2 mm., directly in the line KL; the rim of this hole is well rounded. The branch KL is 100 cm. long, and graduated from the point K into millimetres for the first 3 cm.; from 5–10 cm., into $\frac{1}{2}$ cm.; from 10–50, into $\frac{1}{2}$ cm.; from 50–100, into $\frac{1}{4}$ cm. This pipe is very important; it acts as a pressure-gauge. Before washing the sample into the tube, the clamp is opened fully, to expel any air-bubble from the apparatus. Then, closing the inflow, the funnel is emptied by means of a syphon,

and while the sample is introduced a very slow inflow is maintained to prevent any heavy grains from clogging the tube at D. Placing the cork in the neck and a beaker-glass under the hole K, the cylindrical portion BC fills in about eight minutes, then rises more rapidly in the neck; the turbid water flows from K, and the lines in the branch KL. Now it only remains to regulate the inflow in such a manner that the velocity of the water in the cylindrical tube BC will keep in suspension those particles of the clay which it is intended to separate. For a given apparatus this velocity is measured directly by the column of water in the gauge KL. As no two apparatus are exactly alike, it is necessary to construct a table for each instrument by noting the quantity of water which flows through K in a minute under various heights of the column in KL. The diameter d of BC being known—say exactly 5 cm.

—the gauge registering 2.5 cm., = h , and the volume of water V flowing from K being 50 cc. per minute, the velocity c in BC will be per minute,

$$V = c \frac{\pi d^2}{4} \quad c = \frac{4 \times V}{\pi d^2};$$

$$c = \frac{4 \times 50}{3.141 \times 25} = 2.55 \text{ cm.,}$$

and per second = 0.042 cm. = 0.42 mm.; when the column, $h = 25$ mm. Now, by varying h ascending and descending, values will be found which can be easily laid down in a parabolic curve; and thus for any desired velocity in actual experiment, the corresponding h can be read from the curve.

Since the sandy particles vary in diameter from 1 mm. to microscopic sizes, it is not possible to draw an absolute line of separation between the clay-substances and the sand. According to Seeger, Schulze, and Bischof, it is most practical to wash first with a velocity $c = 0.18$ per second until the water shows but a slight milky turbidity. The particles going over at this velocity cannot have a larger diameter than 0.01 mm. This is clay-substance. The receiving beaker-glass is now replaced with an empty one and the velocity increased to 0.10 mm. per second. The material going over at this rate ranges between 0.01 and 0.025 mm. in diameter. It shows still a small degree of plasticity. What passes over at a velocity of 1.5 mm. may be designated as "dust-sand," ranging in size from 0.025 to 0.04 mm. Fine sand from 0.04 to 0.33 mm., and everything above the last size, would be called "coarse sand." The solid materials in the several beaker-glasses are allowed to settle, the clear water drawn off; the residue, rinsed into small porcelain dishes, is evaporated to dryness, weighed, and reserved for further examination, microscopic and chemical.

This method is serviceable in the examination and comparison of soils. There are, in fact, nothing but very impure clays, going all the way to nearly pure quartz sand.

2. *Determination of the Degree of Fusibility.*—For this purpose a clay is selected of known excellence, like that from Saarau, or an artificial mixture is prepared of pure alumina and pure silica, in the proportion of 1 : 1½. One part of the clay under examination is then intimately mixed with one, two, three, four, or more parts of the No. 1 clay or of the artificial clay. These mixtures are shaped into cylinders of equal size, together with one of the clay by itself. After drying they are exposed to the same intense white heat in a wind- or a small blast-furnace. Supposing, now, that the mixture of 1 to 3 showed the least effect like the No. 1 clay, then the clay in question would be 100 – (3 × 10) = 70. This test is the most practical of all. It gives with least expenditure of time and money a perfectly reliable basis upon which the value of a given clay may be considered.

3. *The Degree of Binding-Power or Plasticity* may be ascertained by several methods. The most convenient one is based upon the fact that the surface of dry plastic clay when rubbed with the finger only leaves a fine film of dust on the finger, while a lean clay will yield a powder—the more, the leaner it is. We prepare a finely-pulverized quartz, passing it through a 60-mesh sieve, and mix one grain of the dry clay (which is to be examined) with one, two, three, or four grains of this quartz by rubbing them together in an agate mortar. Then add water and form thick cream of each sample; place it with a spatula upon a slab of plaster of Paris. It will very soon be of sufficient stiffness to be moulded into a prism or other convenient shape, each one being marked with the number equal to the parts of quartz. When thoroughly air-dry, each one is subjected to the abrading action of the finger by passing it over once; that number which stands the rubbing without yielding powder gives the degree of plasticity. If pure plastic clay-substance

will take 10 parts of quartz, its plasticity is 10; one which takes 7 parts of quartz will have the degree 7; and so forth.

4. *The Degree of Shrinkage.*—The sample of clay must be well mixed with water until it forms a cream. This is stiffened upon a plaster slab until it easily parts from the latter by a shrinkage beginning. It is now moulded into a prismatic body of $\frac{1}{8}$ inch in thickness, $\frac{1}{2}$ inch wide, and 4 inches long. Thus it is placed upon a glass plate of corresponding size and its weight taken. A very sharp incision is made near each end, and the distance between the two measured to $\frac{1}{100}$ of an inch. The clay is left standing at a dry place until the weight does not change sensibly; then it is dried at increasing temperature in an air-bath up to 130° C. until the weight remains constant. If the distance between the two marks be now measured, the difference between the first and the last measurement gives the linear shrinkage, whilst the volume of the evaporated water gives the cubic shrinkage. If the dimensions of the wet prism are exactly $\frac{1}{8} \times \frac{1}{2} \times 4$, its volume will be $\frac{1}{4}$ cubic inch. The loss of water in grams is equal to the volume of the same number expressed in cubic centimetres (one cubic inch = 16.129 cubic centimetres). Now, suppose that for a given clay the loss of water had been 0.2 gram = 0.2 cubic centimetres. Then the cubic shrinkage would be $\frac{1}{4} \times 16.129 \div 0.2 = 0.2016$, or nearly $\frac{1}{5}$. (G. A. K.)

CLAY, CASSIUS MARCELLUS, an American statesman, son of Gen. Green Clay, was born in Madison co., Ky., Oct. 19, 1810. He graduated at Yale College in 1832, and began to practise law. In 1835 he was elected to the State legislature, and again in 1837 and 1840, but his strong opposition to slavery interrupted his political career. In 1844 he advocated the election of his relative, Henry Clay, to the Presidency, and made a tour in the Northern States in his behalf. In 1845 he began to publish in Lexington a weekly newspaper called the *True American*. It encountered violent opposition from the mob, and after several conflicts he was obliged to have it printed at Cincinnati. When the War with Mexico commenced, although he had opposed the annexation of Texas, he entered the service as captain, and was taken prisoner. In 1848 he advocated the election of Gen. Zachary Taylor, the Whig candidate for the Presidency. When, the next year, the constitution of Kentucky was to be revised, he gathered a convention at Frankfort in favor of the emancipation of the slaves. In 1850 he left the Whig party and became anti-slavery candidate for governor, but received only 5000 votes. In 1861 he was appointed minister to Russia by Pres. Lincoln; he returned in 1862 to take part in the Civil War as major-general of volunteers, but after a year's service resumed his position in Russia, and remained there till 1869, when he returned to Kentucky. A volume of his speeches and writings was published in 1848.

CLAY HENRY (1777–1852), an eminent American statesman, was born in a swampy district p. 530 Am. ed. (p. 610. Edin. ed.). called "The Slashes," in Hanover county, Va., April 12, 1777. His father, a Baptist preacher, died when Henry, the fifth of seven children, was only five years old, leaving for the support of the family a little farm with two or three slaves. The widowed mother, a woman of considerable ability, struggled bravely under her burden. At the district school Henry received only the rudiments of education, and at the age of thirteen was compelled to work on the farm. The next year he became clerk in a drug-store in Richmond, and in 1792, when his mother married again, his stepfather, before removing to Kentucky, procured for him a clerkship in the Virginia court of chancery. Henry's remarkably neat penmanship soon led to his employment as amanuensis by Chancellor George Wythe, one of the signers of the Declaration of Independence and deservedly eminent as a jurist and classical scholar. Four years of daily association with this Virginia gentleman

of the old school sufficed to give "the Millboy of the Slashes" that courtly grace which in later years captivated all who met him, while his clerkship taught him the methodical business habits which served him in good stead when he was Speaker of the House of Representatives and leader of a great political party. He never became a scholar, nor even a student of history, but he cultivated the art of oratory, for which Nature had amply endowed him with a receptive mind, a ready tongue, and a voice of wonderful clearness and compass. By the advice of his aged friend, the chancellor, he studied law, and after spending a year in the office of the State attorney-general, Robert Brooke, he was admitted to the bar in 1797. Then, barely twenty years of age, he removed to Lexington, Ky., where his fluency of speech soon found abundant employment in defending criminals and settling disputed land-claims. In 1799 he married the daughter of Col. Thomas Hart, the most prominent man in the town, and his married life was eminently happy.

When the people of Kentucky were forming their first State constitution, in 1799, Clay and other young men, seeing the evils of the slave system, urged the insertion of a clause providing for the gradual abolition of slavery—an idea to which he adhered throughout life. But the effort was in vain, as was his similar effort fifty years later. Though his advice on this question was summarily rejected, his hearty good-fellowship made him a favorite with all classes. His influence was sought by the scheming and plausible Aaron Burr in his prospecting-tour in the West; and when Burr was arrested on a vague charge of treason, the chivalrous young lawyer secured his discharge—a result which destroyed the professional reputation of "Jo" Daviess, the prosecuting attorney. In 1804, Clay had been elected to the State legislature, and when, two years later, Gen. John Adair resigned his seat in the United States Senate, Clay was chosen to fill the vacancy, though he had not yet attained the constitutional age.

No one could better appreciate than a patriotic Kentuckian the necessity of binding more closely the remote settlers beyond the Alleghenies to the people of the seaboard; and when President Jefferson, in his message of 1806, proposed that part of the money then beginning to accumulate in the national treasury should be spent on roads and canals, he found a ready supporter of his views in the young Senator from Kentucky. Clay's first speech in the Senate was in favor of building a bridge over the Potomac; he next proposed an appropriation for a canal around the falls of the Ohio at Louisville, and introduced a resolution directing the Secretary of the Treasury to report on the whole subject of internal improvements. In 1807, Clay was again a member of the State legislature, and in the next year was made Speaker of that body. In his advocacy of President Jefferson's policy of non-intercourse with Great Britain, he urged the members of the legislature to pledge themselves to wear nothing that was not of home manufacture. For this he was denounced by Humphrey Marshall as a demagogue. A challenge and a duel ensued, in which the combatants fired twice and were both wounded slightly. In 1809, Clay was again elected to fill a vacancy in the United States Senate, and began to urge the systematic protection of American manufactures. His speech that attracted most attention during the term was in opposition to the rechartering of the United States Bank, the arguments of which were afterward employed by President Jackson in his bank veto of 1832, when Clay had changed his views on that subject.

In 1811, Clay was elected to the House of Representatives, and, though this was his first appearance in that chamber, he was already so well known that he was chosen Speaker by a large majority. The younger members of the Republican party were eager for war with England, whose wanton outrages on the Ameri-

can flag on the high seas had excited public feeling to the highest pitch. Led by Clay and Calhoun, they forced President Madison to declare war, although no proper preparations had been made for it. In spite of opposition in the House, the collapse of the finances, and repeated disaster in the field, Clay maintained the war-spirit to the close of the contest. When Great Britain had conquered a peace in Europe, and no longer had actual need to search American ships to discover possible subjects, she quietly relinquished the practice which had given offence and expressed her willingness to enter on negotiations for peace. Madison and his Secretary of State, Monroe, anxious for peace on any terms, gradually receded from any attempt to obtain an acknowledgment of the principle for which the war had been undertaken. Clay, being appointed one of the commissioners to frame the treaty, resigned the Speakership on Jan. 19, 1814, and sailed for Europe. He was the representative of the interests of the people of the Mississippi Valley, as John Quincy Adams was of those of New England, while the adroit and conciliatory Gallatin was assiduously employed in bringing them to common ground. The negotiations were concluded Dec. 24, 1814, but Clay did not return to the United States until the following September. In the mean time, he had been unanimously re-elected by his constituents, and when the House assembled he was again chosen Speaker.

The costly experience of the war had proved to Clay's mind the necessity of a national bank for public emergencies. Gallatin, the ablest—in fact, the only—financier of his party, had pleaded for such an institution, but was unable to break down the prejudices of years. A. J. Dallas, who followed him in the difficult position of Secretary of the Treasury, managed to obtain for the same plans the support of Clay, Calhoun, and Webster. The success of the bank was such that Clay never hesitated to assume its championship. In all other respects the war had fully confirmed the views which Clay had inherited from Jefferson. The political independence of the nation was to be confirmed by establishing the industrial independence of the people; the protection of American manufactures was to go hand in hand with the improvement of internal communications. But the same love of liberty which impelled him to foster American institutions made him the champion of all oppressed people who were struggling to win for themselves the blessings of self-government. His memorable speech in 1818 in favor of recognizing the South American republics was read by Gen. Bolivar at the head of his troops. In a similar way, in 1822, Clay espoused the cause of the insurgent Greeks, and roused a strong spirit of sympathy with their war for independence.

In American history, Clay is especially noted as the compromiser who deferred from time to time the crisis of the irrepressible conflict between the systems of free labor and slavery. His ingenuity in this regard was first shown in the Congressional struggle over the admission of Missouri as a State. He suggested the balancing of Missouri as a slave State with Maine, and when that plan was rejected secured a committee of conference, which under his guidance prepared the celebrated Missouri Compromise. By this, Missouri was admitted without restrictions as to slavery, while in all the remaining portion of the Louisiana Purchase lying north of 36° 30' slavery should be forever prohibited. To Clay's tact and personal influence the acceptance of this scheme was due. Yet at the very time when, in the estimation of the great body of his fellow-citizens, he had thus saved the Union, he was compelled to retire from Congress on account of the inadequacy of his salary to his needs. It is true that in his younger days his good-fellowship had led him to share the gambling habits of his associates, but after he became Speaker of the House, though an inveterate whist-player, he strictly limited his stakes. In 1816 he had

fifteen hundred dollars a year, but this vote had nearly cost him his seat at the next election. He now retired to devote himself to his private affairs, which had suffered while he was attending to his public duties; but in the next term he returned, and had the satisfaction of seeing the independence of Greece recognized by the United States.

As the close of Monroe's administration drew near, the clique which had long been dominant in national affairs marked William H. Crawford, then Secretary of the Treasury, as his successor, and the Congressional caucus gave him the nomination. But the younger men gave no assent to this plan, and the Presidential campaign became a personal contest between four candidates nominally of the same party. While John C. Calhoun received 182 electoral votes for the Vice-Presidency, the votes for President were thus distributed: Andrew Jackson, 99; John Q. Adams, 84; W. H. Crawford, 41; Clay, 37. When the choice devolved upon the House of Representatives, voting by States, Clay, as having the lowest number, was excluded, and his friends, joining with those of Adams, secured for the latter thirteen States, while Jackson had seven and Crawford four. Jackson had already been at enmity with Clay, on account of a speech in which Clay had condemned Jackson's conduct in his invasion of Florida in 1818; this new cause of offence inspired in him a deadly hatred. When Clay accepted the position of Secretary of State under President Adams, Jackson's partisans never wearied of crying, "Bargain and corruption!" while the reckless and intractable John Randolph uttered his well-known sarcasm on "the coalition of Puritan with blackleg." This language led to a duel between Randolph and Clay, April 8, 1826, in which each fired two shots without effect.

In 1828, Gen. Jackson attained the object of his ambition, being elected to the Presidency, by a majority of both popular and electoral votes, over John Quincy Adams, his only competitor. His hour for revenge had come, and he made a clean sweep from office of every person known to be, or suspected of being, a friend of Clay, while appointments were lavished on those who were especially hostile to him. The United States Bank, whose championship Clay had undertaken, was doomed to share his fate.

Meantime, Clay recruited his energies in the peaceful pursuits of farming and the outdoor life dear to every Kentuckian, until 1831, when he was again elected to the United States Senate. Here he defended the protective tariff, which was then filling the national treasury to overflowing, though also exciting discontent, especially in South Carolina. In support of his financial and economical views, which he had now fully developed in what he called "the American system," Clay organized a national party, which subsequently assumed the name of "Whig." In 1832 this party, with Clay as its Presidential candidate, seemed likely to be successful; but Jackson, who had been pledged to a single term, thrusting aside Calhoun, again entered the field, and through his overwhelming popularity with the masses carried off the prize. Bitter as was the animosity of the rival candidates, their devotion to the Union was shown when South Carolina, under the influence of Calhoun, declared the tariff acts null and void and threatened to establish an independent government if they were enforced by the Federal authorities. This declaration was made by the State convention which assembled Nov. 24, 1832, and in reply President Jackson issued his famous proclamation of Dec. 11, declaring his determination to enforce the law at all hazards. Clay, with his ingrained tendency to compromise, now sacrificed the principle of protection by proposing that all duties exceeding 20 per cent. *ad valorem* should be reduced to that uniform rate by removing annually one-tenth of the excess. This compromise was accepted by both Houses, even Calhoun, who had resigned the Vice

Presidency and was now a member of the Senate, assenting. Thus once more was threatened disunion averted by compromise.

After the war of 1812, for which he was in a large measure responsible, Clay was never again in favor of an appeal to arms for redress of national wrongs or grievances. Being chairman of the committee on foreign affairs, he curbed Jackson's intention of making reprisals on French vessels as the speediest way to obtain indemnity for the spoliation committed on American vessels during Washington's administration. In 1836 he was prompt to urge the recognition of the independence of Texas, then in revolt against Mexico, though a few years later he strongly opposed its annexation, as involving his country in war.

The financial disasters of 1837 prepared the way for a change of national policy, but the Whig convention at Harrisburg in 1840 passed by the true leader of the party and selected Gen. William Henry Harrison, a Western soldier without political record, as a more available candidate for the Presidency. To win favor at the South, John Tyler of Virginia, a Democrat who had opposed Jackson's transfer of the government deposits, was nominated on a Whig platform, of which he professed his acceptance. After the most exciting election campaign which had yet occurred in America, noted especially for its monster meetings and processions of workmen, these candidates were elected. Harrison's death within a month after his accession placed Tyler in power. Clay had prepared the measures promised in the platform of the Whig party, but Tyler vetoed the bill distributing the proceeds of the sales of the public lands among the States and the bill incorporating a new Bank of the United States. Then the President gave his friends the outline of such a bank as he considered constitutional, and a bill was passed embodying some of these features. But in vain, for again the President vetoed the bill; and the Whig members of the Cabinet, except Daniel Webster, the Secretary of State, forthwith resigned. The party, thus cheated of its victory, turned in despair to Clay, now recognized as the unflinching champion of its principles, while the Democratic party, so lately defeated at the polls, renewed its strength under the fostering care of the administration. In March, 1842, Clay, wearied with the protracted struggle, resigned his seat in the Senate and delivered a memorable farewell speech, reviewing his political career since his entrance to that body. In 1844 he was called from his retirement to become the Presidential candidate of the party, and for a time had a fair prospect of success. The opponents of slavery, however, had been driven by the steady and threatening growth of that institution, and especially by the proposed annexation of Texas, to organize a political party pledged to the repression, if not the absolute extinction, of that system. Clay was a slaveholder, and had for years unsparingly denounced the abolitionists as the enemies of the Union; yet in his own State he had advocated the emancipation of the slaves and their transportation to Africa, and he was president of the American Colonization Society, which had been formed to carry out this idea. He had also voted in favor of the right of petition when that was denied in Congress to those who asked for the abolition of slavery. In consequence of his ambiguous attitude, he was called upon for explicit statements of his views on the question of the day, and in August he ventured, in a letter to some friends in Alabama, to declare that he would be glad to see the annexation of Texas with the common consent of the Union, and upon just and fair terms. By this declaration, which was not strong enough to win favor in the South, he lost the support of many in the North. These mostly joined the Liberty party, which had nominated for the Presidency James G. Birney, who had emancipated his slaves in Alabama and removed to the North. This movement secured enough votes in Western New York

to give the electoral vote of that State to Polk, an avowed friend of the annexation policy. But the annexationists, led by John C. Calhoun of South Carolina, did not wait even for Polk's accession; in spite of constitutional restrictions, the project was hurried through before Tyler left the Presidential chair, and to Polk was left the inevitable sequence of a war with Mexico. Clay had opposed the course which led to war; but when the war came, he would not refuse whatever was necessary to the success of the army. In the course of the war he was called to mourn the loss of his son Henry, who was killed, while in command of a regiment, at the battle of Buena Vista, Feb. 22, 1847.

At their next national convention, held in Philadelphia, in June, 1848, the Whigs nominated for the Presidency Gen. Zachary Taylor, whose military reputation had been acquired in the Mexican war, and this, with his Southern connections, was sufficient to secure his election. In the same year Clay was again elected to the United States Senate, though he did not take his seat till Dec. 3, 1849. He had come forth, in spite of the infirmities of age, to make a last effort to stem the rising tide of disunion. Asserting that his country's danger sprang from the abolitionists of the North rather than from the fire-eaters of the South, he devoted all his remaining strength to the repression of the former and the conciliation of the latter. As the most effectual means for this purpose, he prepared his last great compromise, the "Omnibus Bill" of 1850. By its multifarious provisions Congress was to be precluded from interfering with the introduction of slavery into territory acquired from Mexico, California was to be admitted to the Union without any restriction on the subject, the slave-trade between the States was allowed to go on, and United States officers in the various States were empowered to restore fugitive slaves to their masters. As an offset to these pro-slavery measures, the national disgrace of the slave-trade in the District of Columbia was partially removed. This Omnibus Bill, reported unanimously by a committee of the Senate, obtained the support of Daniel Webster and other Northern Whigs, but led to a fierce parliamentary contest, which was protracted through six months. It was found impossible to enact these measures in one bill, as Clay had earnestly desired, but separately they secured majorities, and became law in the summer of 1850, after the death of President Taylor and the accession of Millard Fillmore. Clay was thus permitted to rejoice in the belief that he had again been the instrument of averting a dissolution of the Union. Though widespread opposition was shown in the North to the enforcement of the stringent Fugitive-Slave law, yet generally the commercial and professional classes of the North accepted the compromise and urged observance of its terms. Clay continued in the Senate, though his physical strength was exhausted and he was able to take no part in its debates. He died at Washington, July 29, 1852. On the announcement of his death Congress immediately adjourned, and on the next day leading members of both Houses paid eloquent tributes to his memory.

No man in American history has possessed in greater measure the gift and the art of pleasing than did Henry Clay. Over his followers he exercised not merely control, but fascination. They were ready to do anything to secure his triumph; they were overwhelmed with grief at his defeat. As an orator he was able not only to entrance the Senate, but to mould the masses of the people to his will. Yet the effect of his speeches was rather immediate than permanent. When examined critically, little can be found in them to account for their powerful effect on his auditors. Clay was especially successful in great debates which called forth at once the native powers and the intuitive perceptions of the participants. Then his knowledge of human nature, his quickness in seizing points of advantage, the charm of his manner, and the brilliancy of his

speech readily gave him the victory. The effect of the doctrines which he advocated and of the course which he pursued on the progress of the country has been but slightly indicated here, as the full treatment of it belongs to history rather than to a biographical sketch. As the leader and the chief exponent of a great political party, he exercised immense influence on the destinies of his country. Yet his career seems more remarkable for its defeats than for its victories. The latter, won by compromise, though full of illusion at the time, proved transient and ineffective; yet the principles which he advocated, though sometimes sacrificed for a temporary purpose, were really working their way into the institutions of his country. Throughout his career he was devoted to the preservation of the Union as the only safeguard of liberty and popular government, and to the protective tariff for the maintenance of national independence.

See *Life, Correspondence, and Speeches of Henry Clay*, by Calvin Colton (6 vols., N. Y., 1864).

(J. P. L.)

CLAYTON, JOHN MIDDLETON (1796-1856), an American statesman, born at Dagsboro', Sussex co., Del., July 24, 1796; died at Dover, Del., Nov. 9, 1856. He was descended from Joshua Clayton, an English Quaker who came over with Penn and settled in Delaware. James Clayton, the grandson of Joshua, a Sussex farmer, married Sarah Middleton, of Virginia ancestry, and John M. was their second child and eldest son. Receiving some preparatory instruction at schools near his home, he passed the examination at Yale College, and was admitted to its classes on the day he was fifteen years old. He graduated in the class of 1815 with the highest honors, having meantime studied with diligence, not even returning home for a vacation. Entering the office of his cousin, Thomas Clayton (afterwards chief-justice of Delaware and United States Senator from that State), he began the study of law, and in March, 1817, went to the law-school at Litchfield, Conn., where he remained twenty months, studying, he said, sixteen hours a day. In 1819 he was admitted to the bar in his native county, but fixed his residence at Dover, the State capital, in the adjoining county of Kent. Here he came into competition with several lawyers of unusual strength, including his preceptor, Thomas Clayton; Willard Hall, subsequently, for many years, judge of the U. S. district court; and Henry M. Ridgely, who was United States Senator from 1827 to 1829. He took, however, from the first, a high position. His ability as an advocate was remarkable; his power over juries so great that the opinion of Mr. James A. Bayard, his political rival, is quoted to the effect that he had no superior in the country as a jury lawyer. His career at the bar continued ten years, and won him thorough acquaintance and great repute with the people of Delaware, with whose character and tastes he had a singularly perfect sympathy, enabling him to exert with them, during his public career, an influence commanded previously or since by no other man. In 1822 he married Sally Ann, the daughter of Dr. James Fisher of Camden, near Dover, but she died three years later, leaving two infant children, one but a few days old. Mr. Clayton's devotion to her memory was such as to influence in a marked degree the whole of his after life—more than thirty years—and while he never remarried, he even avoided, to a degree, all female society.

In 1829, Mr. Clayton entered the United States Senate. He had filled several clerkships in the State legislature—one or more of them during his minority—and had served as a member of that body and as secretary of state and State auditor. In 1828, in the fierce Presidential contest between Mr. Adams and Gen. Jackson, he had thrown himself warmly into the fight in favor of the former's re-election, and the electoral vote of Delaware being so decided, the legislature chosen was also in accord with Mr. Clayton's friends. He was therefore chosen Senator, and he entered the

Senate at the special session in March, contemporaneously with the opening of Jackson's eventful administration. In that body he found himself the youngest member, the list of his colleagues containing the names of Webster, Clay, Calhoun, Benton, Hayne, Felix Grundy, Hugh L. White, Edward Livingston, and others of national distinction. His ability, however, was quickly recognized. The first regular session began in December, 1829, and he took part, a few weeks later—March, 1830—in one of the most famous debates of the Senate, that upon "Foot's Resolution," which gave occasion to the great encounter between Messrs. Webster and Hayne. Of his speech in this debate John Quincy Adams records in his *Diary* the judgment that it was "one of the most powerful and eloquent orations ever delivered in either of the halls of Congress." His vigor as an orator and the high order of his capacities as a Senatorial leader gave him rank at once amongst those who were arrayed in opposition to the Administration, and he was one of the most effective of the Senators who antagonized the several radical measures of Gen. Jackson's two terms. He made an energetic inquiry into irregularities in the Post-Office Department, and ultimately secured important reforms in it; he was conspicuous in the promotion of the prompt passage of the "compromise tariff" in 1833, by which Mr. Calhoun and the nullification party of South Carolina were afforded a door of retreat from their threatened rebellion; he advocated effectually the Land Act of 1833, and strongly supported the United States Bank in its application for a re-charter and its resistance to the removal of the deposits and of the pension fund. Voting for Mr. Clay's resolutions condemning the removal of the deposits, he was one of the Senators against whom the President made an issue, by name, in his famous "Protest." His term of office was now closing; he received, however, and accepted, a re-election in 1835 as the proof of the continued confidence of his State. In the autumn of 1836 he resigned, and was appointed a few months later chief-justice of the Delaware courts. His first service in the Senate had therefore continued about eight years and a half. He had been since 1833 chairman of the committee on the judiciary.

Mr. Clayton held his judicial office until August, 1839. The active canvass then begun for the election of Gen. Harrison to the Presidency attracted him irresistibly, and he resigned to enter again the political field. The electoral vote of Delaware had been given to Gen. Harrison in 1836, and was again cast for him in 1840, Mr. Clayton having been one of the most earnest and effective of the Whig speakers in his own and other States. He did not, however, re-enter public life until 1845, when he again took his seat in the Senate, having for his colleague his cousin, Thomas Clayton. His service in that body now continued for four years. He took a prominent part in favor of the payment of the French spoliation claims and in the adjustment of the Oregon boundary question; supported the war with Mexico after it had been entered upon; and actively promoted the nomination by the Whigs of Gen. Taylor as their candidate for President. In March, 1849, he entered the Cabinet as Secretary of State, resigning, upon the death of the President, in July, 1850. During his service in the State Department he negotiated with Sir Henry Lytton Bulwer, then British envoy to the United States, the famous CLAYTON-BULWER TREATY (which see) relating to the proposed construction of a ship-canal in Central America to connect the Atlantic and Pacific oceans. He also, through an agent sent to Hungary, gave expression to the interest felt by the American people in the efforts of that country to gain its independence, and conducted a correspondence with Lady Franklin in reference to the search for her husband.

By the election of 1852 the Whigs, friendly to Mr. Clayton, obtained a majority in the Delaware legislature on joint ballot, but as the Democrats had control

in the Senate, it was presumed that they would decline to go into a joint convention for the election of a United States Senator. Early in January, 1853, however, Gen. Cass of Michigan made a speech in the Senate at Washington attacking the Clayton-Bulwer treaty, and criticising Mr. Clayton in connection with it. The feeling in Delaware was such that the Democrats in the Senate agreed to a joint session, and Mr. Clayton was again chosen Senator, his term commencing on the 4th of March following (1853). Taking his seat at that time in the special session, he spoke on the 10th in explanation and defence of the treaty, and on the 14th replied to speeches against it delivered by Messrs. Mason and Douglas. The subject continued to occupy attention at each session during the remainder of his service in the Senate (which closed with his death), and he made other elaborate addresses concerning it. His remains are interred in the Presbyterian churchyard at Dover.

(H. M. J.)

CLAYTON-BULWER TREATY, THE, a convention between the United States and Great Britain, negotiated at Washington in 1850 by John M. Clayton, Secretary of State, and Sir Henry Lytton Bulwer, British envoy. It consists of nine articles, the preamble to which states its object to be the desire of "consolidating the relations of amity" between the two nations "by setting forth and fixing in a convention their views and intentions with reference to any means of communication by ship-canal which may be constructed between the Atlantic and Pacific oceans by way of the river San Juan de Nicaragua, and either or both of the lakes of Nicaragua or Managua, to any port or place on the Pacific Ocean. . . ."

The vital parts of the treaty are expressed in the first and eighth articles, which, in full, are as follows:

"ART. I.—The Governments of the United States and Great Britain hereby declare that neither the one nor the other will ever obtain or maintain for itself any exclusive control over the said ship-canal; agreeing that neither will ever erect or maintain any fortifications commanding the same or in the vicinity thereof, or occupy, or fortify, or colonize, or assume or exercise any dominion over Nicaragua, Costa Rica, the Mosquito Coast, or any part of Central America; nor will either make use of any protection which either affords or may afford, or any alliance which either has or may have to or with any state or people, for the purpose of erecting or maintaining any such fortifications, or of occupying, fortifying, or colonizing Nicaragua, Costa Rica, the Mosquito Coast, or any part of Central America, or of assuming or exercising dominion over the same; nor will the United States or Great Britain take advantage of any intimacy, or use any alliance, connections, or influence that either may possess with any state or Government through whose territory the said canal may pass, for the purpose of acquiring or holding, directly or indirectly, for the citizens or subjects of the one, any rights or advantages in regard to commerce or navigation through the said canal which shall not be offered on the same terms to the citizens or subjects of the other."

"ART. VIII.—The Governments of the United States and Great Britain having not only desired, in entering into this convention, to accomplish a particular object, but also to establish a general principle, they hereby agree to extend their protection, by treaty stipulations, to any other practicable communications, whether by canal or railway, across the isthmus which connects North and South America, and especially to the inter-oceanic communications, should the same prove to be practicable, whether by canal or railway, which are now proposed to be established by the way of Tehuantepec or Panama. In granting, however, their joint protection to any such canals or railways as are by this article specified, it is always understood by the United States and Great Britain that the parties constructing or owning the same shall impose no other charges or conditions of traffic thereupon than the

aforesaid Governments shall approve of as just and equitable, and that the same canals or railways, being open to the citizens of the United States and Great Britain on equal terms, shall also be open on like terms to the citizens and subjects of every other state which is willing to grant thereto such protection as the United States and Great Britain engage to afford."

The other articles relate to the particulars in which the two Governments undertook to guarantee the neutrality of the proposed canal and secure its common use to other nations; to the protection of its builders and their property; to the encouragement of its early construction, etc. The sixth article engages the contracting parties "to invite every state with which both or either have friendly intercourse to enter into stipulations with them similar to those which they have entered into with each other; . . . and [they] likewise agree that each shall enter into treaty stipulations with such of the Central American states as they may deem advisable for the purpose of carrying out the great design of this convention—namely, that of constructing and maintaining the said canal as a ship communication between the two oceans for the benefit of mankind on equal terms to all, and of protecting the same."

The treaty was signed by the negotiators April 19, 1850, and having been approved by the British Government and confirmed by the U. S. Senate, the ratifications were exchanged at Washington, July 4, 1850. In making this exchange the British minister gave notice that his Government understood the treaty not to apply to the settlement at "British Honduras [Balize] and its dependencies," to which the American Secretary replied with a carefully drawn counter-declaration, worded under the advice of the attorney-general, Mr. Reverdy Johnson, to the effect that he (Mr. Clayton) so understood it, that he was informed by Mr. King, chairman of the Senate committee on foreign relations, that the Senate so understood it, but that the treaty referred to and did include "all the five Central American states of Guatemala, Honduras, Nicaragua, Costa Rica, and San Salvador, with all their just limits and proper dependencies." He also declared to the British envoy that nothing in either of these explanatory notes could affect the treaty itself, as no alteration could now be made by either negotiator, and notified him that if he meant to ask any change in its provisions the proposition must go to the Senate. He also defined what he understood by the term "dependencies" of Balize—i. e., small islands quite near (a marine league or thereabouts) the town of Balize. One of these was Cayo Cafina, or St. George's Key, the others a cluster of small islands forming a triangle, and mentioned in the treaty of London concluded in 1786 between Great Britain and Spain. By this treaty Great Britain received the permission for her subjects to land and cut dye-woods, mahogany, and other natural products on the Balize coast, and after Mexico became independent of Spain a like grant was negotiated with that country. But in acts of Parliament passed in 1817 and 1819, Great Britain disclaimed all dominion or sovereignty over Balize and its dependencies. The rights of that country with reference to them were, at the time of the treaty (of 1850), as represented by Mr. Clayton in his speeches in the Senate, of the narrowest description—simply to land and cut and remove timber, etc., making no colony or settlement except for this purpose, and refraining even from entering upon the cultivation of artificial products of the soil. (These rights, however, seem to have been enlarged. See **BRITISH HONDURAS**, in *ENCYC. BRIT.*, Vol. XII.)

This explanation seems necessary, because the questions involved in it were the chief occasion of elaborate debates upon the treaty in the United States Senate in 1853, 1854, 1855, and later. In Jan., 1853, Mr. Cass of Michigan attacked the treaty, and criticised Clayton for having conceded too much in saying it did not refer to Balize. In March of the same year Clayton elabor-

ately replied, and made rejoinder to speeches of Messrs. Mason and Douglas, who spoke in support of Cass's views. On Dec. 12, 1853, the Senate called on the President for correspondence that had taken place concerning the treaty between the State Department and the British Foreign Office; and this being communicated on Dec. 30, a second elaborate debate occurred in January, in which Mr. Clayton and Mr. Cass were the principal speakers. In Dec., 1855, upon an allusion to the subject in the President's message, the question again came up, the British Government having at different times manifested an apparent uneasiness and dissatisfaction concerning the treaty. In 1881-82, on account of the proposed construction of the ship-canal of De Lesseps across the Isthmus of Panama, correspondence between the American Secretary of State, Mr. Blaine, and his successor, Mr. Freylinghuysen, on one side, and Lord Granville, the British minister of foreign affairs, on the other, has revived interest in the question as to the exact nature of the treaty and its bearing upon the present situation.

Concerning the general character of the treaty, Mr. Reverdy Johnson, in a letter written in 1853 and read in the Senate, said: "It is the first instance within my knowledge in which two great nations of the earth have thus endeavored to combine peacefully for the prosecution and accomplishment of an object which, when completed, must advance the happiness and prosperity of all men." In Jan., 1854, the British Government having suggested a new treaty, Mr. Cass himself said he could not see what the United States could gain by it. "The first," he continued, "is well enough if carried out in its true spirit. . . . What we want, and all we want, is that the Central American states should be let alone to manage their own affairs in their own way. . . . And all this is precisely what the Clayton-Bulwer treaty would effect if fairly interpreted and fairly executed." Mr. Seward, in concluding his eulogy upon Mr. Clayton in the Senate in 1856, declared that the negotiation of the treaty was "the first universal fact in the history of the world—a fact indicating an ultimate union of the nations. . . . Whatever difficulties have hitherto attended the execution of that great treaty, whatever future difficulties may attend it, the treaty itself is the bow of promise of peace, harmony, and concord to all nations."

See the *Congressional Globe* for the Senate debates on the subject, and the volumes of executive documents, etc., for correspondence relating to the treaty. (H. M. J.)

CLEARING-HOUSE. This is an institution established by banks in large cities for the settlement of mutual claims by the payment of the difference. The total of the claims is called "clearings," and the differences are called "balances." The clearings mainly consist of checks held by different bankers who receive them in the way of ordinary deposit. The process of clearing is a very simple one, and is substantially the same in all clearing-houses. At a certain hour in the morning—usually ten o'clock—every bank which is a member of the clearing-house sends a clerk or deputy and a messenger. The deputy takes with him all the checks on other banks belonging to the clearing-house that have been received by his own bank during the preceding day. Each bank has a desk there, and all of them are arranged in a certain order. When the work of clearing begins, each deputy is found at his desk; and he receives from the messengers of the other banks in turn all the checks and exchanges held against it for payment. When the messengers deliver their exchanges, they take a receipt for the amount. When they have made the tour of the room, each bank will have received all the checks held against it by the other banks belonging to the clearing-house, and will have delivered to the messenger of every other bank all the checks and exchanges it holds against it for payment. Each bank is then credited on the books of the clearing-house with the amount due to it from other banks, and is debited with the

amount it owes to the other banks belonging to the clearing-house. If a balance is due to a particular bank it is said to have "gained," but if there be a balance against it the bank is declared to have "lost," the amount of the difference. The reader will perceive that the sum-total of the losses of the losing banks must be precisely equal to the sum-total of the gains of the gaining banks. The balances, therefore, against some of the banks which are paid to the clearing-house are paid over by that institution to those banks which have balances in their favor. Within a certain hour of the day the debtor banks must pay into the clearing-house the sum due by them, and with the funds thus received at a later hour the creditor banks are paid. This is a purely voluntary association, and its success depends on the faithful performance by each member of its obligations. The advantages of the system are so great that there has never been any serious difficulty in the way of securing an easy compliance with the regulations except when banks have failed and had not the funds to respond. A clearing-house may be legally incorporated, but generally it is a private association organized among banks to suit their own requirements and convenience.

Clearing-houses, however, are not necessarily limited to banking operations. In London, Paris, and Vienna there are stock-clearings, and recently an attempt has been made to introduce a mode of clearing stock at the New York Stock Exchange. The chief objection to any plan yet devised is that there is not enough secrecy of the operations of the individual members. There is a stock clearing-house in Philadelphia, in which clearings are effected daily. Various plans have been considered for establishing clearings in connection with the leading exchanges in the country, and it is quite likely that this will be eventually done.

The New York Clearing-House is by far the most important institution of the kind in this country, and its leading features are worth description. It does not include all the banks, however; indeed, there are only sixty-three members out of a total of one hundred and seventy-seven banks and bankers. Those outside of the association clear or make their exchanges through some others or by special arrangement. It has been said that without this facility for effecting clearings it would be difficult to do business, as the only method would be to present all the checks they received on other banks at their individual counters by the hands of messengers. A bank which performs a service of this kind for another opens an account with it as with an individual, and undertakes the business on the deposit of such a security as shall be fixed by the parties. The use of this credit balance is the compensation received for doing the business. In thus acting it agrees to pay all checks drawn on the outside bank, and it must give one day's notice to the Clearing-House before it can discontinue exchanging for it. Nevertheless, solvent banks not belonging to the association have no difficulty in getting some member of the Clearing-House to act for them. All the large banks are included in the association, but before a bank can be admitted to membership it must be examined. No fixed limits, however, with respect to the amount of capital or other conditions have been prescribed. A committee of five are chosen annually to supervise and direct the officers of the association, but the manager, who is under the control of the committee, has immediate charge of all the business. The hour for making exchanges is ten o'clock. Between half-past twelve and half-past one the debtor banks pay to the manager the balances against them in actual coin, United States legal-tender notes, or United States certificates of deposit. At half-past one, or as soon afterward as the amounts can be made up and proved, the creditor banks receive from the manager the balances due to each of them. If any member of the Clearing-House should fail at the proper hour to pay the balance against it, the amount must be immediately furnished

to the Clearing-House by the banks exchanging with the defaulting bank in proportion to their respective balances against it resulting from the exchanges of the day. In such a case the manager is required to make requisition for the sum needed, in order to avoid delay in the general settlement. If the defalcating bank should not make the deficiency good to the banks that responded for it with the Clearing-House, it would cease to be a member of the association. Every bank belonging to the association is required to furnish a weekly statement of its condition to the manager for publication, showing the average amount of its loans, discounts, specie, legal-tender notes, circulation, and deposits. Another feature of the association is worth describing. The Bank of North America is a chosen depository to receive in special trust such coin or legal-tender notes as any of the associated banks may choose to send to it for safekeeping, and the depository issues certificates in exchange for convenient amounts. The certificates are payable on demand and bear no interest, are negotiable only among the banks, and are received by them in payment of Clearing-House balances. These certificates are the invention of Francis W. Edmonds, formerly cashier of the Mechanics' Bank,

who in 1852 induced four of the largest banks to join his own in depositing a million dollars in coin with the latter, for which it issued certificates; and these were received instead of coin by the other banks in payment of balances. Thus the way was paved for establishing the Clearing-House itself two years later. The first proposition for the establishment of the New York Clearing-House came from Albert Gallatin in 1841. In his pamphlet entitled *Suggestions on the Banks and Currency* he said: "Few regulations would be more useful in preventing dangerous expansions of discounts and issues on the part of the banks than a regular exchange of notes and checks and an actual daily or semi-weekly payment of the balances." A more complete account of the New York Clearing-House may be found in the third volume of the *International Review*, p. 595. This article may be fitly closed with a table showing the total clearings and balances of the clearing-houses in the United States for 1883, the increase or decrease in the clearings, the ratio of the balances to clearings, and the total actual or estimated exchanges. (A. S. B.)

	Exchanges.	Increase or Decrease per cent.	Balances.	Balance to clear per cent.	Total Clearings reported to December 31, 1883.	No. of Yrs Re- ported.
New York	\$37,434,300,872	— 20.2	\$1,564,678,096	4.18	\$695,304,252,497	31
Boston	3,515,747,083	— 3.3	433,651,493	12.33	62,471,841,205	28
Philadelphia	2,812,817,489	+ 1.2	241,485,216	8.55	45,934,152,128	26
Chicago	2,525,622,994	+ 6.7	270,789,665	10.72	22,092,840,837	19
St. Louis	870,961,645	+ .9	146,890,899	16.86	8,708,555,002	15
Baltimore	697,308,617	+ 1.7	*118,500,000	17.	5,552,046,900	9
San Francisco	617,921,854	— 1.8	107,269,495	17.38	4,597,814,076	8
New Orleans	526,984,660	+ 5.6	†50,000,000	9.49	5,240,480,501	12
Pittsburg	497,653,962	+ 2.9	91,807,082	18.45	4,442,232,335	18
Cincinnati	494,414,900	+ 3.2	*74,000,000	15.	6,135,198,715	18
Providence	237,143,800	+ 2.0	*47,500,000	20.	1,379,039,000	7
Louisville	214,802,485	+ 10.9	†28,778,000	13.40	1,204,758,616	8
Milwaukee	176,102,159	— 7.3	29,143,173	16.55	2,113,796,773	15
Kansas City	132,501,100	+ 34.9	*26,500,000	20.	521,673,360	10
Detroit	131,006,713	.....	21,606,201	16.49	131,006,713	1
Cleveland	106,986,273	— 5.7	*25,700,000	24.	598,000,080	7
St. Paul	105,635,292	+ 31.6	*25,000,000	23.7	185,911,392	2
Indianapolis	93,649,878	— 7.8	†15,600,000	16.67	864,107,906	13
Hartford	91,694,132	+ 1.0	26,303,694	28.69	440,856,132	6
Minneapolis	†90,000,000	.....	*26,000,000	29.	90,000,000	1
New Haven	63,186,441	— 2.1	14,705,419	23.27	339,912,169	7
Memphis	56,563,962	+ 23.5	11,315,813	20.	195,455,440	5
Peoria	50,779,885	— 4.6	*15,000,000	30.	153,485,668	3
Portland	47,857,595	— 5.2	*14,000,000	30.	186,365,595	4
Worcester	43,056,862	— 2.0	13,594,539	31.54	501,744,652	23
Springfield	40,280,940	— 3.7	11,842,251	29.40	341,292,209	12
Lowell	35,323,527	+ 15.3	13,593,460	38.48	159,581,510	8
St. Joseph	32,171,974	+ 8.2	*8,000,000	25.	136,699,287	7
Columbus	31,596,743	+ 9.6	5,524,233	17.48	172,243,962	9
Norfolk	27,035,083	+ 4.4	5,428,181	20.08	52,943,268	2
Syracuse	25,990,668	+ 13.5	6,793,832	26.14	132,450,937	7
Total, 31 Clearing-Houses...	\$51,827,104,588	— 14.9	\$3,491,001,042	6.74	\$870,380,738,865	
Outside of New York	14,392,803,717	+ 3.1	1,926,322,946	13.38	175,076,486,363	
Total, 1882	60,877,425,958	— 4.0	3,453,248,227	5.65	.....	
Outside of New York	13,960,470,927	— 5	1,862,271,883	13.34	.....	
Estimate of clearings not reported					9,400,000,000	
					\$879,780,738,865	

* Estimated. † About.

CLEMATIS, a genus of plants belonging to the natural order Ranunculaceæ, and characterized chiefly by having opposite leaves, apetalous flowers with the sepals simulating petals, and with achenia terminated by a feathery style. They are mostly climbing plants, ascending by coiling the petiole; a few are herbaceous perennials. Though the species are not numerous, the genus has a wide range, and some are found in almost all parts of the temperate regions. The original *klematis* of the Greeks is the lesser periwinkle (*Vinca minor*); *klematitis*, as used by Dioscorides, seems to have been what is now *Clematis cirrosa*, which is indigenous in many parts of Greece. Apparently through the similarity of the names, the plants were all classed under one head by the early herbalists; and when

modern botany became a science, the name given to the *Vinca* originally was left with the genus which now bears it. The misapplication of names seems also to have followed some of their common appellations. The species indigenous to England, *Clematis Vitalba*, is known there as ladies' bower, virgin's bower, and traveller's joy; and, as the terms are employed by Gerard, Parkinson, and other writers of the time of Queen Elizabeth, there have been modern discussions as to whether the name was given in compliment to the "virgin queen" (Elizabeth) or to the Virgin Mary. Gerard says the plant makes "bowers fit for maidens to sit under," and numerous pictures of the flight of Joseph and Mary into Egypt represent them as sitting under the shade of this vine. But the earlier herbal-

ists classed the plant with the bryony. The *Bryonia dioica* was with them *Vitis nigra*, and the clematis was *Vitis alba*, probably from its white blossoms. The bryony is a dioecious plant, sometimes, as it is now known, becoming monoecious with age. "'Tis call'd virgin-vine," says Louis Liger d'Auxerre, "in regard it has never yet produced anything, and so is a virgin, as 'twere," alluding to its unisexual flowers. The origin of the name *Vitalba* is apparent, and its relation to the Virgin has probably followed from this early association with bryony. Another European species, *C. Flammula*, has retained as its specific appellation its original common name. *Flammula* was the name given to an acrid, burning species of *Ranunculus* (*R. Flammula*), and the acrid leaves of this species, with some resemblance in the foliage under some conditions, brought about the association. Another species, *Clematis Viorna*, has retained its original proper name, some supposing it to have been derived from "adorning the way;" but it may be simply "ornamental vine." *Viorne* is the French name of the *virburnum*, which in English is "wayfaring tree." Dr. Arnold Bromfield, in *Flora Vectensis*, notes that "the slender flexile branches [of *C. Vitalba*] served occasionally for binding faggots, and as a substitute for the more costly pipe or cigar to our young rustic smokers," and that with these the branches were known as "bedwine." "Pethwine" is, however, the correct vernacular. The Greek *klemata* is suggestive of the use of the branches for tying purposes.

The commonest American clematis in the Eastern portion of the continent is *C. Virginiana*, closely allied to the European "virgin's bower," but differing in having ternate instead of pinnate leaves; and, singularly enough, a species differing but slightly from this, and chiefly in narrower leaflets and sepals, is found in Japan. *C. ligusticifolia*, also nearly allied, takes the place of *C. Virginiana* in the Rocky Mountains and westward to the Pacific coast. China and Japan have several very ornamental species, and these have been the parents of many pretty forms in gardens, in some of which the flowers are double by the transformation of stamens to petals. *Clematis Japonica*, closely allied to our *C. Virginiana*, is known in this country as *Futs Kusa*. Shecut, an early botanist of South Carolina, notes in his *Botany* of that State: "The Spanish, or blistering, flies are very fond of *Clematis crispa* (a Southern species), and it would be well for medical gentlemen in the country to propagate the plant about their residences, in order to secure a constant succession of these valuable insects." Florists, however, find no necessity for such action, the blister-beetle being one of the most persistent of insect enemies. A species of *Ægeria* is also very destructive as a stem-borer, and the roots are preyed on by a species of *Anguillula*, making them granulated, as *Phylloxera* does the roots of the grape. Besides this, a fungous disease often kills the plants as if by lightning. These enemies render clematis-culture no sure success in American gardens.

In regard to *Clematis Viorna*, Shecut says that a yellow dye may be extracted from both leaves and branches. The fibrous shoots may be converted into paper, and the wood is yellow, compact, and odoriferous, furnishing an excellent material for veneering. *Clematis Vitalba* is commonly known as German clematis in American gardens. In the time of Dodonæus the German vernacular was *Lignen*. In modern times the Germans called it *Waldrebe*. The "ladies' bower of Virginia," of the early English herbalists, is the passion flower, *Passiflora incarnata*.

Clematises have generally no odor, but *C. Flammula* of Europe, and *C. coccinea* of the Southern part of the United States, are delightfully scented.

(T. M.)

CLÉMENCEAU, GEORGE BENJAMIN EUGÈNE, a French statesman, was born at Mouilleron-en-Pareds (Vendée), Sept. 28, 1841. He was educated at

Nantes, and went to Paris to study medicine. There he associated with the young republicans and contributed political articles to various journals. Having thus become obnoxious to the imperial government, in 1865 he removed to the United States, where he settled at Hartford, Conn., and was soon after married to Miss Mary G. Plummer. In September, 1870, on the downfall of the Empire, he returned to Paris and established himself as a practising physician in Montmartre, in Paris. But he was almost immediately called to be mayor of the arrondissement, and during the subsequent siege of the city by the Germans was conspicuous for energy and administrative ability. In February, 1871, he was elected to the National Assembly for the department of the Seine.

On the uprising of the Commune in March, Clémenceau exerted himself to prevent bloodshed and to restore order, but the mob, suspecting him of being an agent of the national government, which was then organized under M. Thiers, thrust him from his office, and even sought his life. When the second siege of the city began, Clémenceau retired from the National Assembly to share the fortune of his fellow-citizens. Yet he continued his efforts for conciliation, and early in May went on a mission to other cities of France to endeavor to secure an immediate meeting of the newly-elected republican delegates in the interests of peace. Before his return the gates of Paris were closed, and the Commune movement was presently suppressed. Having returned to the Assembly, Clémenceau, in March, 1872, presented the draft of a law authorizing the election of a municipal council for Paris. On its passage he was elected in July to this council, and became in succession its secretary, vice-president, and president. In February, 1876, he was elected to the new Chamber of Deputies, where he was a member of the extreme Left. In May, 1877, he took part in the famous protest of the 363 against the prorogation of the Assembly by the Duc de Broglie; and when the Assembly was dissolved, in June, he was one of the committee of eighteen which directed the vigorous electoral campaign which ensued. In the strongly republican Assembly thus elected Clémenceau continued to proclaim bluntly his radical ideas and to denounce unsparingly the administration of Marshal MacMahon. He was then a supporter of M. Gambetta, and, though in character and manner widely different, was for a time his personal friend. This was shown by his being Gambetta's second in his duel with M. de Fourton in November, 1878. In January, 1879, M. Grévy became president of France, and Gambetta was made Speaker of the House. Clémenceau then succeeded to the leadership of the extreme Left, and was active in carrying through the House the radical programme for the exclusion of the clergy from educational affairs, the expulsion of the Jesuits, and the amnesty of the communists who had been banished to New Caledonia. At this time it became evident that Gambetta, for the purpose of uniting firmly the people of France, had adopted the policy of opportunism, but Clémenceau remained stanch in his aggressive radicalism. He openly opposed the ministry of Jules Ferry, and when Gambetta became minister continued to wage a more vigorous policy. Since the death of Gambetta the followers of the latter have mostly joined in supporting M. Clémenceau.

CLEMENS, SAMUEL LANGHORNE, an American humorist, generally known by his assumed name, "Mark Twain," was born at Florida, Mo., Nov. 30, 1835. A few years later his father removed with his family to Hannibal, on the Mississippi River, where Samuel entered a printing-office. After learning the printer's trade he journeyed from town to town as far as New York; then, returning, found his way to New Orleans. He then resolved to become a Mississippi steamboat pilot, but scarcely had he become perfect in his knowledge of the navigation on that river when it was closed by the outbreak of the Rebellion. Then his brother, having been appointed lieutenant-governor

of Nevada Territory, made Samuel his private secretary. The attractions of the mines soon allured him from this post, and for months he lived the rough life he afterward described so vividly. He next became local editor of a newspaper in Virginia City, and in connection with it began to use the name by which he is generally known. It is a familiar cry on the Mississippi steamboats, the man sounding the channel calling out "Mark twain" instead of "Mark two" (fathoms). In 1864, Clemens left Nevada and became connected with the San Francisco press, and afterward visited Southern California and the Sandwich Islands as a newspaper correspondent. Having acquired considerable reputation on the Pacific coast, he entered the lecture-field and came to the Eastern States. In 1867 he joined an excursion on a steamer to the shores of the Mediterranean, and the incidents of the trip furnished abundant material for his book, *The Innocents Abroad* (1868), which gave him a wide reputation as a humorist. His next book, *Roughing It* (1872), depicted with the same exuberance of humor the life on the Plains, while *Tom Sawyer* (1873) has generally been considered autobiographical to a great extent. *The Gilded Age* (1873), in the authorship of which he was associated with Charles Dudley Warner, was a burlesque on the American tendency to speculation and extravagance. In *The Prince and the Pauper* (1878) Mr. Clemens attempted with less success to portray English life in the seventeenth century. *His Life on the Mississippi* (1874; revised ed. 1883) is a graphic account of the occupation to which he devoted some years of his youth, and of varieties of character which he there encountered. His travels in Europe in 1878 have been humorously depicted in *A Tramp Abroad* (1880). Several collections of his minor sketches have been made, all showing the same grotesque humor and keen powers of observation. He has for several years resided at Hartford, Conn. (J. P. L.)

CLERC, LAURENT (1785-1869), an American instructor of the deaf and dumb, was born at La Balme, Isère, France, December 26, 1785. While an infant he fell into the fire, burning his head and face, and in consequence lost the senses of smell and hearing. When twelve years old he was placed in the celebrated school for the deaf and dumb in Paris under the direction of the abbé Sicard. He was a favorite pupil, and in 1805 he began to give instruction to others. In 1806 he was regularly employed in the institution, and a few years later he taught the highest class. In 1815, while on a visit to England, he met Rev. T. H. Gallaudet, D. D., of Hartford, Conn., who had gone to Europe to acquire the art of training deaf-mutes. Mr. Clerc was induced to accompany Dr. Gallaudet to the United States. He arrived August 22, 1816, and immediately took part in organizing the Connecticut Asylum for the Education of the Deaf and Dumb. (See DEAF, EDUCATION OF THE.) Mr. Clerc was married in 1819 to Miss Boardman, a deaf-mute and a pupil in the Hartford asylum. Their children all speak and hear. In 1858, Mr. Clerc, after having been engaged in teaching with great success for fifty years, retired on a pension. He died at Hartford, Conn., July 18, 1869.

CLEVELAND, CHARLES DEXTER, LL.D. (1802-1869), an American educator and author, was born at Salem, Mass., Dec. 3, 1802. His father was a merchant, who in his sixtieth year entered the ministry of the Congregationalist order, and served for nearly forty years as city missionary in Boston. From the age of sixteen until he was twenty-one the son was engaged in mercantile business, but then went to Dartmouth College, where he graduated in 1827. While a student he published the *Moral Characters of Theophrastus, with a Translation and Notes* (1826). In 1830 he was appointed professor of Latin and Greek in Dickinson College and while in that position published a *Compendium of Grecian Antiquities* and some other school-books. In 1832 he became professor of the Latin language and literature in the New York University, and in 1834 he

removed to Philadelphia, where he opened a school of a high order for the instruction of young ladies. This he maintained with unvarying success for nearly thirty years, when he was compelled on account of failing health to relinquish it. During all this time he was also engaged in literary work, and published a *Compendium of English Literature from John Mandeville to Cowper* (1848), *Compendium of English Literature of the Nineteenth Century* (1851), *Compendium of American Literature* (1858), *Compendium of Classical Literature* (1865). The selections in these text-books were made with good judgment, and the biographical and critical notes were carefully prepared. Mr. Cleveland also made a collection of American hymns under the name *Lyra Sacra Americana*, and published a *Critical Edition of Milton, with Notes, Life, and a Complete Verbal Index* (1853). He was always an earnest opponent of slavery, and in 1844 wrote the "Address of the Liberty Party to the People of Pennsylvania." Occasionally the selections and notes in his compendiums show how strongly he felt on this subject. After he had closed his school he was in 1861, without solicitation, appointed by Pres. Lincoln United States consul at Cardiff, Wales. He returned to Philadelphia in 1867, but by the advice of his physician soon went to reside in England. In the summer of 1869 he again visited Philadelphia, and died there suddenly, Aug. 18, 1869.

CLEVELAND, GROVER, an American statesman, was born at Caldwell, Essex Co., N. J., March 18, 1837. His father, Richard F. Cleveland, was a Presbyterian minister, who afterward removed to the State of New York, and died at Holland Patent in 1853. Grover then became a teacher in the New York Institution for the Blind. In 1855 he set out for Cleveland, O., with the intention of studying law, but while passing through Buffalo was induced by his uncle, W. F. Allen, to remain in that city. He was admitted to the bar in 1859, and in January, 1863, was appointed assistant district attorney for Erie county, which position he held three years. In 1870 he was elected sheriff of the county, and on the expiration of his term he resumed the practice of his profession. He had been an active Democrat, and, as Buffalo was a Republican city, he seemed henceforth excluded from office. But in 1881 a change of municipal administration was demanded by the people, and Cleveland was nominated and elected mayor after a spirited canvass. His conduct in this office was marked by impartiality and fidelity to the best interests of the city. In 1882 the dissensions in the Democratic party in New York City and its vicinity caused the State convention to turn to the West for its candidate for governor, and Cleveland was nominated. The Republican candidate was Hon. C. J. Folger, who had been chief-justice of the State and was then Secretary of the Treasury in the President's Cabinet. Cleveland was elected by the unprecedented majority of 192,854. Soon after entering the governorship he became noted for the frequency of his vetoes, among which those concerning railroads attracted general attention. Questions relating to the condition of labor and the government of municipalities were also fully discussed in the messages which he sent to the legislature.

His course as governor, while generally approved by the people of the State, did not reconcile the conflicting elements in his party there. Before the Democratic National Convention met, in Chicago, in July, 1884, Mr. S. J. Tilden, who had been the party nominee for President in 1876, wrote a letter declining the nomination, which would otherwise have been offered to him. When the convention met, several candidates were presented, but on the first ballot Mr. Cleveland had a majority of votes, and soon secured the necessary two-thirds. Great efforts had been made to prevent this result by the minority from his own State, but they were unsuccessful. A number of Independent Republicans accepted him as their candidate.

CLEVELAND, the county-seat of Cuyahoga co., Ohio, is at the mouth of the Cuyahoga River, on the southern shore of Lake Erie. It is the largest city in Ohio except Cincinnati, and the eleventh among the cities of the United States. By rail it is 606 miles W. of New York, 356 miles E. of Chicago, 135 miles N. E. of Columbus, and 255 miles N. E. of Cincinnati. The following is a complete list of the railroads radiating from Cleveland: the Lake Shore and Michigan Southern; the Cleveland, Columbus, Cincinnati, and Indianapolis; the Cleveland and Pittsburgh; the New York, Pennsylvania, and Ohio; the Cleveland, Tuscarawas Valley, and Wheeling; the Cuyahoga Valley; the Connotton Valley; and the New York, Chicago, and St Louis, known as "the Nickel Plate." Dépôt and station accommodations are furnished by three of these roads independently of the union dépôt. The commerce of the port of Cleveland has kept pace with the increased facilities for railway traffic, lines running daily to Detroit and the ports of Lake Superior, whence iron ore and copper are returned in large quantities. These are met at Cleveland by the bituminous coal of the Mahoning and other valleys, and it is to the low cost of bringing the coal and iron here that Cleveland owes its manufacturing prosperity. The leading manufactures are those of iron, and they have been developed in an endless variety, from heavy castings to surgeons' needle-injectors. Rolling-mills, Bessemer steel-works, wire-mills, car-wheel works, and tube-mills form only a partial list of the establishments of this class. The other leading articles of manufacture are acids, ale, barrels, baskets, boots and shoes, bridges, cars, carpets, carriages, cigars, fences, files, flour, furniture, lawnmowers, leather, mill-furnishings, organs, paints, paper, paper boxes, pottery, powder, sashes and blinds, saws, screws, sewing-machines, ships (wooden), shirts, soap, steam-engines, stoves, tools of all kinds, trunks, varnishes, vinegar, washing-machines, white lead, wines, and wooden ware. Two notable industries located in Cleveland are the Standard Oil Company and the Brush Electric Light Company. There are 48 hotels, 6 national banks, 8 private banking-houses, and 3 savings banks. The newspapers and periodicals published here are classed as follows: daily, 9; tri-weekly, 2; weekly, 28; semi-monthly, 2; monthly, 19; quarterly, 1. The following is the number of the churches: Baptist, 10; Bible Christian, 2; Roman Catholic, 18; Christian, 3; Congregational, 9; Evangelical, 16; Friends, 1; Jewish, 5; Methodist, 18; Presbyterian, 10; Episcopal, 13; Reformed, 8; Swedenborgian, 1; Spiritualist, 2; United Brethren, 2; Universalist, 1; miscellaneous, 29—total, 148. The public schools of Cleveland received the first prize at the Centennial Exhibition at Philadelphia in 1876. The board of education consists of one member from each of the eighteen wards. A superintendent of instruction has the special charge of the schools, assisted by a special superintendent of primary instruction, a supervising principal of the German department, and teachers of music, drawing, and writing. The higher branches are taught in two high schools and a normal school. The public schools are divided into two districts, each with a supervising principal. The first district contains 25 schools, for the most part in large "union school" buildings; the second district contains 14 schools. The Roman Catholics have 4 convents and a large number of parochial schools. There are also a number of private educational institutions, several of which are devoted to the teaching of young ladies. The Case School of Applied Science has a liberal foundation. The Western Reserve College, formerly at Hudson, Ohio, where it was founded in 1826, was removed to Cleveland in 1882 at the instance of a wealthy citizen, who erected new buildings and furnished an ample endowment, so that it has become the Western Reserve University. The city is divided into eighteen wards, each of which sends two trustees to the common council. The police and fire departments are under separate boards of commission-

ers. Thirteen steam-engines, 5 hook-and-ladder companies, and a telegraphic alarm are the city's defence against fire. The park commissioners have charge of the new Lakeside Park, which extends along the terraced slope of the lake for nearly a mile. They also have the care of Wade Park, a magnificent tract of land near the eastern limits of the city. Aside from the cemeteries that belong to the corporation, a new one, called "Lake View," has been recently laid out on the edge of a hill overlooking the city and just outside of its eastern borders. In this spot repose the remains of Pres. Garfield, and his monument is to be erected here at a cost of \$250,000. Among the recent improvements, besides the enlargement of the U. S. Government building and the erection of many handsome business blocks, is the viaduct of stone and iron that spans the chasm through which the Cuyahoga River flows. This immense structure unites the east and west sides of the river by a broad street at a height of 75 feet above the water-level, the cost having been \$2,250,000. An extensive breakwater off the harbor serves to protect the shipping from the storms to which Lake Erie is the more liable because it is the most shallow of all the great lakes. By the annexation of Newburg, Cleveland has taken within its limits the Northern Ohio Insane Asylum. The city is noted for the large number of benevolent societies and social clubs that are maintained, a special feature being the German singing societies.

Cleveland was first settled in 1796 by the Connecticut Land Company, and named in honor of Moses Cleveland, who had charge of the survey. But the first permanent settlement was in 1800. Ohio City was annexed in 1855, and East Cleveland and Newburg in 1872 and 1873. The decennial censuses have given the population as follows: 1810, 57; 1820, 350; 1830, 1075; 1840, 6071; 1850, 17,034; 1860, 43,417; 1870, 93,018; 1880, 160,146.

CLIENT, the person who employs an attorney, barrister, counsellor, solicitor, proctor, or other member of the legal profession, either to prosecute or defend a cause for him, or to advise him with reference to legal matters. The name has its origin in the *clientes* of Roman days, of which each *patronus* had a large following. It was the duty of the *patronus* to relieve the distress of his *clientes*, to appear for them in court, and to expound the law to them in doubtful cases. As a recompense the *clientes* were bound to be heartily dutiful and obedient to their *patronus*, to promote his honor, to pay his mulcts and fines, to aid in discharging his taxes, portioning his daughters, etc., etc. In the latter days of the Roman Empire the relation of patron and client seems to have entirely disappeared. Hired advocates, called *statuti* or *supernumerarii*, performed the duties of the *patronus*. Their employers, however, continued to be known as *clientes*.

The term was imported into the English law at a very early date, and it is believed is in universal use both in England and in the United States. The rights of a client with regard to the attorney employed by him are rigidly enforced by the law. All communications taking place between them are regarded as privileged, and as to them the attorney's lips are sealed. He not only cannot be compelled, but will not be permitted, to give testimony in reference to them in a court of justice where the interest of the client may be injuriously affected by his so doing.

Where attorneys fail to pay over moneys collected for or on behalf of their client the court will by summary process compel such payment, frequently going to the length of disbarring the delinquent for breach of his professional duty.

The term "client" is also sometimes used loosely to indicate the persons employing practitioners of learned professions other than the law. (L. L., JR.)

CLIFF-DWELLINGS, a name applied to human abodes either constructed upon shelves or terraces on the faces of cliffs or precipices, or excavated, wholly or

in part, in the rocky walls of cliffs and cañons. Such dwellings, now mostly abandoned, are found in various parts of New Mexico, Southern Utah, and Arizona, and in South-western Colorado, as well as in Northern Mexico. That their former inhabitants were in some way related (either as ancestors or as the kindred of ancestors) to some one or more of the various races of so-called Pueblo Indians may be taken for granted, since the civilization of the cliff-dwellers was in many respects identical with that of the Pueblos of to-day. In some respects the cliff-dweller seems to have been better off than his modern representative: the cañon walls gave his habitation a shelter from the severe storms, and overhanging shelves of rock often protected the house from any attack from above. Many of the pueblos now inhabited are, in some sense, composed of cliff-dwellings. The town of Acoma, New Mexico, for example, is perched upon a lofty rock, and is with some difficulty accessible by only two narrow paths. But the true cliff-dwellings are in many instances built on ledges and shelves which it is almost impossible to reach. The dwellings vary in size with the space upon which building was practicable. In some instances the houses are immense structures three or four stories high, and are divided into many small apartments, in every respect resembling the great communal dwellings which still compose some of the principal inhabited pueblos. Often the rock in the rear of the building is hollowed out into a cave. The walls are usually of stone, often rough, sometimes squared; but some of the dwellings are of adobe. Stone watch-towers are usually found near at hand, and the presence of ruins on the cultivable bottom-lands of the cañons may indicate that the cliff-houses were sometimes places of refuge in time of attack, rather than ordinary habitations. In some examples the outer wall of the cliff-house is so finished as to be scarcely distinguishable from the face of the neighboring cliff. Early in 1884 the discovery was reported of a series of cliff-villages lining the walls of Walnut Cañon in North-eastern Arizona, the series extending for five miles or more. This locality is interesting from the great number of domestic utensils there found, but access to the houses is very difficult. Fifteen miles away is an interesting cave-town, with at least sixty-five remarkable subterranean dwellings, long since abandoned, and rich in domestic implements and ornaments. The cave-houses are apparently artificial, being excavated in the crest of certain volcanic hills. Among the more remarkable cliff-dwellings are those of the Cañon de Chelle and the cañons of the Diamond Creek, Rio Mancos, La Plata, and San Juan, South-western Colorado being the region where the greater number of these remarkable structures have thus far been found. (An illustration of one of these buildings is given in the article on AMERICAN ARCHÆOLOGY, vol. i. p. 279.) Some of the cliff-dwellings were still inhabited when the Spaniards first invaded this region. Atitlan, in Central America, was a cliff-city when the Spaniards first captured it.

In the Old World cliff-dwellings are by no means unknown. Perhaps the most remarkable of which we have any account are those of the island of Thera (Santorini), in the Greek archipelago. This island forms a large part of the rim of a submarine volcanic crater which has been active within the historic period. The inner basin, sheltered by the islands of Thera, Therasia, and Aspronisi, and including several islets, is walled about by high volcanic cliffs. At the northern extremity of this inner wall, on the cliffs of Thera, is the town of Epanomeria, which consists of tier above tier of houses, partly built on shelves on the cliff's face and partly excavated in the volcanic rock. The lowest range of houses is said to be four hundred feet above the sea, and the highest is so near the top of the cliff that the chimneys in some cases reach up through the soil above. In some places the houses are piled up fifteen or twenty deep. A zigzag

road and stairways give access to the houses. Other towns of the island have somewhat of the same general features. The famous ruined city of Petra and its environs afford examples of cliff-dwellings, and the terraced slopes of Assos should also be noticed. The case of Acoma and the other mesa-built towns of the Pueblo Indians is more than paralleled by that of Albinen, a town of the Swiss canton of Valais, built upon a high mountain and accessible only by means of a succession of eight perpendicular wooden ladders. It is probable that some of the ruined and now inaccessible cañon-houses of the South-west were once reached by ladders and stairways long since destroyed. In the island of Minorca there is a prehistoric cañon-town quite in the general style of the abandoned New Mexican cliff cities.

(C. W. G.)

CLIFFORD, WILLIAM KINGDON, F. R. S. (1845–1879), an English mathematical and philosophical genius, was born at Exeter, May 4, 1845. He was educated in his native town till 1850, when he went to King's College, London. There he displayed rare mathematical talent, and also distinguished himself in classics, history, and English literature. Entering Trinity College, Cambridge, in 1863, though he could not be induced to confine himself to the regular course of study, he maintained his high reputation as a mathematician, and on graduating, in 1867, was second wrangler. He was elected fellow of his college, and in 1870 took part in the English expedition to the Mediterranean to observe the solar eclipse. In the next year he was made professor of applied mathematics at University College, London, and in 1874 was elected a Fellow of the Royal Society. His constitution was weak, and, though at college he was proficient in gymnastics, his mental activity and delight in intellectual labor led him to neglect the care of his health. In 1876, being compelled to go abroad, he spent the summer in Spain and Algiers. He returned to his work with renewed zeal, but in April, 1878, was again obliged to go south. He died in Madeira, March 3, 1879. He was a most brilliant lecturer, being able to render the most abstruse subjects clear and intelligible. At college he had been an extreme High Churchman, but he afterward became a follower of Darwin, and then of Herbert Spencer. In his lectures and in various articles in the *Reviews* he discussed scientific, philosophical, and metaphysical subjects with such clearness, brilliancy, and profundity as to excite the highest anticipations of discoveries to be made by him. He had published a volume called *Seeing and Thinking*, and after his death his *Lectures and Essays* (1879) were published with a biographical introduction.

CLIFTON SPRINGS, a village and health-resort in Ontario co., New York, in the townships of Phelps and Manchester, and on the Auburn branch of the New York Central Railroad, 11 miles E. N. E. of Canandaigua. It is chiefly known for its calcic sulphur waters, useful in many cases of rheumatism and catarrhal and skin disease, and in certain nephritic and vesical complications. Another spring is highly charged with carbonic acid. The village has a union school, a seminary, a newspaper, four churches, and a large sanitarium connected with the springs.

CLIMATE. The primary cause of terrestrial climatic variations is the influence of the solar rays on the earth's surface; the secondary causes are the annual and diurnal revolutions of the earth and the complex conditions of its surface. The variations of climate, multiform as they are, are gradually being brought within the domain of science and shown to be governed by general laws, of which it is here proposed to give a brief explication. If the surface of the earth were covered with a uniform ocean, the problem of climate would be greatly simplified. Certain fixed conditions would then rule which now only rule in part, since they are disturbed by the influence of the land-surface. That we may properly understand the problem of climate, it is necessary first to detail these conditions, and

afterward to consider the disturbing effects of the land-surface.

Let us, then, imagine the earth to be—as it probably once was—covered with a general ocean, and above this the gaseous atmosphere. Upon the equatorial surface of the rotating sphere the solar heat falls vertically, and obliquely on the regions toward the poles. Hence the direct effect of the solar heat steadily decreases north and south from the equatorial zone, and reaches its minimum at the poles. But this zone is of considerable breadth, since the vertical sun moves twice annually over a zonal region of 47° in width, with the equator for its median line. Thus the temperature at any point must vary from a maximum degree in the summer to a minimum degree in the winter of either hemisphere. But this direct distribution of temperature is disturbed by other causes—namely, the movements of the heated air and water. A primary disturbing influence is the evaporation of water, in consequence of which the air becomes saturated with moisture. This greatly decreases its transparency to the solar rays and cuts off much of the descending heat. On the other hand, it prevents the ready escape by radiation of such heat as penetrates to the surface. This heat is partly absorbed by the surface and only gradually yielded to the air, so as to preserve some uniformity of temperature. In the most conductive soils the direct heating effect of the solar rays is felt to a depth of 4 feet. In water it has been traced to a depth of 500 feet.

Important consequences arise from the warming of the surface-layers of air and water. The warm ocean-water of the tropics expands and rises. In the frigid zones the water is condensed by cold and contracts. Thus an inequality of level is produced, and a flow of water from the equator toward the poles takes place to restore the equilibrium. As a result of this outflow, the water-pressure in the tropical zone is reduced and that in the frigid zones is increased. In consequence, the heavy water from the polar regions flows toward the equator along the ocean-bottom to restore the equilibrium of pressure. Such a revolution of the ocean waters is in constant operation. Were there a general ocean, it would be perfectly regular, instead of irregular as now. Its effect upon climate is to carry the warm water of the tropics far to the north and south, and thus considerably to increase the temperature of these regions. To gain an idea of the modifying influence of the great ocean-currents on temperature, we may adduce the calculation of Prof. Croll, who estimates that if the Gulf Stream were removed the temperature of the North Atlantic would be reduced to 3° below zero. This movement of the waters, however, is not due north and south; the axial rotation of the earth gives it a set toward the east. It moves from the equator, where the earth's surface is rotating eastward with a speed of 1000 miles per hour, to regions where the speed is much less. Thus, when the tropic waters reach the temperate zones, they have an excess of motion easterly. They form currents moving north-easterly and south-easterly, and turning more and more to the east as they reach the higher latitudes, where the speed of the earth's surface is greatly reduced.

This oceanic revolution is paralleled by a somewhat similar revolution in the atmosphere. The heated air of the torrid zone expands and rises in a strong upward current. The atmospheric pressure is reduced, and a current of air sets in from north and south to restore the equilibrium of pressure. But this movement disturbs the equilibrium of pressure in the upper atmosphere, and an upper current moves from the superabundant air of the tropics to restore the air taken from the temperate and frigid regions by the surface-currents toward the equator. These surface-winds are affected by the earth's rotation in the same manner as are the ocean-currents. Their original speed of rotation is less than that of the equatorial region; hence they lag back

and gain a westerly set. They form the north-east and south-east trade-winds. Reaching the torrid zone, they travel almost due west, while between them is a zone of calms and variable winds, the zone of ascending air.

The upper currents of winds, or anti-trades, blowing polarly, gradually descend toward the earth's surface, which they reach in the latitude of 35° or 40° , north and south. Their downward pressure produces in this latitude zones of high atmospheric pressure, which, like the equatorial zone, are regions of calms and variable winds. They form in the North Atlantic the region of calms and baffling winds designated by sailors as the "horse latitudes." From these zones part of the descending air turns toward the equator to feed the trade-winds. Part of it continues to move in its original direction, and forms winds blowing with a westerly trend toward the poles, its influence extending far up into the frigid zones, which are also areas of low atmospheric pressure.

Between these regular revolutions of air and water there are certain important differences. The heat of the surface water-currents is given to the air and greatly aids to modify the temperature of the extra-tropical zones; the heat of the upper atmospheric currents is radiated to space and lost to the earth. Another peculiar action of the air depends upon its moisture-containing powers. These increase very rapidly with increase of temperature. Air at 32° F. can hold $\frac{1}{160}$ its weight of transparent vapor. At 59° it can hold $\frac{1}{80}$, and at 86° $\frac{1}{40}$, its weight, its capacity doubling with every 27° of temperature-increase. Saturated air at 80° holds 10.81 grains of water per cubic foot; at 60° it holds 5.87. Hence air chilled from 80° to 60° loses much of its vapor-containing power, and must throw down as rain about 5 grains of water from every cubic foot. This is the main cause of rains—a chilling of the air, and partial loss of its capacity for water-vapor.

The air of the tropics, warmed and expanded by the solar rays, gains a high saturation-capacity and absorbs large stores of evaporated ocean-water. Ascending into the upper regions of the atmosphere, it becomes chilled and is forced to discharge much of its water-vapor in the form of rain. To this cause must be attributed the prevailing rains of the equatorial belt. In the belts of high pressure in the temperate zones, at the north and south limits of the trade-winds, the opposite conditions exist. The air is below its saturation-point and rain not likely to occur, except from local causes. In the Sargasso Sea of the Atlantic, which is crossed by the northern belt of high pressure, clear skies and bright and sunny weather prevail, with occasional squalls.

The regularity of climatic conditions which would result from these causes, were there a uniform ocean-surface, is disturbed by the influence of the land-surface. We may briefly point out the interference with the regular movements of air and water which is produced by the land-distribution. In the first place, the great mass of the land exists in the northern hemisphere. It is in some way due to this that the southern trade-winds surpass the northern in tropical vigor, blowing, in the Atlantic, across the equator and to 3° north latitude, while the northern trades die out at 7° north latitude. (These limits, of course, vary as the sun moves north or south.) In regard to the movements of the ocean-waters, the broad expanse of sea in the southern hemisphere permits a general southward trend but little broken into currents. In the northern hemisphere, on the contrary, the oceans are contracted in area, and their westward-setting tropical waters are heaped against the eastern coasts of the continents and forced to flow north in narrow and deep streams of warm water. These, deflected eastward in the temperate zone, and the warmth which they communicate to the air carried eastward by the anti-trades, greatly mitigate the temperature of the western sides of the continental masses, and give to Europe and

Western America a far higher temperature than prevails in the same latitudes in Asia and Eastern America.

Another effect produced by the land is an irregularity in the distribution and precipitation of aerial vapor. Only the winds which blow over the ocean-surface become saturated with vapor. Those which blow over the land fail to gain new vapor and gradually lose what they have; so that in the interior of continents the winds become more and more dry, and the portions of wide continents most distant from the ocean crossed by the prevailing winds are apt to become desert regions, through lack of rain. This result is greatly influenced by the degree of elevation of the land. A range of hills lying in the path of the winds acts to drain them of their moisture. The hills are usually colder than the air which impinges on them, and thus cause condensation. They also force the moving air upward into rarer regions of the atmosphere, where it expands and chills. By both these causes considerable precipitation is produced, and the winds are dried. Another result of precipitation is an increase of temperature. The gaseous vapor becomes condensed to a liquid and gives out its latent heat, which warms the air. At the same time the gathering clouds check radiation and act to retain and render uniform the terrestrial heat.

In regard to the direction of the winds, continental masses exert important influences. In fact, all masses of land affect the winds, causing special inflows and outflows of air. But with small masses this effect is irregular and fluctuating; with large masses it becomes regular. The general movements of the air are decidedly affected by the larger continental masses, such as Asia and North America. These great bodies of land are subject to special heatings by the solar rays in summer and special chillings in winter, and thus act as secondary centres of atmospheric disturbance. They produce local regions of high and low pressure, which cause special winds and important modifications in the distribution of rain.

Modern meteorological study has revealed one important fact. All winds are due to a single cause—the natural flow of air from regions of high to regions of low atmospheric pressure. The air removes from points where it is in excess to points where it is deficient, to restore the equilibrium of quantity. Probably in all such cases a similar but reverse movement takes place in the upper atmosphere. The changes of atmospheric pressure to which winds are due are indicated by the variations of the barometer, which has thus become the all-essential measuring-rod of modern meteorology.

In the greater continents wind-producing influences exist little less regular and persistent than those which produce the trades. In summer the atmospheric pressure is lowest in the central regions of the continents of Asia, Africa, and America, and relatively highest in the Atlantic between Africa and the United States, and in the Pacific between Asia and the United States. Thus persistent winds set in from the oceans toward the centres of these continents. In winter the opposite conditions exist; the lowest pressures are in the North Atlantic and Pacific, where the temperature is relatively the highest. The highest pressures are in the central regions of the continents, where the temperature is abnormally low. In consequence, there is a steady outflow of air from these central regions toward the low-pressure regions of the oceans. These differences of condition are more marked in Asia than in the other continents, and there produce effects of the greatest importance. Persistent winds, known as "monsoons," blow regularly in from the neighboring oceans toward the region of Central Asia from April to October. These ocean-winds bring with them abundant moisture, which is shed in torrents of rain on the Coromandel coast and on the mountain-regions of Hindostan. In winter, from October to April, the conditions change; high pressure prevails on the con-

tinental and relatively low pressure on the ocean. The winds blow steadily southward from the continent, forming the north-east monsoons, which are dry winds, and bring persistently clear weather. At the period of change of the monsoons storms of extreme violence occasionally arise in the eastern seas.

Winds resembling the monsoons prevail on the coasts of Africa, South America, and Australia, with the like effect of raising the rainfall to its maximum in the summer of these continents. Other important effects, arising from the same general cause in its local applications, are the daily and nightly sea- and land-breezes which prevail on the coasts of the warmer climates, and greatly mitigate the severity of this heat. In North America the main centre of atmospheric disturbance appears to be in Utah and the surrounding States. In this region the pressure is abnormally low in summer, and the winds blow in from all directions. In winter there are two regions of high pressure, one around Utah, the other in the South-eastern States. Between them is a trough of low pressure extending from Chicago to South-western Texas. From these regions of high pressure the winds blow out toward the low-pressure trough, or toward the Atlantic. In the United States, as a whole, the prevailing winds in winter are north-west, and these frequently cause a sudden and great fall in the temperature and bring with them violent storms.

In addition to these far-extending and regular movements of the air, caused by the influences of great bodies of land and water on the atmosphere, there are other movements, more localized and irregular, of great interest and importance. The widespread variations of atmospheric pressure, with their fixed zones or centres, are paralleled by minor variations of frequent occurrence, and usually distinguished by the migratory character of their centres. To such variations, in which there is a contracted area of low pressure surrounded by a wide zone of high pressure, are due the cyclones, or great spiral storms, which have of late years attracted so much attention. The causes of these fluctuations of pressure are not known. The most violent of those which occur on the American coast seem to have some connection with the warmer regions of the Gulf Stream, though no explanation has been offered of the cause of their rapid movement northward.

The movements of the air in a cyclone are in harmony with its more general movements. The centre of the cyclone is a region of low pressure and of ascending air; its exterior is a zone of high pressure and of descending air. The excess of air in this outer zone flows toward the centre, to supply the deficiency there existing. But the winds thus occasioned do not move directly, but spirally toward the centre; the result is a great whirling motion in the air, the deflection being toward the right in the northern hemisphere, through the influence of the earth's axial rotation. All great wind-storms tend to assume this cyclonic character, the direction of the wind being at an angle of 60° to 80° from a right line to the centre. The centre is a region of calm. The air which whirls round it, starting in gentle winds from the high-pressure region, increases in violence inwardly, and becomes a severe gale as the centre is approached. The whole motion is supposed to be a descending one in the anti-cyclone or high-pressure zone, then a horizontal spiral whirl, increasing in violence as its diameter is lessened, then an ascending movement near the centre of the whirl. This is apt to be a point of severe rain, from the chilling of the ascending air. The inward pressure of the wind from various directions necessarily causes a calm at the centre, precisely as the opposite movements of the north-east and south-east trade-winds cause a central zone of calms. The two cases, indeed, are otherwise parallel. At the high-pressure zone of the anti-trades the air descends, blows toward the equator, and there ascends. The cyclonic

whirl cannot be imitated by the trade-winds, since they blow toward a zone, not to a centre of low pressure. Wherever the low pressure occupies an extended line, there can be no cyclone. Where it occupies a localized centre, the wind always approaches in a cyclonic whirl.

Of the cyclones which visit the United States, the most vigorous originate in the region of the West Indies and move north-eastward along the Atlantic coast of the continent, where they produce heavy easterly gales; they are finally lost in the North Atlantic, but may occasionally reach Iceland and Great Britain. In less frequent instances they pass northward from the Gulf along the Mississippi Valley, and thence north-eastward to Maine. Their origin is in the southern limit of the north-east trades, and may be partly or wholly due to the heat and humidity of the Gulf Stream's current.

The United States is visited by other cyclonic movements of less violence and moving from other regions. In addition to these, there occur more localized storms of different origin, and often of extreme violence; these are known as "tornadoes" and "whirlwinds." They are ascribed to vertical, as cyclones are to horizontal, variations of atmospheric pressure. They arise from an abnormal vertical diminution of atmospheric heat and moisture. Tornadoes are much more violent than cyclones. The air which is drawn up in the centre of the whirl, being of high temperature and near saturation, becomes suddenly chilled through expansion, and a rainfall of extreme violence is apt to follow.

Such are the general causes and features of climatic variation in different regions of the globe; there are other more special causes, which we have not space to describe. The influence of the polar ice-cap in chilling the air is one of these. Other less regular causes are the chilling influence of great snowfalls and of floating icebergs. The height and direction of mountain-ranges, the width and elevation of table-lands, the existence of broad sea-level plains or of great sandy deserts whose dry air permits an abnormally rapid heating and cooling, the influence of atmospheric electricity, and numerous other slighter causes, influence climate and give it that rapid variability and frequent great difference in similar latitudes which would not exist were the earth's surface uniform in level and condition. The whole problem of climate is yet far from solution, and a much fuller series of facts is requisite. This the daily observations of the signal stations, now made at many widely-separated regions of the earth, promise to give, and there is reason to hope that in the near future a degree of scientific certainty may replace the largely empirical deductions of modern climatology. (C. M.)

CLINTON, CHARLES (1690-1773), the founder of the Clinton family in New York, was born in Longford co., Ireland, in 1690. His grandfather, William Clinton, was an officer in the army of Charles I., and after the execution of the king took refuge in the north of Ireland. James, his son, married Elizabeth Smith, whose father had been a captain in the Parliamentary army. Charles, their son, being a man of some influence and an elder in the Presbyterian Church, gathered a company for the purpose of settling in America, chartered a ship, and sailed for Philadelphia, May 20, 1729. On the voyage the captain of the vessel tried to starve the emigrants, so as to gain possession of their property, but finally landed them at Cape Cod, where many of them died. In 1731, Clinton purchased a tract in Ulster county, about sixty miles north of New York City, where they made a permanent settlement. He built a house surrounded with a palisade to protect it from the Indians. Besides attending to his farm, Clinton acted as land-surveyor, and was made judge of the county court. In 1756 he was lieutenant-colonel in Bradstreet's expedition against Fort Frontenac (now Kingston), Canada, his sons James and George serving with him. He died Nov. 19, 1773.

CLINTON, DE WITT, LL.D. (1769-1828), governor of New York, was the son of Gen. James Clinton and Mary De Witt, and was born at Little Britain, N. Y., March 2, 1769. He was educated by Mr. John Addison at an academy at Kingston, and after the Revolutionary war entered the junior class at Columbia College. This institution, formerly called King's College, had just been revived, and in 1786, De Witt Clinton was its first graduate under its new name. He was a diligent student, and in later life bore grateful testimony to the labors of Professors Cochran, Kemp, and Moore (afterwards Bishop Moore), under whom the college began its new course. He studied law, and was admitted to the bar in New York City in 1788.

As the question of the adoption of the Federal Constitution was then hotly discussed, young Clinton had an opportunity of displaying his talents as a political writer, and some letters signed "A Countryman," in which he opposed the arguments of Jay, Hamilton, and Madison in favor of the proposed Constitution, caused him to be regarded as a champion of the anti-Federal party. He became private secretary to his uncle, Gov. George Clinton, and remained in that position till 1795, when Gov. Clinton retired from office. He was elected a member of the State assembly in 1797, and in the next year a State senator. He strongly opposed the measures of President Adams's administration, and especially its hostility to France, yet when war was imminent he raised and equipped an artillery company. In 1800 the Republican party regained its power, but Mr. Jay remained in office as governor. His council, according to the constitution, consisted of one senator from each district, chosen by the assembly. The governor heretofore had enjoyed an exclusive right to nominate to office, allowing the council the right to confirm or reject. In 1801, De Witt Clinton became a member of council, and claimed the right of nomination for each member of the council. The same proposal had been made when his uncle was governor, and was successfully resisted, but now Gov. Jay, though opposing it, submitted the matter to the legislature, which body referred it to a convention of the people; and here, by the influence of the Republicans, the constitution was amended so as to secure Clinton's object. Yet his success at this time, by increasing party hostility, did much to embitter his subsequent political life. Clinton labored to improve the laws of his State, introducing sanitary regulations, fostering the arts and sciences, promoting agriculture, and stimulating the effort to apply steam for the purpose of navigation. His enthusiasm in behalf of these objects was frequently ridiculed by his political opponents, but the people learned to esteem him as one who used power for public good.

In 1801 he entered the Senate of the United States, where he maintained the high reputation he had already secured in his native State. Two years later he resigned his place to become mayor of the city of New York, being appointed by Gov. Clinton and a Republican council. In twelve years, owing to the changes of party ascendancy, he was twice removed and twice restored to this position, then considered one of the most important in the United States. The mayor was president of the city council, head of the police, and had important judicial functions. Clinton was also State senator part of the time, and was lieutenant-governor of the State from 1811 to 1813. He had now become the most prominent Republican in the Empire State, yet so fierce were the attacks made upon him by the Federalists, and so moderate were his own views, that he lost favor with both parties. Madison had been selected for President in 1808, owing to Jefferson's partiality, and when his first term drew to a close, De Witt Clinton received the support of the Federal party, but obtained only 89 electoral votes to 128 for Madison. This defeat caused him also to lose his position as lieutenant-governor of New York. He was

still mayor of the city of New York, and by his liberal culture and wide sympathies did much to direct and harmonize the various movements which were then making that city the metropolis of the New World. He was an active promoter of free schools, of charitable institutions, of various literary and scientific societies. His chief publications were letters and addresses in connection with these. He was from 1810 to 1820 successively vice-president and president of the New York Historical Society, and promoted its interest not only by personal labor, but by securing a grant from the State.

From an early period Clinton had been an advocate of the project of connecting Lake Erie with the tide-water of the Hudson, and in 1810 was one of the commissioners to explore the wilderness through which the proposed canal must pass. In 1812, in company with Gouverneur Morris, he laid this matter before the Government at Washington, and requested aid for it as a national measure; but President Madison pronounced the undertaking too great for the resources of the entire Union. The war with England prevented anything more being done in the matter at that time, but when, in 1815, Clinton was removed from the office of mayor by the Republican council, he retired to prepare a memorial and argument in favor of the immediate construction of the Erie and Champlain canals. Having been adopted by a public meeting of citizens of New York, and enthusiastically approved by towns in the interior of the State, it was presented to the legislature. The Republican majority treated the scheme coldly, yet several commissioners were appointed to make the necessary surveys, to solicit grants, and report at the next session. Gov. Daniel D. Tompkins was at this juncture called to be Vice-President of the United States, upon which the people, without regard to party, elected Clinton to fill his place, and on July 4, 1817, he broke the ground for the great enterprise he had so zealously advocated. In 1819, though Mr. Tompkins, who had been very popular, left his position to become candidate for governor, Clinton was re-elected. In 1820 he contributed to a New York paper, under the signature of "Hibernicus," a series of sketches of travel along the proposed line of the Erie Canal. These were collected and published in 1822 under the title *Letters on the Natural History and Internal Resources of the State of New York*. During his second term as governor a State convention was called which made several amendments to the constitution, diminishing the powers of the executive and judiciary, and extending the right of suffrage. In consequence of these changes Clinton declined to be a candidate for governor, and in 1824 his political opponents even removed him from the post of canal commissioner, a position without salary. The people, indignant at this outrage, again set party machinery at naught and re-elected him governor; and in this term he had the proud satisfaction of seeing the completion of his great work, and being borne in triumph on a barge from the waters of Lake Erie down to the harbor of New York, Oct. 26, 1825. This work not only facilitated commerce, but largely increased the population of the State. Villages grew into towns and towns into cities; agriculture, manufactures, and commerce were quickened in their movements, and wealth flowed in from all sides. Clinton did not rest satisfied with the completion of this great work; by his advice branches were extended to the smaller lakes of the State, and numerous canals in other States were projected and constructed. While beholding the increasing prosperity of the Empire State, and still occupying the highest place in her gift, at the close of a day spent in public business he died suddenly at Albany, Feb. 11, 1828.

This outline of his busy and useful life sufficiently shows the character of the man. Physically and intellectually, he was well fitted to be a leader of the people, though not of a party. He was over six feet in height and well-proportioned, with intellectual features

and dignified bearing. He was an impressive public speaker, a graceful writer, an enthusiastic natural philosopher, a patron of the arts and sciences. He was ambitious and fond of power, but only that he might use it for the public good. What Benjamin Franklin was to Philadelphia in the middle of the eighteenth century, De Witt Clinton was to New York in the beginning of the nineteenth. Besides the *Letters* already mentioned, he published a *Memoir on the Antiquities of Western New York* (1818), and many historical, literary, and political addresses. His life has been written by David Hosack (1829), James Renwick (1840), and W. W. Campbell (1849).

CLINTON, GEORGE (1739-1812), fourth Vice-President of the United States, youngest son of Col. Charles Clinton, was born in Ulster co., N. Y., July 26, 1739. He was trained by his father, and showed his enterprising character in early life by sailing in a privateer during the French war, as well as accompanying his father in the expedition to Fort Frontenac. At the age of twenty he was made clerk of the county court. He afterwards studied law, was admitted to the bar in 1764, and was appointed surrogate. In 1768 he was elected to the colonial assembly, and soon became prominent in his defence of the liberties of the people. In 1775 he was a delegate to the Continental Congress, where he voted for the Declaration of Independence, but before it was ready for his signature he was called to command a brigade of militia, and the next year he was appointed by Congress a brigadier-general. He was a deputy to the provincial congress of New York which framed the first State constitution in 1776, and at the first election held under it, April 20, 1777, was elected both governor and lieutenant-governor. He accepted the former office, and continued to hold it till 1795, being re-elected five times. He rendered distinguished service both in his civil and military capacity, and was known as the "champion of the Highlands." He exerted himself to save Fort Montgomery on the Hudson when attacked by Sir Henry Clinton, Oct. 6, 1777, for the purpose of opening communications with Gen. Burgoyne, and, though unsuccessful in defence of this post, prevented the co-operation aimed at by the movement. He was much harassed in his administration by the Tories. On Nov. 25, 1782, when the British army evacuated New York, Gov. Clinton and other civil officers marched in with Washington to take possession. In 1788 he presided in the State convention which adopted the Federal Constitution. To this instrument he was opposed, on the ground that it restricted too much the power of the separate States. But learning that nine States, the number necessary to put the constitution into force, had already given their assent, Clinton and his party withdrew their opposition, though they still demanded amendments. In 1789 he urged upon the State legislature to set apart lands in each new township for the support of common schools. In 1791 he advocated the improvement of internal communication by navigation companies, thus originating the movement which has given fame to his nephew, De Witt Clinton. In 1792, when Washington was elected President for a second term, Gov. Clinton, as representing the anti-Federalists, received 50 electoral votes for Vice-President to 77 for John Adams. In the same year John Jay, the Federal candidate for governor of New York, obtained a majority of the votes cast, but owing to some informality the votes of certain counties were rejected and Clinton declared elected. At the close of this term he issued an address declining a further nomination, as he had now served the public in elective offices for thirty years. Yet in 1801 he was persuaded by Aaron Burr to become a candidate of the anti-Federal or Republican party, and by the shrewd management of that politician was elected governor of the State. This movement brought his party into power not only in New York, but throughout the Union, and Burr was rewarded by being elected Vice-President; yet his action at the very moment of

his triumph intensified Jefferson's dislike, and at the next election Burr was a ruined politician, while Clinton became his successor as Vice-President. In 1808, through the influence of Jefferson, Madison succeeded to the Presidency, while Clinton remained as Vice-President. In 1811, while presiding in the Senate, he gave the casting vote against the recharter of the United States Bank. He died at Washington, April 20, 1812. He was frank and amiable in private life, as he was firm and dignified in public.

CLINTON, SIR HENRY (1738-1795), an English general, was born in 1738. His father, George Clinton, was an admiral in the British navy and royal governor of New York from 1743 to 1753, and his grandfather, Francis Fiennes Clinton, was the sixth earl of Lincoln. He received a liberal education, was made a captain in the Guards in 1758, and served on the Continent in the Seven Years' War. In 1775 he was sent to America as major-general, and arrived at Boston, May 25, in company with Gens. Howe and Burgoyne. At Bunker's Hill, June 17, when Gen. Howe's troops found difficulty in reaching the American intrenchments, Clinton, without waiting for orders, brought up reinforcements, and otherwise exerted himself in the battle. He was afterwards detached, and went to Wilmington, N. C., where he awaited the arrival of Admiral Parker's fleet, and then took part in the unsuccessful operations against Charleston, S. C. Returning to the North, he was second in command in the movements that compelled the Americans to evacuate New York in September. When Gen. Burgoyne led his expedition from Canada in 1777, Clinton strove in vain to effect a junction with him, and for this purpose stormed Forts Clinton and Montgomery, Oct. 6. In Jan., 1778, he was appointed commander-in-chief of the British land-forces in America in place of Gen. Howe. In May he proceeded to Philadelphia, and a month later, in obedience to orders from England, evacuated that city. Gen. Washington started from his camp at Valley Forge as soon as informed of Clinton's movements, and overtook him at Monmouth Court-house, where an indecisive battle was fought, June 28. The British army continued its march without further molestation to New York. Though in command of nearly 30,000 men, Clinton did little more than watch the movements of his cautious antagonist. In expeditions in Connecticut and New Jersey his troops practised great cruelty, for which he is held responsible. At last, when the British general Prevost had captured Savannah, and successfully held it against the combined forces of Gen. Lincoln and Count d'Estaing, Clinton, believing that America could be as effectually conquered from the South as from the North, sailed with part of his troops to Charleston, S. C., and on May 12, 1780, received the surrender of that city and of the entire Southern army. He then issued a proclamation denouncing all persons that remained neutral as enemies and rebels, but the only effect of this was to strengthen the opposition to the king's cause. Leaving Cornwallis to finish the work of crushing the rebel spirit, Clinton returned to New York, and endeavored, through Benedict Arnold, with whom he had been in communication for eighteen months, to secure possession of West Point, which would have given him control of the Hudson and effectually separated New England from the other colonies. Baffled in this, he remained inactive in New York, nor could Cornwallis's urgent demands for help rouse him until he found that Washington had departed for Virginia. Then, on Oct. 19, 1781, the very day that Cornwallis surrendered at Yorktown, Sir Henry set sail from New York, but on arriving at the entrance of the Chesapeake, five days later, he learned the humiliating fact, and returned to New York. While he was preparing to attack the French settlements in the West Indies he was superseded by Sir Guy Carleton, and returned to England in June, 1782. As Lord Cornwallis had powerful friends, who threw the blame of his capitulation on Clinton's tardiness, a violent controversy ensued. Clinton was elected to Parliament, and after-

wards made governor of Limerick. In 1793 he was placed in command of Gibraltar, and died there, Dec. 23, 1795. He published *A Narrative of his Conduct in America*, 1783, a rejoinder to Lord Cornwallis's *Observations* on it, and *Observations on Stedman's History of the American War*, 1794.

CLINTON, the county-seat of De Witt co., Ill., is on the Illinois Central Railroad, on the Gilman, Clinton, and Springfield division of that road, and on the Wabash Railroad, 43 miles N. E. of Springfield and 145 miles S. S. W. of Chicago. It has a court-house, two banks, three hotels, three newspapers, six churches, a music conservatory, a high school with fine building, a public library; also a foundry, two flour-mills, two grain-elevators, carriage-factory, tile-factory, hay-press, and railroad machine-shops. Population, 2709.

CLINTON, the county-seat of Clinton co., Iowa, is on the Mississippi River, the Chicago and Northwestern Railroad, the Chicago, Milwaukee, and St. Paul Railroad, the Chicago, Burlington, and Quincy Railroad, and the Burlington, Cedar Rapids, and Northern Railroad, 138 miles W. of Chicago. It has a splendid iron bridge, 4000 feet long, connecting this city with Fulton, Ill. It has three banks (one national), one daily and three weekly newspapers (one German), twelve churches, a high school and other public schools, a public library, large water-works, gas-works, and an excellent sewerage system. It is largely engaged in the manufacture of lumber, and has several saw-mills, two sash-and-door factories, two paper-mills, railroad machine-shops, two foundries, asphaltum-works, canning-works, and flour-mills. Population, 9052.

CLINTON, JAMES (1736-1812), a brigadier-general in the Revolutionary army, was the fourth son of Col. Charles Clinton, and was born in Ulster co., N. Y., Aug. 9, 1736. He was carefully taught, and served as captain in Bradstreet's expedition in 1756, distinguishing himself at the capture of Fort Frontenac. In 1763 he commanded a large body of troops defending the settlements in Ulster county against the Indians. When the Revolutionary war broke out he was made colonel, and served in Gen. Montgomery's expedition to Canada. He was made brigadier-general Aug. 9, 1776, and was chiefly employed under Gen. Putnam in preventing the British from ascending the Hudson. He was in command at Fort Clinton on the Hudson when that fort was attacked, Oct. 6, 1777, by a large British force under Sir Henry Clinton, who had succeeded in deceiving Gen. Putnam as to the object of his expedition. After a gallant defence the fort was taken by storm, Gen. Clinton being the last man to leave the works. He had received a severe bayonet-wound, but, sliding down the rocky precipice, he escaped to his home, sixteen miles off. In 1779 he took part in Gen. Sullivan's campaign against the Iroquois of Western New York, and afterwards was in command of the northern department at Albany. He was present at the final operations of the war at Yorktown, and at the evacuation of New York by the British. He was afterwards one of the commissioners to settle the boundary-line between New York and Pennsylvania. He was a member of the State convention which adopted the Federal Constitution in 1788. He was also elected to the assembly and to the senate of New York. He died at Little Britain, N. Y., Dec. 22, 1812.

CLINTON, a town of Massachusetts, on Nashua River, at the crossing of the Worcester and Nashua and the Boston, Clinton, and Fitchburg Railroads, 45 miles by rail W. by N. of Boston. At South Clinton, near the village, is a station of the Massachusetts Central Railroad. The river affords extensive water-power, utilized in large factories, which turn out cotton goods, carpets, ginghams, plaids, machinery, wire goods, counterpanes, castings, etc. The town has a high school, a national bank, a savings-bank, a town-hall, churches of the leading denominations, and a newspaper, and is one of the most thriving places in New England. Population of township in 1870, 5427; in 1880, 8029.

CLIPPER SHIPS. A clipper is a sailing vessel of peculiar construction, designed for great speed rather than for capacity. It has a long sharp bow, flaring outward as it rises above the water, a long clean run aft, hollow water-lines, a rising floor, raking masts, and a great deal of sheer. The period of American maritime ascendancy was identical with that of the clipper ship.

The freighting- and war-vessels in vogue when America was settled were of a short, bluff type. They had full round bows, floors extremely full and flat, and swelling sides, the broadest part of the ship being about two-fifths of the length aft of the bow. Some of them were very straight and level on deck from end to end, having little sheer. The old bluff form came down to later times in the line-of-battle ships of the Revolutionary period, and in the sugar and cotton vessels and East Indiamen which were produced by American yards in great numbers after the peace of 1814. Circumstances gradually led to changes with a view to increasing the speed of vessels. For a long period both before and after the Revolutionary War American vessels were very much molested at sea. British and Spanish law, and at times French law, forbade American ships to trade to and from certain colonial ports which were excellent markets for our fish and agricultural products. Rather than give up their trade, American owners chose to run the risk of loss of their ships. Good sailing qualities then became of the first importance, and a great deal of attention was paid to the study of the shapes of such vessels as had developed great speed. In 1778 the alliance with France brought a number of French war-vessels to our shores. Some of these vessels were hauled out of water on the marine railway at Salem, Mass., for repairs. Their models were the finest in the world, and they were immediately copied and improved upon with advantage. Congress having ordered the construction of four frigates and three sloops-of-war, the very best talent in the country was employed upon them, and French ships were taken as the pattern. The building of the *Alliance*, one of the new frigates,

was perhaps the first step in the evolution of the clipper ship. The *Alliance* was the pride and favorite of the whole navy. She was 135 feet long on the keel, 151 feet 7 inches on the gun-deck, 36 feet broad, and 16½ feet deep under the spar-deck, being about the size of a three-masted coasting-schooner of the present day. In 1782, while chased by an English ship too big to fight, she ran fifteen knots an hour with the wind abeam. The *Alliance* drew 14½ feet of water aft and 9 feet forward, and was sharp on the floor. Speaking of the American navy in the Revolution, Fincham says: "But the American frigates were excellent vessels in point of sailing, and so peculiarly adapted to the existing circumstances of the country at that time." The *Alliance* and her sister-ships had a great influence on the forms of vessels after the Revolution, but models remained short and deep, a good entrance forward being secured by a lighter draft there.

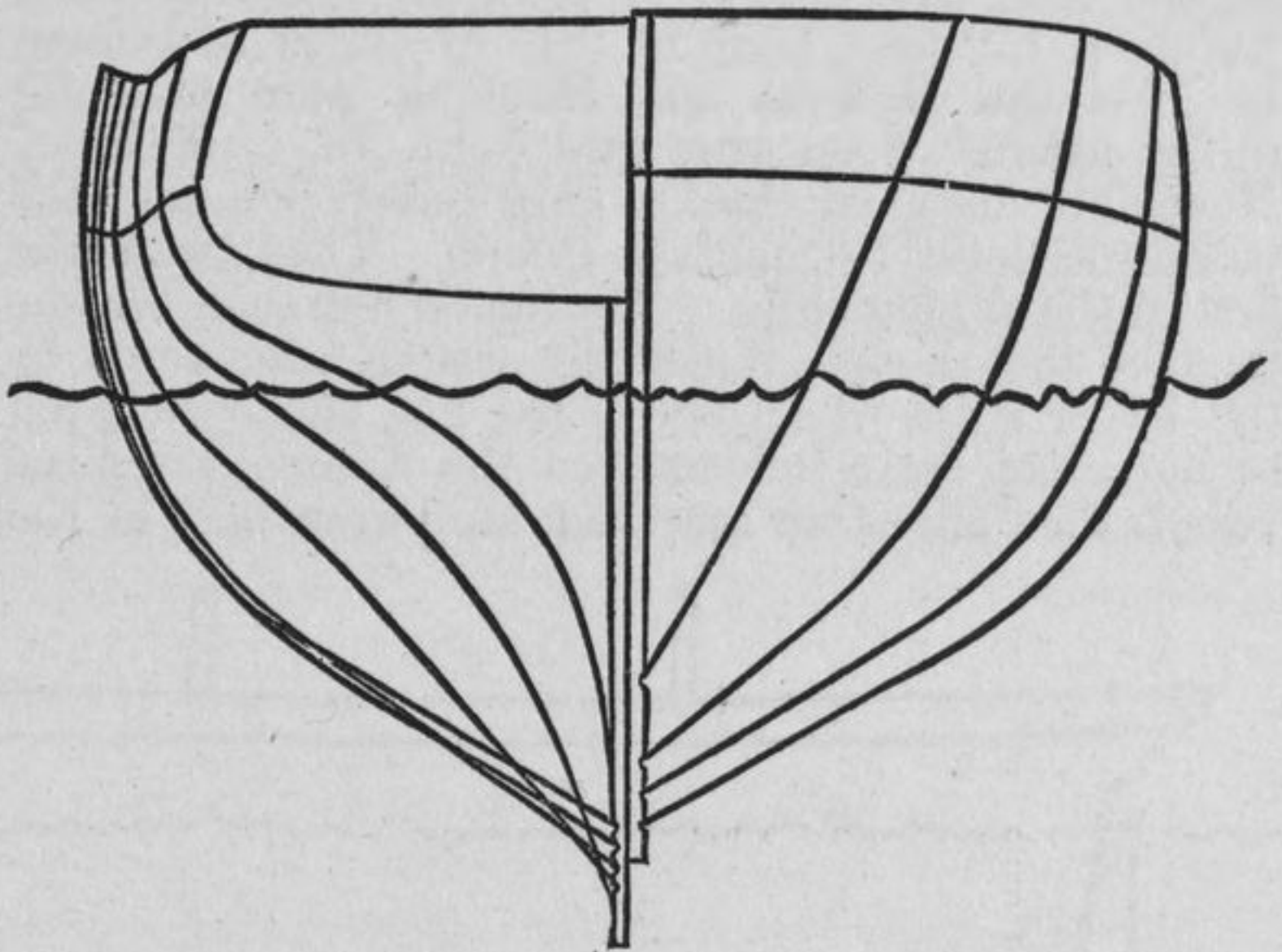


FIG. 1.—Ann McKim.

In the War of 1812, America became famous for fast ships. Some of the best were built at Baltimore, a city whose builders had been for years producing a

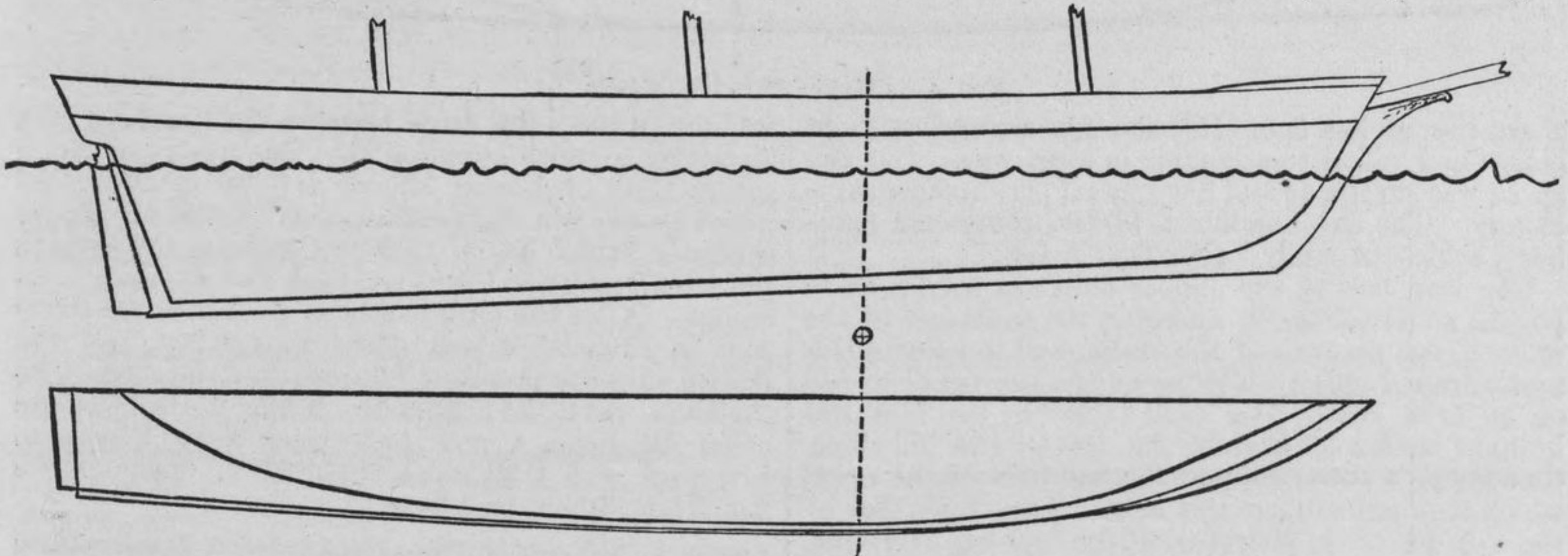


FIG. 2.—Baltimore Clipper Ship Ann McKim.

species of fast vessel intended originally for the African slave-trade. These vessels were long, low schooners, with flaring bows, raking masts, a great spread of canvas, and a deep draft aft. Some of these slavers drew 16 feet aft and 8 feet forward. They were of small carrying capacity, but in the War of 1812 they did good service as privateers. In that war Baltimore sent out 58 privateers, New York 55, Salem 40, Boston 31, Philadelphia 14, Portsmouth 11, and Charleston 10. It is said that not one of the new vessels was captured. Sharp floors, greater length, clean runs, a usually lighter draft forward, and a towering cloud of canvas secured the result. The sailing qualities and large size of American frigates in that war were so marked as to compel England to order the building of large vessels for her navy.

The privateers of 1812 raised the standard of Ameri-

can vessels permanently. At the end of the war every one of them fit to go to sea was at once employed in foreign trade. Ranging in size from the schooner and brigantine of 100 tons to the ship of 350 tons, still carrying a few cannon as a necessary precaution, and provided only with a few erroneous maps and charts, a sextant, and a "Guthrie's Grammar," their masters set sail for regions they knew nothing about, relying only on their smart vessels and Yankee pluck for a prosperous voyage out and a safe return. The speed of these vessels was of great advantage in trade; and while full ships continued to be built for carrying cotton, sugar, salt, and other bulky commodities, for all first-class service a better type of vessel was employed.

The new type reached its perfection in the packet-ships, which were soon sailing in regular lines to European ports. Passenger-, express-, and mail-traffic

was all transacted by the packet-ships in that age, and American builders managed to make these vessels so smart that they generally ran to Europe in nineteen days, or an average of two or three days' shorter time than their European competitors. From 1850 to 1860 the packets plying to Liverpool reached the size of 1400 and 1600 tons, and were generally built with three decks. It was only one step from the packet to the clipper ship.

The *Ann McKim*, a clipper built at Baltimore in 1832 (length on water-line, 143 feet; beam, 32 feet; depth of hold amidships, 14 feet), was of an extreme type of sharpness. In fact she was too sharp for a cargo-ship; but a schooner built of the same model was a capital vessel, and proved a remarkably swift sailer. (See figs. 1, 2.)

The first of the famous American clippers were built at New York. The pioneers were the *Helena*, 650 tons, built in 1841 by Wm. H. Webb, and the *Rainbow*, 750 tons, built in 1843 by Smith & Dimon. In 1844 the *Howqua* and *Montauk* were built for the tea-trade. Soon afterward John W. Griffiths of New York designed the fast ship *Sea-Witch*, and the vessel was built by Smith & Dimon. These were the first of the clipper ships. The *Sea-Witch* soon became famous, and though repeatedly beaten afterwards by the larger ships which succeeded her, she is believed to have had more influence on the form of deep-sea vessels than any other merchant ship ever built in the

United States. With her the full bow and long, sharp run went out of fashion, and the long, sharp bow, with a fuller after end, came into permanent use the world over for fast ships of the merchant marine. The *Sea-Witch* was 170 feet 3 inches in length, 33 feet 11 inches in breadth, and 19 feet in depth. The proportion of width to length was as 1 to 5, whereas the old rule was

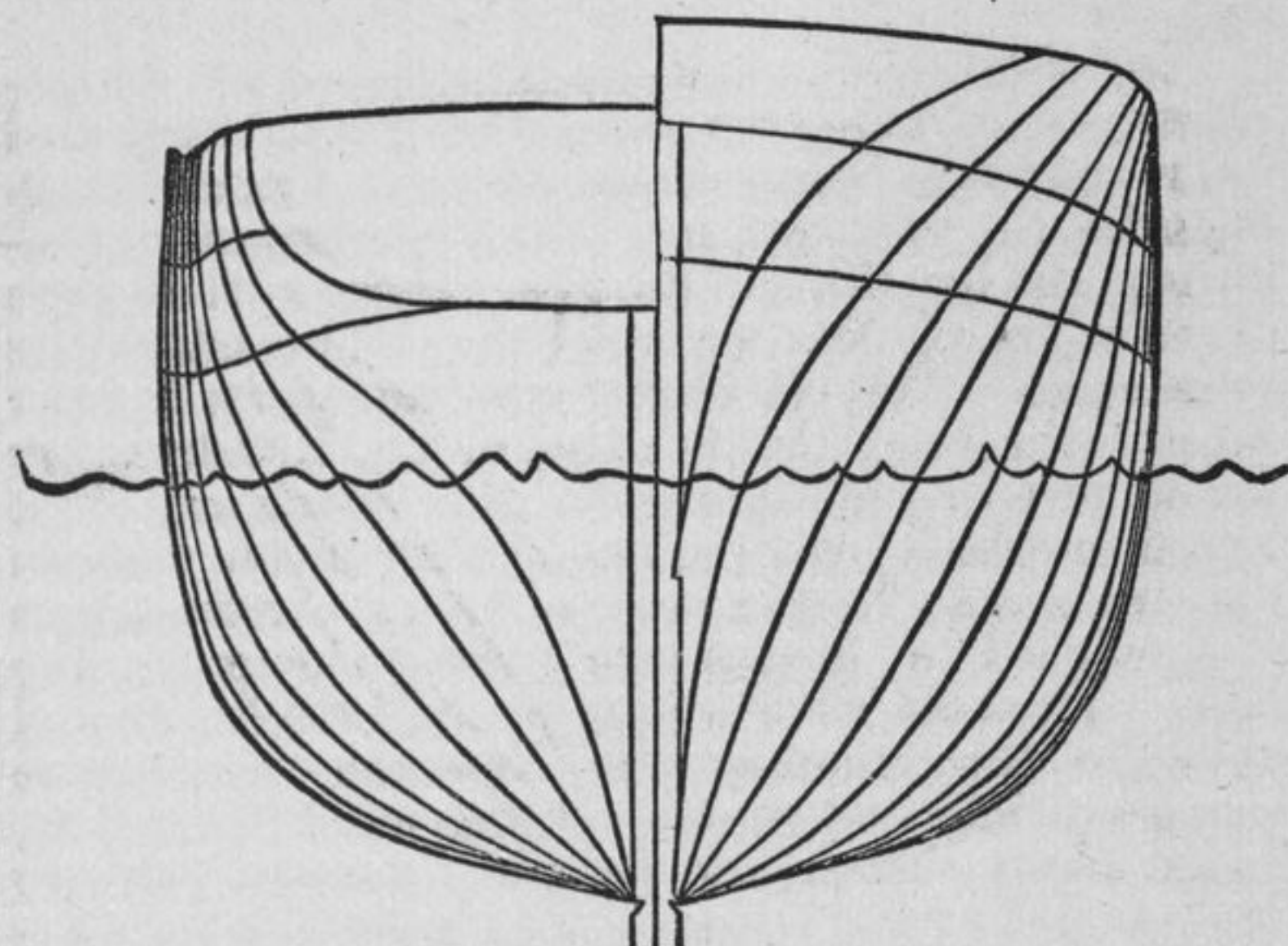


FIG. 3.—*Sea-Witch*.

as 1 to 4. The new clipper registered 907 tons, and would carry 1100 gross tons of cargo. Owing to the

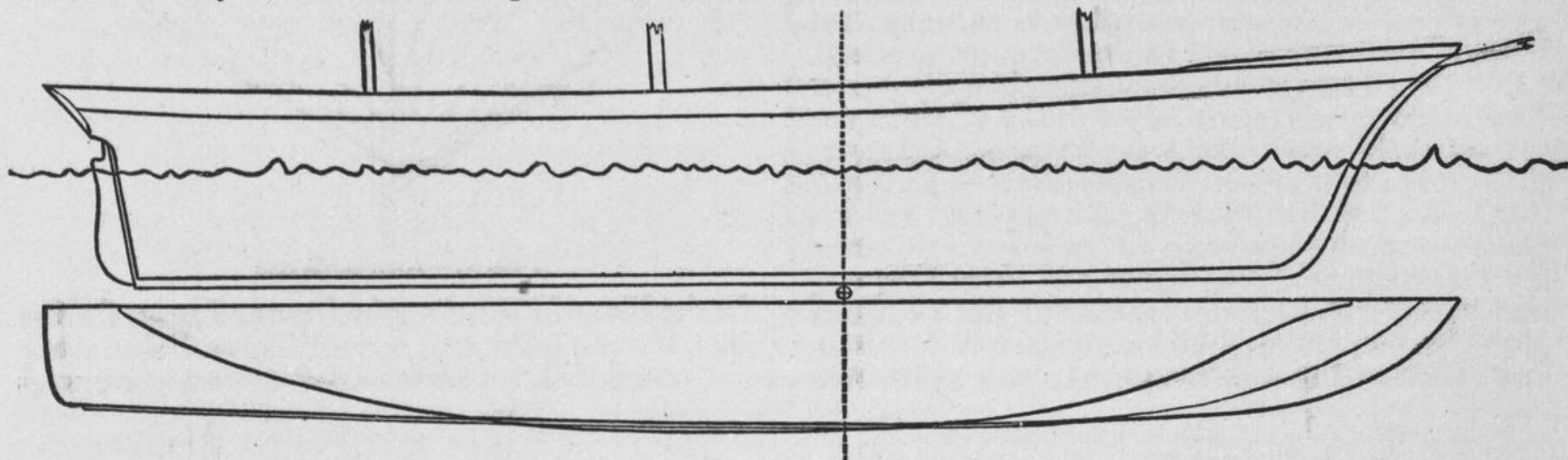


FIG. 4.—Clipper Ship *Sea-Witch*.

sharp rise of her floor (16°) she was unstable without ballast and rolled considerably in a sea-way. But her speed was surprising and her general performance satisfactory. The naval architects of two continents made her a subject of study. (See figs. 3, 4.)

The long bow of the clipper ship was soon seen to possess an advantage in lessening the resistance of the water to the progress of the vessel, and in gaining this much-desired object while permitting the vessel to sail on an even keel. The swell raised by the bow was brought farther aft than in the case of the full ships, thus giving a better support to that part of the vessel which required support the most. The crankiness of the ship due to the sharpness of the floor was overcome, as far as could be, by carrying the sides up straighter from the water-line, diminishing the "tumble home," and giving them only the faint curve inward required by beauty of outline. Round and elliptical sterns began to be built in place of the old square sterns.

For the first few years clippers were employed chiefly in the tea-trade from China to England and America. That trade began for American vessels in 1784, and Salem soon sent out a large number of ships to China; other ports followed, and for a long period of time the duty on tea was the principal source of the revenue of the U. S. Government. Tea loses its quality during a long ocean-voyage, and the fleetest ships were thus always in demand for the China trade. It was a source of profit also to reach the home market first with the first of the new crop of tea, and in time the habit grew up of racing to England and America annually with the first cargoes of that precious article—another circumstance which led to the construction of fast vessels for the

trade. In 1852 the races between the tea-ships were attracting so much attention that the American Navigation Club of Boston offered £10,000 to the vessel which should win the next race, an American clipper against a British one of 1200 tons register, the ships to run from London to China and back under certain regulations. After the offer had been published for thirty days in England it was raised to £20,000, and the British ship was promised fourteen days the start. The challenge was never accepted. While the subject was under discussion a race took place from Canton to Liverpool and Deal which resulted in favor of the American clipper, as follows:

Aberdeen-built clipper *Chrysolite*, Canton to Liverpool, 106 days.
Aberdeen-built clipper *Stornaway*, Canton to Deal, 109 days.
American clipper *Challenge*, Canton to Deal, 105 days.
American clipper *Surprise*, Canton to Deal, 106 days.
British ship *Challenge*, Shanghai to Deal, 113 days.
American ship *Nightingale*, Shanghai to Deal, 110 days.

In the latter part of 1848 occurred the discovery of gold in California, which stimulated the building of clipper ships in an extraordinary manner. From nearly every Eastern port loaded vessels were at once despatched to California. They were mostly brigantines and barks of small size, which consumed from 150 to 160 days in making the voyage. The profit on this early trade with the Pacific coast was immense. Fast vessels came into immediate demand, a good ship being able to exact a double freight on all the goods she carried. A great many Baltimore-built vessels were bought to go into this business. In 1850 two small

tea-ships arrived from New York at the Golden Gate with cargoes of goods, having made the run in 100 days. The quick trip created great excitement. The John Bertram, an extreme clipper of 1100 tons register, the pioneer ship of the old Glidden & Williams line, built in East Boston in 1850, was launched in sixty days from the laying of the keel, and in thirty days thereafter was on her way from Boston with a full cargo of goods for the Pacific, at \$40 per ton freight. Twenty-nine years afterward the John Bertram was still a good ship. The Witch of the Wave, 1500 tons, followed the first vessel, and four others from the same model came soon afterward. All the leading builders of the United States devoted themselves to the construction of clipper ships, and New York, Boston, and Baltimore vied with each other in the business. In less than a year's time clippers of 2000 and 2500 tons were being built and set afloat, and the increase in size did not stop until one of 4000 tons was launched at East Boston, the largest and finest sailing ship ever built. The year 1853 is noted for the number, beauty, and fleetness of its vessels. The packets improved in shape while the clippers were being developed, and by 1855 the American packets, the Californian, and the East Indiamen were the noblest, fastest, and largest types of merchant-vessels sailing on any sea in any part of the world.

Extreme clippers remained in vogue only a few years. Owing to the depth and sharpness of their floors they lacked stability, and in consequence of the sharpness of the ends those parts did not have buoyancy enough to sustain their own weight—a fact which led to the straining and weakening of the vessel. A change was made in 1855 by joining to the clipper top, bow, and stern the fuller bottom of the old-fashioned freighting ship. The midship section, or widest part of the ship, was also moved farther aft, so as to be only a trifle forward of the middle of the ship's length, and the vessel was made to float substantially on an even keel. That style of vessel remains in use to the present day, although capacity is now the chief aim in American sailing ships rather than speed.

The performances of some of the clippers were remarkable. America led the world in maritime achieve-

ments. In 1851 the clipper Nightingale was built at Portsmouth, N. H., by Samuel Hanscom for exhibition at the World's Fair in London. When she entered Boston harbor her beauty and power led to her immediate purchase by Sampson & Tappan for the foreign trade. The Nightingale was 178 feet long, 36 broad, and 20 deep. She registered 1066 tons, and was an extremely sharp ship. In 1852, on her way from Shanghai to London, she ran 336 nautical miles in twenty-four hours, making the distance from Batavia Roads to London in 70 days, and the whole distance in 110. From New York she ran to Melbourne in 1854 in 76 days 16 hours. In 1851, Donald McKay, of East Boston, built the Flying Cloud, a clipper measuring 208 feet on the keel, 41 feet in breadth, and 21½ in depth of hold—1782 tons register. She made her first voyage to California in 89 days 18 hours. On one day she ran 427½ miles, then the fastest time on record. Mr. McKay in 1852 built the clipper Sovereign of the Seas,

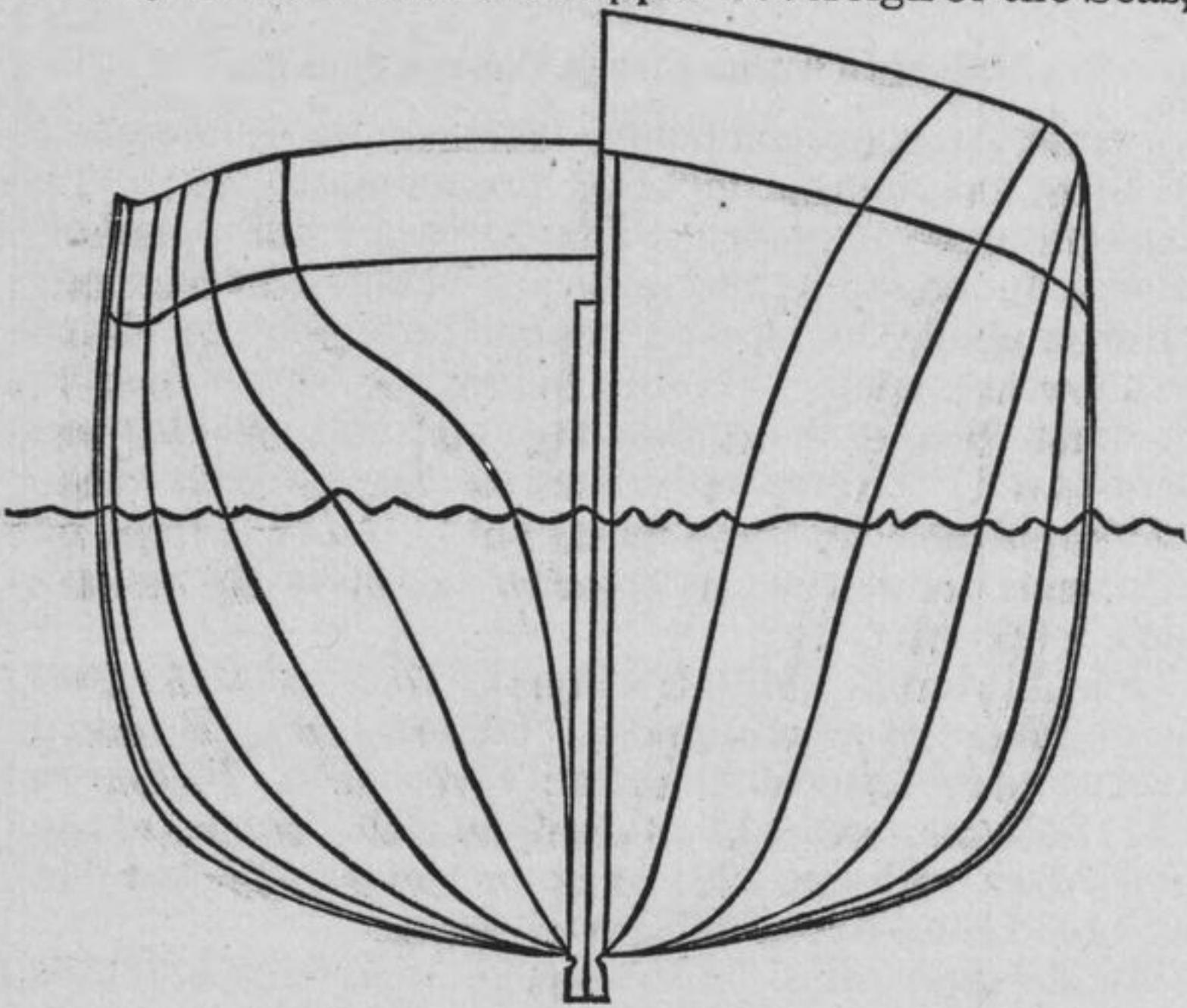


FIG. 5.—Sovereign of the Seas.

2421 tons, 245 feet long on the keel, 44½ feet broad, and 25½ feet deep in the hold. She was the largest, sharpest, and longest vessel in the world at the time of her con-

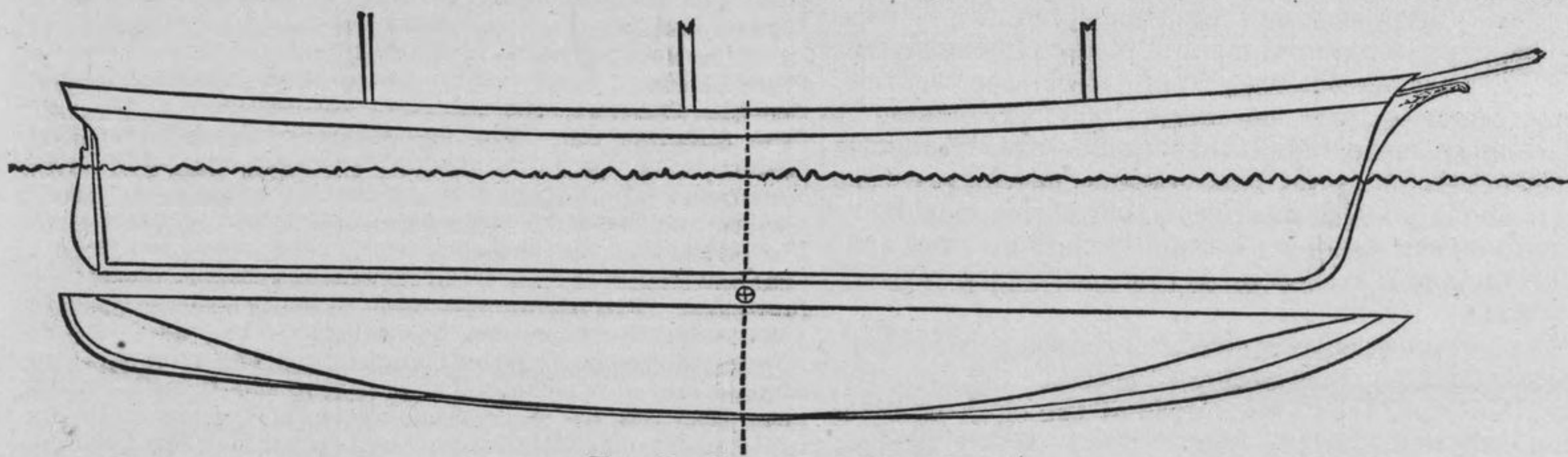


FIG. 6.—Sovereign of the Seas.

struction. In four days she ran 1367 miles, an average of 341½ miles a day. Once she made 436 miles in twenty-four hours. This ship earned \$200,000 gross during the first eleven months of her existence. The Comet, built by William H. Webb at New York, ran from San Francisco to the home port in 76 days. This time has never been beaten except by the Trade Wind, which made it in 75 days. The Comet sailed from Liverpool to Hong-Kong, 13,040 miles, in 84 days. The Young America, built by Webb, ran from San Francisco to New York in 83 days, and sailed 365 knots in twenty-four hours. The famous clipper Red Jacket, designed by Samuel M. Pook, has run from New York to Liverpool in 13 days 11 hours. That achievement stands to the credit of many other American vessels, however. The Dreadnaught beat that time by 3 hours. She was 200 feet on deck, 40 feet wide, and 26 deep—1413 tons. The Red Jacket has

made the run from New York to Melbourne in 69 days 11 hours. The clipper Northern Light ran from San Francisco to Boston in 76 days 8 hours. The Euterpe, of Rockland, Maine, sailed from New York to Calcutta, 12,500 miles, in 78 days.

The largest clipper ever built was the Great Republic, 4000 tons, launched in 1853 at the yard of Donald McKay in East Boston. This ship was 325 feet long, 53 broad, and 39 deep. Aft she drew 28 feet of water. For 60 feet from the bow the keel gradually rose as it went forward, until at the gripe-piece it described the complete arc of a circle. The bow was sharp, but the rising keel was introduced to make the entrance cleaner and lessen the resistance still more, while at the same time giving additional strength to the bow. The ship had a long, clean run, hollow water-lines, and sides which swelled four feet, like an ancient man-of-war. The bottom was full and flat, the dead rise being 20

inches only. There were four decks and four masts, the height of the latter being very great. From keel

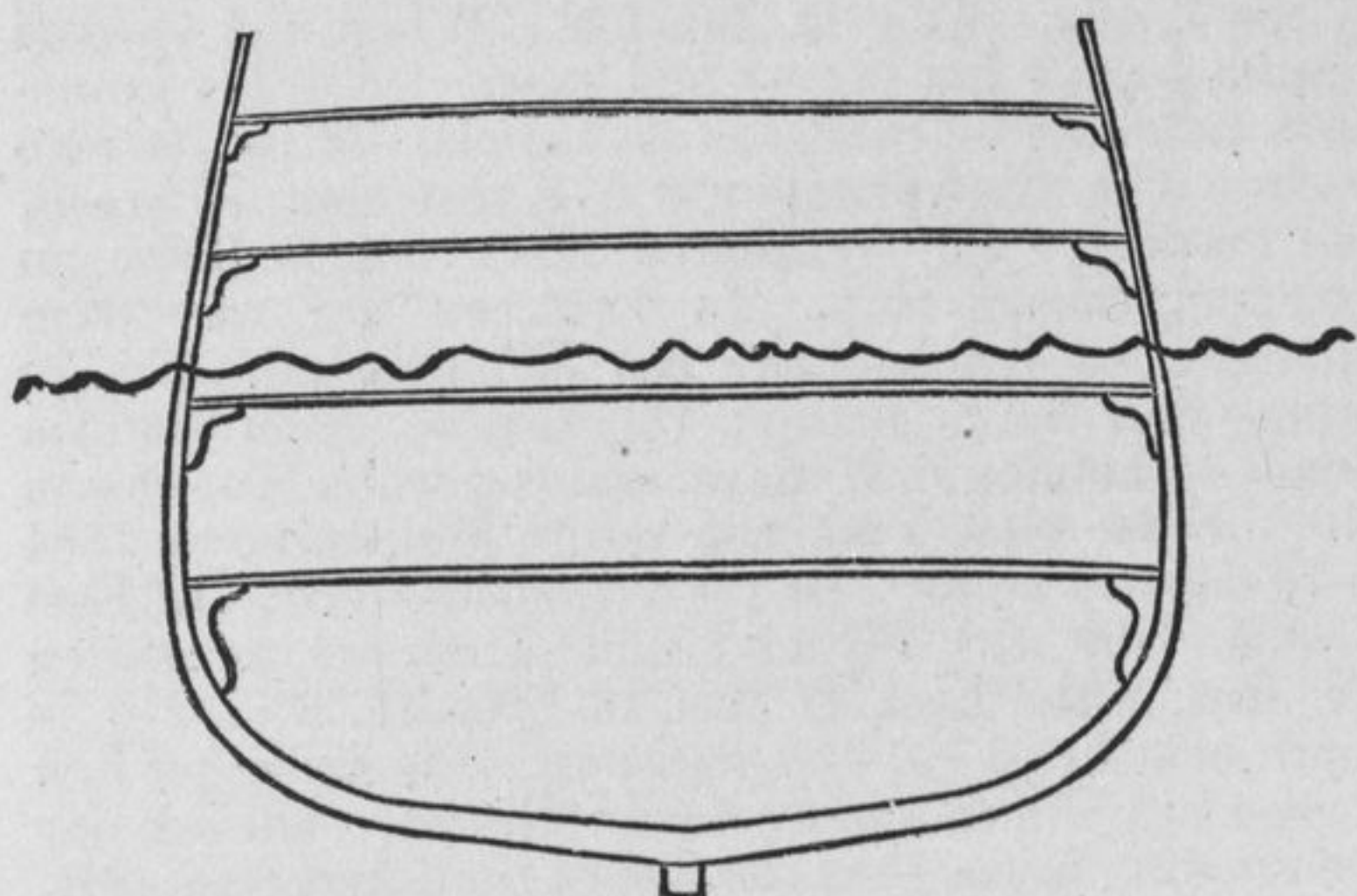


FIG. 7.

Midship Section of the Great Republic.

to truck the perpendicular distance was—foremast, 227 feet; mainmast, 228 feet; mizzenmast, 204. The spanker mast was short. There were 15,653 yards of canvas in her sails, the main yard being 120 feet long. Unfortunately, the Great Republic never had a chance to show her speed. While loading at New York for her first voyage she caught fire, and the topsides were burned off. She was cut down to a three-decker then, and supplied with three masts only. In that form her performance was never regarded as specially remarkable. (See fig. 7.)

The Lightning, built by Donald McKay in 1854, was one of his smartest clippers. She ran from Boston to Liverpool in 13 days 20 hours; Liverpool to Melbourne in 77, 65, and even in 63 days, and the return voyage in 64 days. She was 227½ feet on the load-line and 44½ feet broad, and drew 17 feet of water.

The disappearance of the packet and clipper ships was due to the establishment of well-managed steam lines on all the principal routes of ocean trade and travel. (H. H.)

CLOCKS. The conditions under which clocks are manufactured in the United States are so different from those which obtain in Europe as to require an entire change in the system of manufacture. While in Europe very few, if any, factories turn out over 10,000 per annum, in this country more than that number are frequently furnished and shipped from a single factory per week. American manufacturers rely on labor-saving machinery to produce their goods with rapidity and at a price that shall command a sale even in the most distant parts of the world.

The enormous plant required to produce goods cheaply necessitates a great outlay of capital. Between the years 1852 and 1857 two-thirds of the clock-manufacturing companies in the United States either failed or were compelled to withdraw from the business on account of the great competition in prices; and at the present time the entire industry is in the hands of some six or eight firms, of which number three produce about two-thirds of the whole amount manufactured. The most prominent firms are the Ansonia Clock Co., Brooklyn, N. Y.; Seth Thomas Clock Co., Thomaston, Conn.; New Haven Clock Co. of New Haven; E. N. Welch Manufacturing Co., Forestville, Conn.; Waterbury Clock Co., Waterbury, Conn.; and, for a higher class of clocks, the Howard Clock Co. of Boston, which devotes itself to regulators, bank, office, and turret clocks.

A description of the new factory of the Ansonia Clock Co. of Brooklyn, N. Y., will give an idea of the system which is adopted at all the factories in the United States. The floor-space occupied amounts to 142,000 square feet, and is divided between the main factory, foundry, wood-shops, varnish-rooms, dry-kilns,

and engine-house. The power is furnished by two 250-horse-power engines, and all the buildings are lighted with gas made on the grounds. Throughout the entire works at every fifteen feet there is an automatic fire-extinguisher, so arranged that when the temperature reaches a given point water will be thrown entirely across the room. More than forty miles of pipe are required to distribute steam, gas, and water throughout the works.

The number of hands employed in May, 1881, was 1075, a considerable proportion being boys and girls, as the machinery is to a great degree automatic. The brass for the plates, wheels, etc., is rolled in a separate factory, owned by the same company, at Ansonia, Conn., and is prepared to a standard gauge for each required part.

The plates are first cut to size, and all the brass not required for the support of the train is removed by a single blow of a punching-machine, the plumper of which has the shape of the parts to be removed. The plate is then passed to another machine, which punches all the holes for the posts and pivots except where the holes are of less diameter than the thickness of the plate; the position of these holes is marked by this machine, and they are drilled at a separate operation. After the plates are cleaned by being placed with sawdust in large iron holders which revolve at an angle, thus causing the pieces to rub one against another, they are taken to the finishing-room, dipped for a moment in boiling acid, thoroughly washed, dried in sawdust, and treated with a very thin coat of lacquer; after which they are spread to dry on large metal tables heated by steam. The plate is then ready to receive the posts or pillars: these are made of heavy wire, which is fed through a straightening machine to an automatic cutter, which cuts them exactly to the required length; then they are fed to a machine for cutting the shoulders, both of which are cut at the same moment. The wire is grasped in the centre and held horizontally while two revolving cutters advance, one to each end, and, having been cut to the required depth, which is regulated by a gauge, the wire falls into a receptacle provided, and the operation is repeated. The same method is substantially used in all cases where wire is required for the pivots or posts in any part of the clock. The blanks for the wheels are punched and gutted in the same manner as the plates. A workman takes from 60 to 80 of these blanks and passes a spindle through the centres, care being taken that the blanks are firmly fastened, so that they may not move while being cut. The spindle, with its charge of blanks, is placed in the cutting-machine in a horizontal position. The cutters revolve vertically at a right angle to the plane of the intended wheel. Each tooth requires three cuts to complete it—the first a saw cut, next the rounding up, and thirdly the finishing cut. The three cutters are upon separate arbors, being placed in exactly the same line, and as the workman with one motion passes the charge of blanks under each cutter in the proper order, the entire tooth is practically cut at the same time. The time required to cut one charge of from 60 to 80 wheels averages about three minutes. The pinion most used in the American clocks is that which is known as the lantern. The wires for the arbors, cut to the required length, are placed upon an inclined plane, down which they pass in regular order, while the planchets for the top and bottom of the pinion (being first punched a little larger than required when finished, and also drilled in the centre to receive the arbor) are placed in a hopper.

The machine being started, one wire falls from the plane and is brought opposite the hole in the planchet; at the same moment a plunger, working horizontally, strikes the wire and drives it the required distance to place the pinion in the proper position on the arbor. The top and bottom of the pinion being thus placed, it is next passed to a workman who turns off any surplus metal, and if a shoulder is required anywhere on the arbor, it is turned at the same time. To accomplish this, two cutters are placed in a holder which works in a guide, but is directed by the hands of the workman; this holder is squared in the centre and rounded where the workman grasps it at either end. The cutters, being set at the proper distance, of course make two cuts, either in a plane parallel with the axis of rotation or at right angles to it, as may be desired. Two other cutters are placed in the same holder at 90° from the first, so that four cuts may be made by revolving the holder one-quarter of a revolution. The heads, now being finished, are drilled to receive the wires which constitute the leaves. This operation is mostly performed by girls. An arbor bearing

the top and bottom of the pinion is grasped horizontally in a clutch which is connected with a plate having as many holes as leaves are required in the pinion; this part is then advanced against a drill also working horizontally and revolving at a speed of about 18,000 revolutions per minute; the hole is drilled through the head of the pinion and partly through the bottom, accuracy in depth being secured by a stop. The sliding holder is withdrawn and turned to the next hole in the plate, when the operation is repeated until the proper number of holes is drilled.

The blanks are then ready to receive the leaves: these are of steel wire, which is polished and cut to the required length, a trifle less than the depth of the holes already drilled. Girls then drop these small wires with astonishing rapidity into the holes; they are passed directly to another series of hands, who by a few light blows of a riveting hammer worked by the foot close the holes over the ends of the leaves, and the pinion is finished.

The main springs (weights being very little used at present except where great accuracy of time is desired) are coiled and tempered as any other spring would be, and each spring is then separately tested for strength in the following manner: One end of the spring is fastened firmly to a holder, and the other is connected to an arbor which is allowed to revolve; suspended from this arbor is a weight which the spring in uncoiling is required to raise to a given height. Failing to do this, it is rejected. All the smaller parts of the clock, such as the clicks, lever, etc., are made by automatic machinery. A considerable proportion of the clocks at present made are of the small lever style, going in any position. The manner of making the balance-wheel is interesting. A brass tube slightly larger than the required diameter of the wheel is placed in a lathe, and the workman turns out the inside to a gauge, and afterwards, with another cutter on the same lathe, the outside circumference of the wheel. A cutter working vertically then cuts the circle from the tube, the cutter being so shaped as to finish the inside surface at the same time. One man will turn 3000 balances per day. The next process is to drill the holes for the arms. The rings of metal are placed singly upon a vertical hub made so as to revolve one-third of a revolution at each movement; this hub moves upon a horizontal plane and brings the part to be drilled against a fast-revolving drill. One hole being drilled, the hub is drawn back, turned 120°, and the operation repeated; the small steel wires are then inserted to connect the periphery with the collet which fits the balance-arbor.

The making of the hair-springs requires more skill on the part of the workman than almost any other portion of the clock. The steel is rolled to the proper thickness and cut the desired width. The operative then takes four of these strips and places one on top of the other, being careful that the ends are exactly even. He then puts one end in a slit in an arbor similar to those used by watchmakers to wind main springs. This arbor is then slowly and carefully revolved until the strips are almost wound inside of a small box like a shallow main-spring barrel of a watch: just before the winding is completed another strip of steel is inserted of sufficient length to exactly fill the box, thus preventing the coils from expanding. A small metal table heated by a gas-flame is placed on the workbench immediately before the workman, who, as soon as the spring is wound, removes it, still in the box, and places it upon this heated table to temper, watching the process carefully and judging by the color when the springs should be removed. The completed hair-spring is then fastened to the collet by inserting the end of the interior coil in a diagonal cut in the collet, which cut is closed by a light blow with a hammer.

As the various parts are finished they are taken to the store-room and placed in separate bins until wanted. The work of putting the clock together is done by girls. The lower plate having been placed in a clutch on the work-table, the various parts are taken from the different boxes, put into their proper position, and the upper plate put on and fastened either by screws in the posts or by pins. The rapidity with which this operation is performed is wonderful: each girl is expected to put about 400 clocks together in a working day.

From the setter-up the movement now passes to the adjuster, who inserts the balance-wheel and approximately regulates it. The men to whom is entrusted this operation are placed by twos in separate rooms. A clock with the same calculations as those to be regulated is placed in a position where the vibrations can be distinctly heard. After putting in the balance-wheel the workmen compare the vibrations for a few seconds, and either shorten or lengthen the hair-spring as the case may require until the clock under regulation makes forty synchronous vibrations with the standard, when it is considered regulated; and so ex-

pert do these adjusters become in detecting a difference in vibrations that a movement seldom varies three minutes in twenty-four hours. If the variation reaches this amount it is returned to the person who adjusted it and is charged against his work.

The striking part of an American clock is totally different from that of a French or English clock, both the locking and striking part being between the plates instead of under the dial; the rack and snail are entirely discarded, and in place a wheel is substituted having twelve deep cuts, into one of which a wire arm falls after the striking of each hour. Between these deep cuts ratchet-shaped teeth are cut on the periphery of the wheel, in number in accordance with the strokes required for the several hours. This wheel is placed on the same arbor with the wheel bearing the lifting-pins for raising the hammer, but is held in its place by a spring allowing a free motion separate from the wheel with which it is placed. Projecting from the pinion which meshes into the wheel bearing the lifting-pins is a pin which upon each revolution of the pinion catches one of the ratchet-shaped teeth before described and moves it forward. As the number of leaves in this pinion is the same as the number of teeth between the lifting-pins, it follows that at each strike of the hammer the count-wheel is advanced one tooth, and when one of the deep cuts is reached the arm falls and completes the locking. To effect the warning and locking an ingenious system of light wire rods bent in dies to the proper shape renders the parts very inexpensive to construct.

The manufacture of the cases is a very important branch of a clock-factory. For many years the only forms of case known were the large square and the sharp-pointed Gothic, but as the popular taste improved these passed away, and the success of a manufacturer is now due as much to the style of his cases as the quality of the movements. For the wooden cases the wood is first dried in large kilns, being so stacked that the heated air will pass over and under each piece; as the air becomes filled with the moisture from the wood, it is drawn off in such a way that a constant circulation is maintained.

The smoothing of the wood is very expeditiously and effectively done. Instead of the ordinary method of sand-papering by hand, drums 5 feet in diameter, driven by steam, are covered with a coating of sand, and the part to be smoothed is held for a moment against the face of the drum, and all inequalities are thus removed. When it is required to sand-paper a moulding the reverse of the moulding is cut upon the drum, covered with sand, and when the moulding is brought in contact with this surface the polishing is done very thoroughly.

Within the last few years iron cases in imitation of the French marble clocks have been in great demand; these are so cast as to secure as good a surface as possible. They then receive three coats of lacquer, and after the application of each coat except the last they are baked in large ovens for four hours. When the finishing-coat is applied they are left in the ovens for twelve hours. After the movements are put in the cases they are again run for twenty-four hours, and then packed for shipment.

The amount of capital invested in this industry is, as nearly as can be ascertained, \$3,250,000; operatives employed, 3500; annual amount of wages, \$1,500,000; annual production in value, \$5,000,000; number of clocks produced annually, 1,750,000. About one-third of the entire production is exported to foreign parts.

(G. W. R.)

CLOGHER (Gaelic, *cloch*, stone) is the name of three parishes in Ireland: one in Tipperary, with an area of 8119 acres and a population of 1600; one in Louth, 7 miles N. E. of Drogheda, with an area of 1809 acres and a population of 1300, mostly engaged in fishing; the third Clogher is a town as well as a parish in county Tyrone, about 7 miles W. of Aughnacloy. It is built on a hill where, as the name implies, building-materials abound, and the houses are more substantial than in many Irish villages. Being the residence of a bishop, it has a cathedral and palace, which, with the churchyard wall, form one side of the only street. It was erected into a borough in the reign of Charles I., and

returned two members to Parliament, but at the time of the legislative union with England it was disfranchised. The area of the diocese is 49,761 acres, and the population 14,000. (J. M.)

CLONTARF is a village about 3 miles N. E. of Dublin, Ireland, and gives the name to one of the suburban parishes, embracing 1190 acres. The name, in the original Gaelic, is *Cluan Tarrbh*, or the "Bull's Meadow." Out a little from the north shore of Dublin Bay there is a bank against which the waves strike with a noise resembling the roaring of a bull; so the bank came to be called "the Bull," and the beautiful meads inland became the "Bull's Meadow," in accordance with the fine fancy which so often regulated the formation of Celtic names. The village, which stretches in a rather disconnected way along the roadside, consists of the greatest variety of dwellings, from the humblest cabins to the fine seaside residences of the prosperous Dublin merchants. Inland from the road are substantial mansions surrounded by beautifully laid-out grounds, and forming perhaps the most salubrious of the numerous immediate outlets of the Irish capital; and both villas and village are largely resorted to for bathing purposes. The population of the parish is 4209, and is increasing. Clontarf occupies a prominent place in Irish history, being the scene of one of the most signal victories ever won by the Irish for themselves. The battle was fought on Sunday, 18th of April, 1014, under Brian Boromhe, king of Munster, on the native side, and Maelmordha on the side of the Danes, who were defeated and their dominion in Ireland brought to an end. Clontarf was to have been the scene of one of O'Connell's "monster meetings" in 1844, but the Government having interdicted the meeting, it was countermanded by O'Connell. (J. M.)

CLOUDS. There are several natural phenomena which, though not apparently so, are identical in origin and general character. Of these we may name the "sweating" of the outside of a pitcher of cold water; the hoar-frost which forms on the inside of a window in cold nights; the deposition of dew; the formation of fogs or mists; and the production of clouds in the upper atmosphere. The cause to which these several effects are due is a double one. Primarily, it is the absorption of water-vapor by the air, which takes place at all points of the ocean-surface and over all inland waters, the saturated air being conveyed to the higher regions of the atmosphere by its tendency to rise when warmed, and distributed over all parts of the land-surface by the agency of the winds. If this were all, the atmosphere would soon everywhere become fully saturated, and no further evaporation and absorption of water could take place. But, secondarily, the saturation-point of the atmosphere changes with every change of temperature. When chilled, it is unable to hold as much vapor as when warmed; and the excess vapor is condensed into water, which is suspended as fog or cloud, or falls as rain. The exact effect of chilling is the following. It is known that air doubles its capacity for water-vapor with every 27° increase of temperature, this capacity at 32° F. being $\frac{1}{160}$ its weight of transparent vapor. In consequence, a cubic foot of fully-saturated air at 80° will hold 10.81 grains of water; at 60° it will hold but 5.87 grains. If chilled to this extent, nearly 5 grains of water must fall as rain from every cubic foot of air. Such a variation of temperature is incessantly taking place in the air, which constantly loses its contained vapor in consequence. This loss is replaced by new evaporation, and thus a steady circulation goes on, the ocean feeding the rivers through the medium of the atmosphere.

Warm air is chilled by contact with cold surfaces, by expansion, and by contact or mixture with colder air. In the examples mentioned, of the pitcher and the window, it is the contact of warm moist air with a cold surface, which forces it to deposit some of its vapor as water. In like manner, the rapid radiation

from the earth's surface, of a clear night, chills the surface and the air in contact with it. The air thus loses to some extent its capacity for vapor and deposits part of it as dew, or as frost if the temperature be sufficiently reduced. Fogs and mists arise from the same general cause. The atmosphere is chilled to some distance above the cold surface and its vapor is condensed into water, which remains suspended in the atmosphere instead of falling. Clouds differ in no respect from fogs, beyond that of their greater height. They also arise from the chilling of warm, moist currents of air, and the consequent reduction of their saturation-capacity. These may be uprising currents, which are chilled by expansion or by mingling with colder layers in the upper air, or they may be horizontal currents or winds, which blow into colder regions. In the action of mountains on moving air all these influences are combined. The horizontal winds are forced upward by the mountain, and chilled both by expansion and by mingling with the colder air of the higher atmosphere, and also by contact with the cold surface of the mountain. It is for this reason that rains are particularly abundant in mountain-regions, and that high peaks are apt to be encircled with a cap of clouds. This, indeed, frequently takes the form of a long cloud-streamer, reaching far out from the mountain. Though seemingly the same cloud, such a streamer is, in fact, continually reproduced. It indicates that a current of warm air is blowing over the mountain, its moisture being constantly condensed at the summit and constantly revaporized at the extremity of the streamer. In addition to the above, the daily heating and nightly cooling of the surface of earth and water produce diurnal effects upon cloud-formation, frequently yielding mists or fogs.

In regard to the cause of the suspension of clouds, which is remarkable when we consider the immense weight of water which they represent, there have been various theories. One view holds that the cloud-particles are minute vesicles, or bubbles, of infinitesimal weight. But the prevalent view at present is that they are really solid, but excessively minute. Measurements made by Kaemtz give .00087 of an inch for their average diameter in mists; thus they approximate to the floating motes of the air in weight. They are also undoubtedly sustained, to a considerable extent, by the uprising currents of warm air to which many clouds are due. Yet a cloud is by no means the impassive mass it often appears. Telescopic observation proves that incessant motion and change occur in seemingly unvarying clouds. In many cases it is probable that the cloud-particles constantly descend as rain even when no rain reaches the earth. The gathering drops fall into a region of warmer, unsaturated air below, by which they are revaporized, and thus vanish. In such a condition the cloud is analogous to the mountain-streamer above described. It is constantly moving downward, and is constantly dissipated below and renewed above, its vertical transformation thus resembling the horizontal one of the cloud-streamer. It is only when the falling drops reach the earth that we have the phenomenon of rain. If they become frozen during the condensation of vapor into cloud, snow results. The conditions of congelation which produce hail are not well known.

Fog is the form of cloud whose immediate origin can best be observed. It is found to be always due to the one influence, the chilling of saturated air. But the action of this cause varies. In the one case it is the contact of warm air with a cold surface; in another it is the rising of moist air from a warm surface into colder atmospheric layers. The latter takes place over the warm surface of rivers, whose emitted vapors are carried by warm air into the chilled layers of the night-air above. On the contrary, the nocturnal coldness of the ground in autumn and winter is apt to chill the air for a considerable distance upward and produce those low fogs which quickly vanish before the warm rays of

the sun. This cold air often flows into valleys and fills them with a level sea of white fog, which presents a striking aspect when seen from a mountain-elevation.

Warm ocean-currents are very apt to produce fog. This is markedly the case with the Gulf Stream, whose temperature, in its northern regions, is considerably greater than that of the atmosphere. To its influence are due the dense fogs of the Banks of Newfoundland. Behring's Sea is often very foggy from a like cause. Long, narrow lines of fog are produced at the line of contact of the cold Arctic with the warm southerly winds. Icebergs and Arctic ice-fields also produce fogs by chilling the warmer air that blows over them. A fleet of stranded bergs on the coast of Greenland is apt to destroy all hopes of a hay-harvest by the incessant fogs it produces. The warm moist winds which blow over North-western Europe yield frequent fogs by their contact with the colder land-surface. Similar causes, intensified by the warm air constantly rising from cities, yield fogs of unusual density, of which those that occasionally settle over London are particularly notable.

Observations made upon mountains and in balloons establish the fact that there is no distinguishable difference between a fog and a cloud, and lead to the assumption that their causes are essentially the same. These causes are the following: 1. Radiation of heat from a mass of moist air to the upper sky, through which the air becomes chilled and its vapor condensed; 2. The vicinity of cold ground, particularly of mountain-summits; 3. The cooling effects of expansion when rising air ascends into regions of lower pressure; 4. The contact and mixture of warm with colder air. To the second and third of these causes is due the excessive rainfall of mountainous regions. In the action of the fourth it might be supposed that the mingling of saturated hot and cold air would yield an equally saturated compound at intermediate temperature, but such is not the case, since the saturation-capacity of air increases in a geometrical, while temperature rises in an arithmetical, ratio. Thus a cubic foot of air at 92° can hold 15.7 grains of water; one at 32° may contain 2.1 grains. A cubic foot at 62°, arising from a mixture of the above, would contain 8.9 grains. But the saturation-capacity at 62° is only 6.2 grains; hence from such a mixture there would result an excess of 2.7 grains per cubic foot, which must condense into cloud or fall as rain.

The first attempt to classify clouds in accordance with their apparent forms was made by Luke Howard, an able English meteorologist, in 1802. His classification is still retained. He divides clouds into four species—the cirrus, the stratus, the cumulus, and the nimbus—and distinguishes their intermediate forms by compounds of these; as, cirro-stratus, cirro-cumulus, and cumulo-stratus. The nimbus, or rain-cloud, is otherwise designated as cirro-cumulo-stratus, or as a compound of all three of these forms. Of course this classification can be but partial, since clouds present an extensive variety of intermediate conditions, between the faintest cirrus and the heaviest nimbus. A later author, Rev. W. C. Ley, points out that there are really but two fundamental varieties of cloud, the vertical and the horizontal, and that all intermediate forms arise from various combinations of these. These two forms occur at all altitudes and all times, but the horizontal clouds are more commonly those of the night, of the winter, and of the sea; the vertical, those of the day, of the summer, and of the land.

The cirrus is the fibrous, wispy, or feathery cloud, the "curl-cloud" or "mares'-tails" of sailors. Cirri float at the highest elevation. They may exist—as may, indeed, all cloud-forms—at a far greater elevation than was formerly supposed. Mr. Glaisher, in his balloon-ascent, when five miles high, saw cirri still far above him. At four miles high he passed through rain-clouds, at three miles rain fell on the balloon, and at 14,000 feet he entered a cloud of falling snow. It

is possible that the cirri may at times float at a height of ten miles. They are supposed to be composed of frozen particles, since their action in forming halos, coronas, etc. indicates that they are made up of ice-crystals.

The cumulus is a vertical cloud. Its lower surface is comparatively flat, but above it is heaped into rounded masses which resemble heaps of cotton-wool; hence sailors have named such clouds "balls of cotton" and "wool-packs." Cumuli are especially prevalent in summer, and are due to the condensation of vapor in ascending columns of warm air. The stratus consists of horizontal sheets, whose formation is probably due to the cooling of the earth and lower portion of the air by radiation. They are situated low in the atmosphere, and frequently form at sunset and disappear at sunrise. Another cloud-form, not included in Howard's classification, is that known as "scud," which is characterized by its appearance of extremely rapid motion; this is really due to its low elevation. Still another form of cloud is that of the waterspout and land-spout; this is produced by condensation in whirling columns of air. Horner estimates waterspouts at from 2 to 200 feet diameter, and from 30 to 1500 feet height; Cæsted calculated some landspouts to be 5000 or 6000 feet high. The spout is supposed to consist of warm, moist air, which ascends in a rapid spiral, while the whirl becomes visible through its condensing moisture. On its disruption heavy showers of pure water descend—not salt water, which would be the case were ocean-water really sucked up the axis of the whirl.

Of the compound clouds may first be named the cirro-cumulus. This consists of well-defined small roundish masses separated by narrow intervals of clear sky. It is formed from the cirrus, whose texture changes, but whose arrangement is retained. This cloud-condition is known as a "mackerel sky;" it is frequent in summer, and attends dry and warm weather. Cirro-stratus consists of horizontal or slightly-inclined masses dense in the middle and thin toward the edges; it is an ordinary precursor of storms. Cumulo-stratus arises from the blending of the cirro-stratus with the cumulus; it is distinctly indicated when the cumulus is surrounded by small, fleecy clouds just before rain begins, and also on the approach of thunderstorms. It often passes into the rain-cloud. The name "cumulo-cirro-stratus" suggests the mode of formation of rain-clouds. A sheet of cirro-stratus spreads at a considerable height, under which cumulus clouds drift. These rapidly increase and become of a black or bluish-black hue, and finally extend into a continuous gray mass, from which the rain falls. On the approach of a rain-cloud from a distance cirri appear to shoot out from its top in all directions. The more copious the fall, the greater the number of these cirri. The breaking up of the lower gray mass indicates that the rain will soon cease.

After a long spell of dry weather the approach of a change is often indicated by cirri; these herald the coming of a warm air-current in the higher atmosphere. When their borders grow indistinct, rain may be soon expected. These high-level clouds are succeeded by lower-level clouds of composite form, which soon spread into the rain-cloud. Local storms begin with the formation of a cumulus cloud. If its borders are sharply defined and its color is white, fair weather is likely to continue; otherwise, rain is likely to fall, and often with the accompaniment of thunder and lightning. Some writers believe that the similarly electrified state of the cloud-particles causes them to repel one another. When, by a lightning-flash in any direction, the electrization is neutralized, drops form and rain descends; this may explain the sudden dash of rain which often follows a flash of lightning. Finally, the cloud dissipates, leaving only streaks of cirrus in the upper air and some flecks of scud below. The cumulus often forms without a shower, forming, as Tyndall expresses it, the capital of a vast column of ascending warm air. This

dissolves at night or subsides into loose stratus. The cumuli are most frequent in summer, when they are apt to appear and grow in the morning, attain their highest elevation at the warmest hour of the day, and descend afterward. Their thickness is from 1300 to 1700 feet; their height, from 1500 to 10,000. At night the clouds descend nearest to the ground.

Clouds are very mobile and readily move before the winds; yet there are some which do not progress. These are such as the mountain-streamers or caps, and banks of cloud suspended over water from which rises a stream of moist air. On such clouds a heavy wind seems to have no effect. They are, in reality, constantly dissipated and constantly renewed. The moisture of the warm air grows visible on touching the cold peak or on account of the passage of the cold wind through it.

As to the distribution of clouds, it depends entirely upon the distribution of saturated air and the existence of conditions favoring rapid variations in aerial temperature. These conditions occur most commonly over the oceans and the contiguous portions of continents, and least so in the continental regions farthest removed from the ocean whence come the prevailing winds. If mountain-chasms intervene, the result is most pronounced. The winds are drained more and more of their moisture as they pass inward, so that more rapid and extreme variations of temperature are necessary to produce cloud and rain; and eventually they become so dry that no change of temperature can cause a condensation of their remaining moisture. These are the regions of cloudless skies and desert soils. Elsewhere the cloud conditions depend largely on the direction of the wind. On our Atlantic coast, for instance, the north-east are the cloud-bringing winds; the north-west, the precursors of clear skies. The southerly winds are intermediate in results, as are other combinations. (C. M.)

CLOVER. See **FORAGE CROPS.**

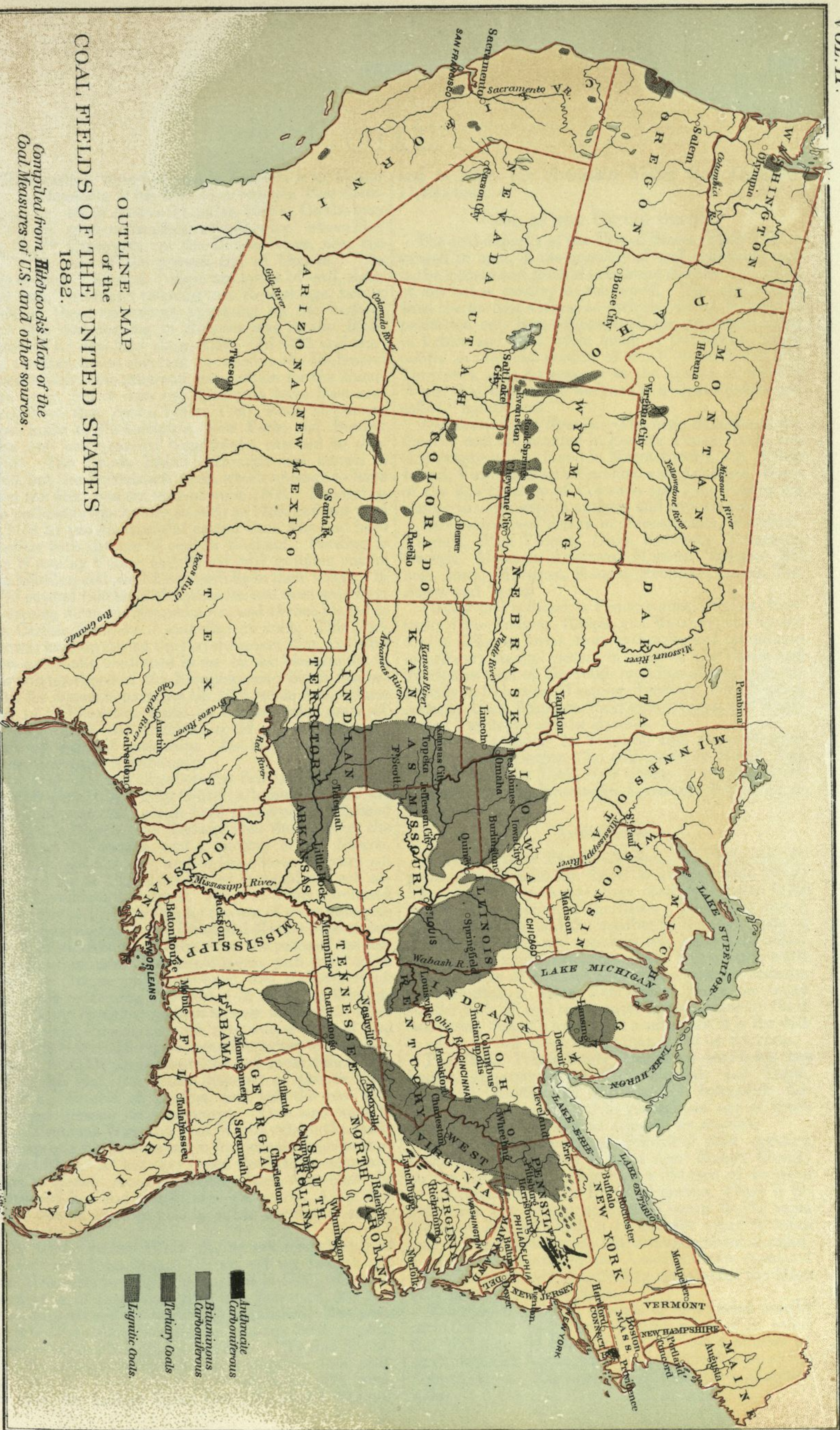
CLUSERET, GUSTAVE PAUL, a French soldier and Communist, born in Paris, June 13, 1823. He was the son of a colonel of infantry in the French army, and was entered at the military school of St. Cyr in 1841. After finishing his course he was appointed sub-lieutenant, and in 1848 was a full lieutenant. He took part with the Garde Mobile, and as commander in the Twenty-third battalion was distinguished in the attack on the barricades. On the 28th of July he received the decoration of the Legion d'Honneur. In 1850 he was a lieutenant in the Fifty-fifth regiment of the line, and when the *coup d'état* was made he, with more than a thousand other officers, was suspended from active service. In 1855 he was appointed a captain of chasseurs and attached to the Arabian bureau of Algerian affairs, in which he was active and valuable. His restless spirit, however, caused him to resign and join Garibaldi in his efforts for Italian independence. In this service he was promoted, after the taking of Capua, to the rank of lieutenant-colonel, and upon the conquest of Sicily and the capture of Naples he was transferred to the staff. At the first sounds of the civil war in the United States he resigned and embarked for America, where he espoused the Union cause, and served as aid to Gen. Fremont and Gen. McClellan, attaining the rank of brigadier-general of volunteers. In 1864 he established a newspaper in New York in the interest of Gen. Fremont's candidacy for the office of President. This enterprise came to an end when Gen. Fremont withdrew his name in favor of Mr. Lincoln, and in 1868 Cluseret returned to Europe to join the Fenians. In the attack on Chester Castle in 1867 he is said to have taken part under the assumed name of Aulif. He escaped to France, but, notwithstanding his vehement denial, he was condemned to death by the English courts, upon his non-appearance, for contumacy. In Paris, where he took up his residence, he wrote articles for the *Courrier Français* on the situation in the United States, which attracted attention, and political papers

in a journal called *L'Art*, which he established. These latter were condemned by the Government, and he was detained for a time in Sainte-Pélagie. While there he conspired with the leaders of the International Commune. He was soon released, and in 1869 he issued, in the pages of *La Démocratie*, *Le Rappel*, and *La Tribune*, a series of violent articles on the condition of affairs in France, and especially on the organization of the army. Upon the issue of a warrant to apprehend him, it was found that he was a naturalized citizen of the United States, and as such he claimed the protection of Mr. Washburne, the U. S. minister. He was ordered to leave France. He was now fully embarked in the International cause, and upon the fall of the Second Empire in 1870 he declared that the fortunate chance for the Commune had arrived—that they must have Paris or destroy it. The revolution of Sept. 4 brought him back to Paris, where he at once assumed the charge of the paper called *La Marseillaise*; but an article called "La Réaction," directed against the Government of the national defence, caused him to be repudiated by his own partisans; even Rochefort denounced him. Thereupon he retired from Paris to take part in the insurrection at Lyons. Thence he went to Marseilles, where he proclaimed himself as military commander in the south of France. Failing, by a large adverse majority, to be returned as member of the Assembly, he was on his return to Paris elected a member of the Commune, but in his dealings with his party he was so haughty, dogmatic, and extreme that he was deposed and arrested. He was confined at Mazas, and only liberated when the French army entered Paris and overthrew the Commune on the 24th of May. He was then concealed for five months by a friendly priest, and in November contrived to escape, first to England, and thence to America. The third council of war condemned him to death for contumacy on Aug. 30, 1872. His principal work, entitled *The Army and Democracy*, was published in 1869. (H. C.)

CLYDE, a village in Sandusky co., Ohio, is at the intersection of the Lake Shore and Michigan Southern Railroad with the Ohio division of the Wabash, St. Louis, and Pacific Railroad, and on the Wheeling and Lake Erie Railroad, 17 miles S. W. of Sandusky. It has a bank, three hotels, six churches, good schools, a weekly and a bi-weekly newspaper, and two monthly periodicals. It has two grain-elevators, two flour-mills, an organ-factory, and manufactures of cutlery, etc. Gen. James B. McPherson was a resident of this village, and there is a fine bronze statue of him in the village cemetery. Population, 2380.

CLYDE, a town of New York, in Wayne county, and in the township of Galen, is on the New York Central Railroad, and on the Erie Canal, 38 miles W. of Syracuse. It is also on the New York, Buffalo and West Shore Railroad. It has a weekly newspaper, six churches, a free reading-room, a union school, an academy, two hotels, and two banks. Its industries comprise manufactures of glass, farm-implements, flour, lumber, and steam-engines. There are also six malt-houses and a fruit-cannery. Population, 2826.

COADJUTOR is the name given, in the Roman Catholic Church, to a clergyman appointed to assist a bishop in the performance of his episcopal duties. He is named by the pope at the personal request of the one needing an assistant, or on the nomination of the prelates of a province. He receives the episcopal consecration and the title of a *see in partibus infidelium*. The principal reasons for asking for a coadjutor are age, infirmity, extent of territory, extraordinary increase of population, other offices in the service of the Church or State. When the coadjutor-bishop is appointed "with future succession," he is properly called "coadjutor;" but when appointed merely during the lifetime of the senior prelate, to relieve him of some of the burdens of governing his diocese, he is more properly called a "bishop suffragan" or "bishop auxiliary." (R. S.)



COAL.

THE earliest record of coal in America is by Father L. Hennepin in his *New Discovery of a Vast Country in America* (London, 1698). On the map prefixed he marks a "cole-mine" above Fort Crevecoeur, on the Illinois River, near the site of the present city of Ottawa. "In this country," he says, "there are mines of coal, slate, and iron," evidently referring not to workings, but to beds of these substances appearing on the surface. The first coal-working in America was in the Richmond (Va.) coal-field about 1750. In 1775 and during the Revolution this fuel was used in the Richmond forges which made arms and ammunition for the American army, but it does not appear to have been sent away from that region before 1789, when shipments were made to Philadelphia, New York, and Boston. This coal was quarried from banks exposed to daylight. The Rhode Island anthracite was known in 1760, but the Portsmouth mine, which appears to have been the first, was not opened until 1808. Pennsylvania anthracite was known as early as 1766, and was used in 1768 by two blacksmiths named Gore who had been familiar with the use of coal in England. Settling in the Wyoming Valley, they found coal cropping out on the hillsides, and used it successfully in their forges. In 1776 several boatloads of anthracite coal were sent from Wyoming down the Susquehanna, and thence hauled to the Carlisle Barracks to manufacture arms. This practice was kept up during the Revolutionary War, and after that anthracite continued in use by the blacksmiths in the neighborhood of the Susquehanna; but it was not used for domestic purposes till 1808, when Judge Jesse Fell of Wilkesbarre made an experimental grate of hickory withes, and found he could get a satisfactory open grate-fire of anthracite. He then made an iron grate, and used it habitually.

In 1791 coal was discovered at Summit Hill in the Lehigh district by Philip Ginter, a hunter, and in the following year the Lehigh Coal Company was formed by Robert Morris, the distinguished financier of the American Revolution, and a number of his friends. They dug out the coal, and in the course of years got some as far as Philadelphia, but it would not sell because it could not be burned. Some of it was purchased by the city of Philadelphia for the use of a steam-engine at the waterworks, then at Broad and Market Streets, but was finally broken up and strewn on the paths of the surrounding grounds. Yet experiments with the "stone fuel" or "stone coal" continued, and the owners of the lands containing it persisted in trying to force its use. They remained without success until 1812, when Col. George Shoemaker took nine wagon-loads of coal from the Schuylkill region, near Pottsville, to Philadelphia. Like his predecessors, he had great difficulty in selling his coal, but finally disposed of two or three loads at the cost of hauling, and left the rest with different persons for experiment. One load went to the Fairmount Wire and Nail Works, where the workmen spent a whole forenoon in fruitless attempts to start a fire with it. At last they closed the furnace-doors and went to dinner; returning an hour later, they found the doors red hot and the furnace all aglow. After that there was no more trouble in either burning or selling anthracite.

In 1814, Charles Miner sent an ark loaded with 24 tons of coal from Mauch Chunk, *via* the Lehigh and the Delaware, to Philadelphia, and in 1820, when the navigation of the former river was improved, 365 tons were shipped and the trade fully established. Two years later the Schuylkill Navigation Company transported by their canal to Philadelphia 1480 tons. We find in 1829 the Delaware and Hudson Canal shipping 7000 tons; in 1833, the Union Canal of Pennsylvania 3500 tons; in 1834, the Lykens Valley Coal Company 4780 tons;

and in 1839, the Shamokin Valley Coal Company 11,390 tons.

COAL IN THE UNITED STATES.

The coal-deposits of the United States (Plate VIII.) exceed in area, in the quantity of coal contained, and in the variety and general excellence of their fuel, those of any other country in the world. The coal ranges from the hardest anthracite—which, indeed, is found in perfection only here—through all the gradations down to lignite and peat, while much of the lignite, which covers an immense portion of the Western States and Territories, is so far superior to the lignites of the Old World that it has been assigned to a separate class and called "lignitic coal."

Distribution and Species.—The main deposits of *anthracite* coal are situated in Eastern Pennsylvania, but this variety is also found in Massachusetts and Rhode Island, Virginia, North Carolina, and Arkansas. Some of the lignitic coals of Colorado and New Mexico are similar to anthracite in analysis and appearance.

Bituminous coal occurs in Pennsylvania, Maryland, Virginia, West Virginia, Ohio, Kentucky, Tennessee, Georgia, Alabama, Arkansas, Missouri, Indiana, Illinois, Iowa, Michigan, Kansas, Nebraska, Indian Territory, and Texas.

Cannel coal is found in Pennsylvania, Virginia, Kentucky, Ohio, Indiana, Illinois, and Missouri; and *lignitic coal* in different forms, from anthracite and bituminous to ordinary lignite, occurs in most of the States and Territories west of the 100th meridian of longitude, especially in Colorado, Wyoming Territory, New Mexico, Arizona, Utah, Montana, California, Oregon, and Washington Territory; also in Mexico.

Lignite is found in Vermont and many Western States and Territories. No coal occurs in Maine, New Hampshire, New York, New Jersey, Delaware, South Carolina, Florida, Mississippi, Louisiana, Minnesota, or Wisconsin.

ANTHRACITE.

ANTHRACITE IN PENNSYLVANIA.—The principal deposits of anthracite are found in Pennsylvania (Plate IX.), where they occupy three closely-connected fields in the eastern section of the State. Their total area is 472 square miles, and the number of workable beds or "veins," as they are popularly but incorrectly called, fifteen, with a total thickness of 107 feet of coal; while the thickness of the measures with which the beds are interstratified is about 3000 feet. There are many smaller beds of coal in the same section, some of them containing fuel of a very good quality, but it is the rule to count no bed which is less than 2 feet in thickness.

The three Pennsylvania anthracite coal-fields are known, respectively, as First, Second, and Third, Southern, Middle, and Northern, or Schuylkill, Lehigh, and Wyoming; and in general use one of these sets of names is about as common as another.

The First, Southern, or Schuylkill field contains basins extending from a point near Mauch Chunk, on the Lehigh River, westward a distance of 44 miles to a bifurcation of the Broad Mountain, where it divides into two prongs, continuing nearly in the same direction, one of which is 15 and the other 25 miles long. The width varies, but averages about 2 miles. Total area, 138 square miles. A smaller basin, separated from the main body by a dividing ridge called the Mine Hill, contains 8 square miles.

The Second coal-field consists of long basins parallel with the First and about 10 miles north of it, called the Mahanoy and Shamokin region, and a number of small detached basins north-east of this, known as the Lehigh region. The total area of this field is 38 square miles.

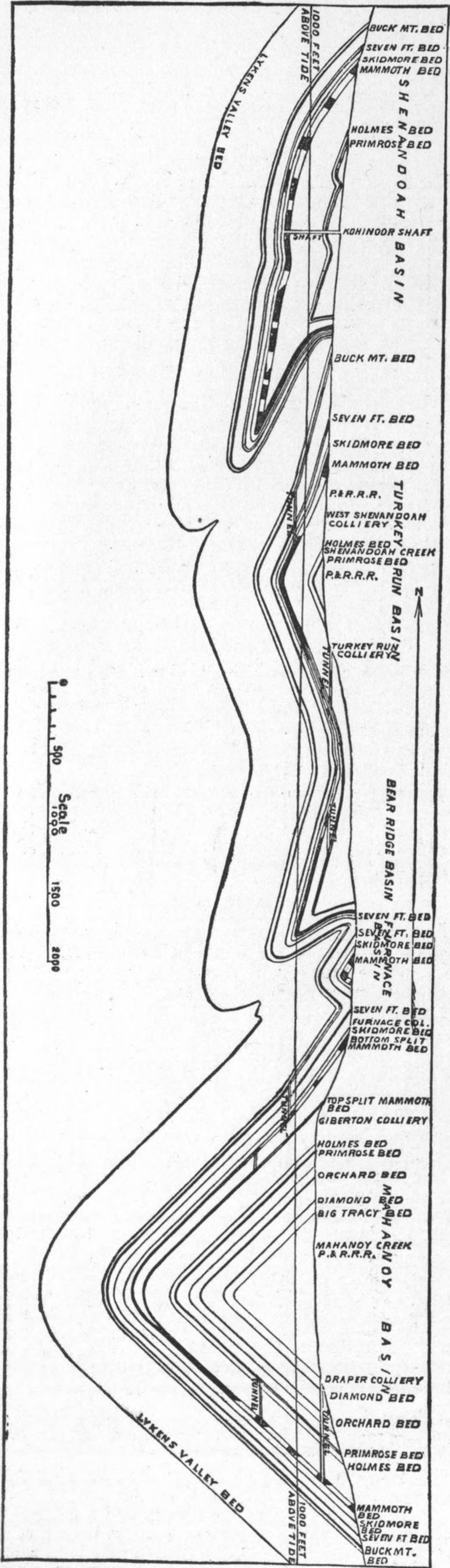


FIG. 1.—Cross-Section of the Second or Middle Coal-field, in the vicinity of Shenandoah, Pa.

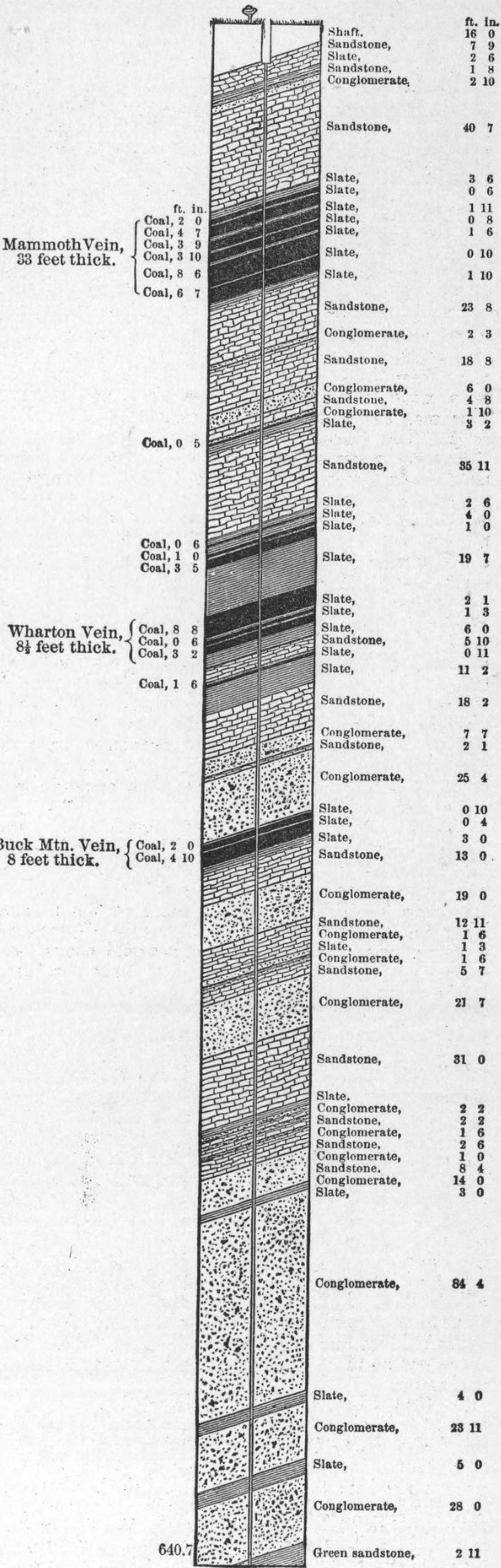
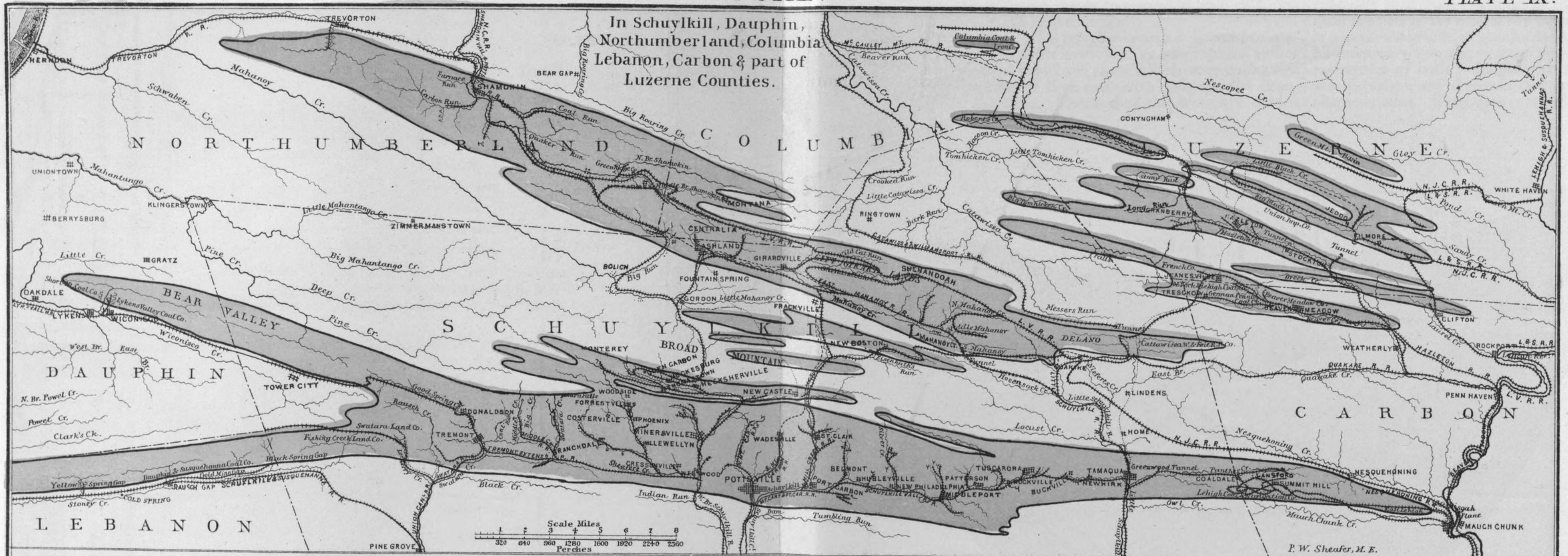
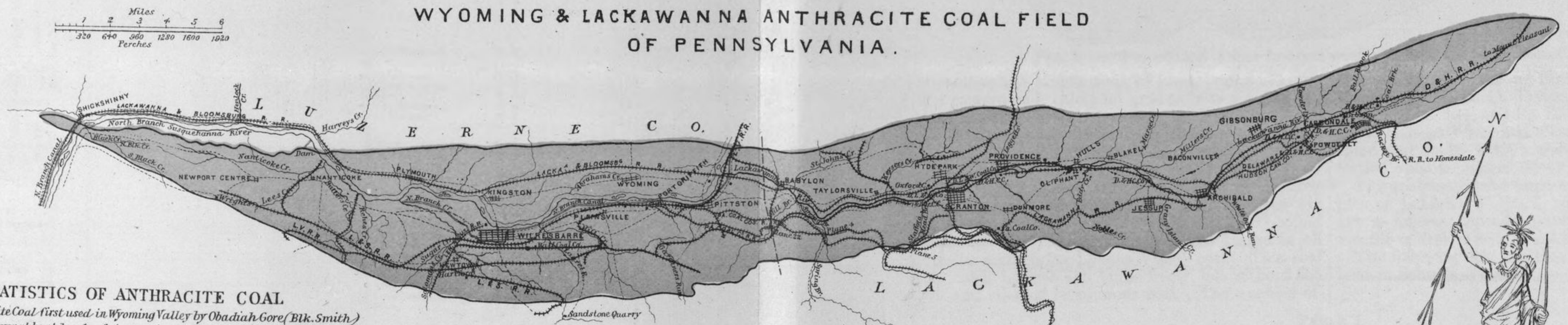


FIG. 2.—Section of the Lehigh Valley Coal Co.'s Bore-hole, No. 19, near Hazleton, Pa., June, 1876.



OUTLINE MAP OF
 WYOMING & LACKAWANNA ANTHRACITE COAL FIELD
 OF PENNSYLVANIA.



The Third field occupies the valley of the Lackawanna River and a part of that of the Susquehanna. It is of crescent shape, and is comparatively regular both in outline and in the arrangement of its beds. This field is about 50 miles long, with a greatest width of 5 miles, tapering almost to a point at each end. Its total area is 198 square miles.

Comparisons.—In popular speech it is usual to consider these coal-fields as divided by geographical rather than geological lines; and there is some warrant for this in the character of their respective coals and the disposition of the beds. The coal of the Northern field is

of nearly uniform quality, and, as before stated, comparatively regular in the dips and flexures of the beds; that in the Middle field is also of nearly uniform quality, though more disturbed in position (see fig. 3), in the detached basins of the Lehigh district, but changes gradually as it goes westward in the Mahanoy region, until the Shamokin coal, at the western end of the field, is a semi-anthracite, a quality between anthracite and bituminous, possessing in some respects the better characteristics of both. In the Southern field the beds are disturbed, and the coals vary greatly in quality and characteristics. They, however, follow the general law

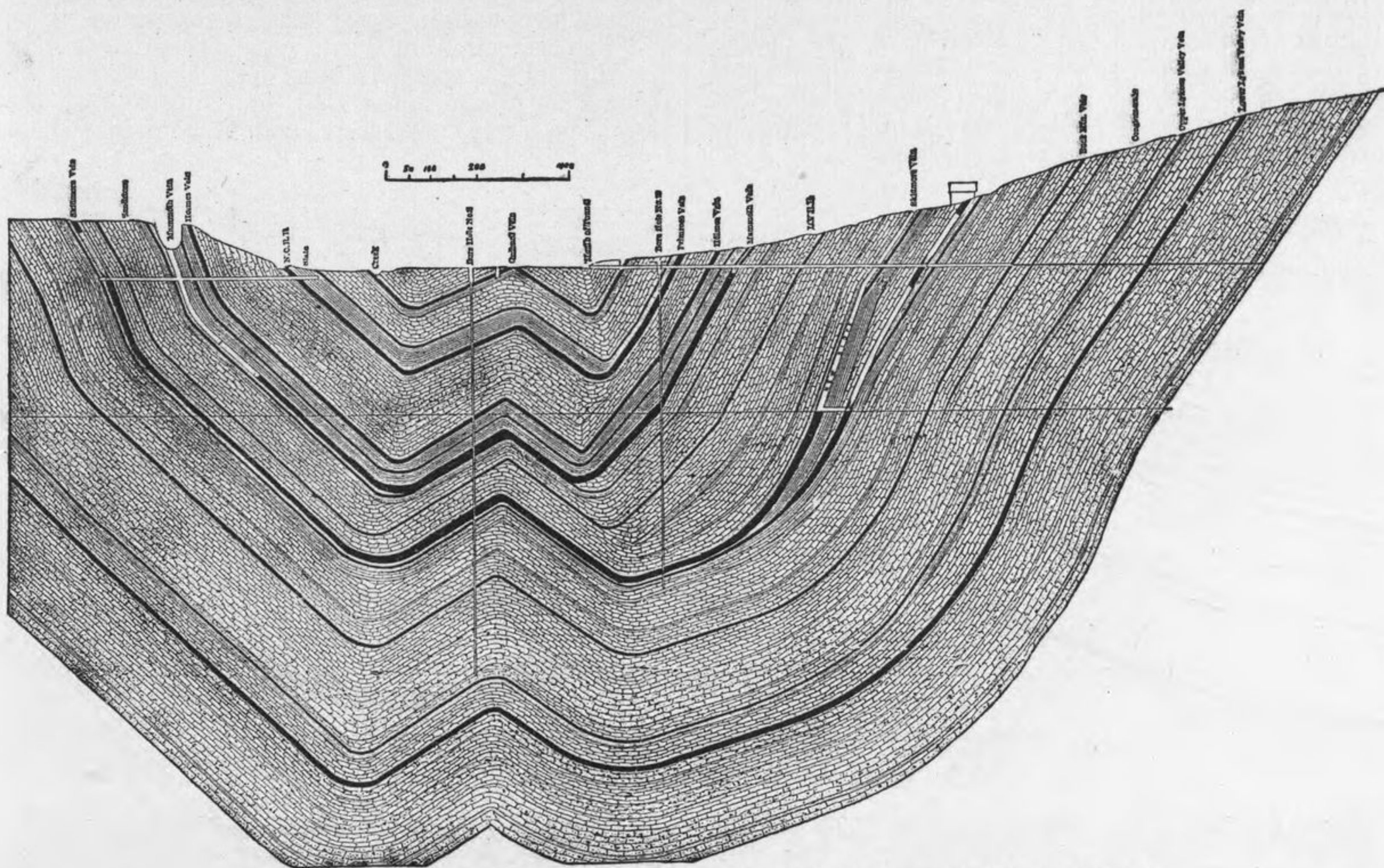


FIG. 3.—Section of Coal Ridge Improvement and Coal Co., near Mount Carmel.

observable in the Middle field, of hard, pure anthracite at the eastern end, changing gradually to a softer anthracite at the western. It is only at the western ends of the Southern and Middle fields that the lowest coals of the series are found in workable condition. These are classified by some authorities as a single bed, and marked as "A," or the beginning of the series; but in Dauphin and Northumberland counties they are two regular beds, averaging, respectively, 3 and 8 feet in thickness, and yielding a product well known in all anthracite markets as Lykens Valley coal. This coal is soft, easily ignited, and burns freely, but without the smoke and odor of bituminous coal. The average of

thirty analyses made by State-Geologist Prof. H. D. Rogers, Profs. R. C. Taylor, W. R. Johnson, J. C. Booth, M. C. Lea, and Dr. Ellet, of samples taken from these beds at Wiconisco shows the specific gravity of their coal to be 1.397; their percentage of carbon, 83.30; volatile matter, 10.42; and ash, 6.11.

The analyses by the same authorities of twenty samples of Lehigh coal (hard, white-ash anthracite) average as follows: Specific gravity, 1.577; carbon, 89.25; volatile matter, 9.86; ash, 4.20.

The following are analyses of anthracite coals from beds in Schuylkill county:

TABLE I.

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	Average.
Moisture.....	1.960	1.500	1.480	1.920	1.440	1.350	1.200	1.250	1.020	1.457
Volatile matter.....	3.240	3.600	3.220	3.480	1.460	0.530	2.640	1.410	2.970	2.494
Fixed carbon.....	86.372	83.619	85.316	88.032	93.502	96.199	89.576	90.986	88.147	89.083
Ash.....	8.300	11.250	9.700	6.330	3.360	1.900	6.250	6.020	7.200	6.701
Sulphur.....	0.128	0.031	0.284	0.238	0.238	0.021	0.334	0.334	0.663	0.252
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	99.987
Pounds of water evaporated by 1 lb. coal...	11.12	11.70	8.82	10.34	11.00	10.36	10.60	10.40	10.10	11.60

Bed.					
I. Little Tracy,	4 ft. 6 in. thick,	from Ellangowan colliery.			
II. Big Tracy,	7 " 2 "	" " "	" " "	" " "	" " "
III. Diamond,	11 " 6 "	" " "	" " "	" " "	" " "
IV. Orchard,	8 " 10 "	" " "	" " "	" " "	" " "
V. Primrose,	13 " 9 "	" " "	" " "	Knickerbocker	"
VI. Mammoth,	37 " 6 "	" " "	" " "	Ellangowan	"
VII. Skidmore,	4 " 0 "	" " "	" " "	N. Mahanoy	"
VIII. Seven-foot,	7 " 0 "	" " "	" " "	" " "	"
IX. Buck Mt.,	13 " 0 "	" " "	" " "	W. Shenandoah	"

The Ashes Test.—Another method of distinguishing different varieties of anthracite—and a very important one from a commercial point of view—is by the color of the ash, which ranges from a pure white in some specimens to a deep red in others. The Lykens Valley coal, just mentioned, yields a light-red ash. Overlying this are four beds of white-ash coal, forming the next or middle number of the series. Then comes a valuable bed of gray-ash, and then a red-ash group.

(See fig. 4.) The color is due to the presence of ferric oxide; and this, in turn, is supposed to have been diffused through the air by volcanic action, to be deposited by rain in the forming coal-beds. Prof. Greene (*Coal, its History and Uses*, p. 63) traces the coloring of the red sandstones to the same source. The well-known intermittent character of volcanic discharges will perhaps account for the coloring of the lowest coals, the absence of color in the middle series, and the deep tint of the ashes of the upper beds; especially when it is considered that the upper beds are thousands of years younger than the lowest ones, and that, as Prof. Greene points out, volcanic action is apt to be most intense when the volcano is about expiring. The commercial importance of the coloring-matter in coal-ashes is due, not so much to its presence or absence as to its furnishing an (apparently accidental) indication of the grade of the coal. All white-

ash anthracites are hard and well adapted for use in blast-furnaces and other fires which require intense heat and great resisting power in the fuel. They all contain a high percentage of carbon, with but little ash, and neither crumble nor cake in the hottest fire. The red-ash coals, on the other hand, are softer, crumble easily, and have a tendency to melt in a hot fire; and the shade of color in the ash is a pretty good indication of the character of the coal in this respect.

Extent of the Deposits.—It is probable that the present anthracite fields of Pennsylvania are but the remnants of a great body of coal which once included them all and filled up the spaces between them, the missing portions having disappeared through denudation. The writer's observations of the geology of the district show that this ancient coal-field must have had an area of about 2000 square miles, and, supposing that all the present beds were coextensive with it, contained about

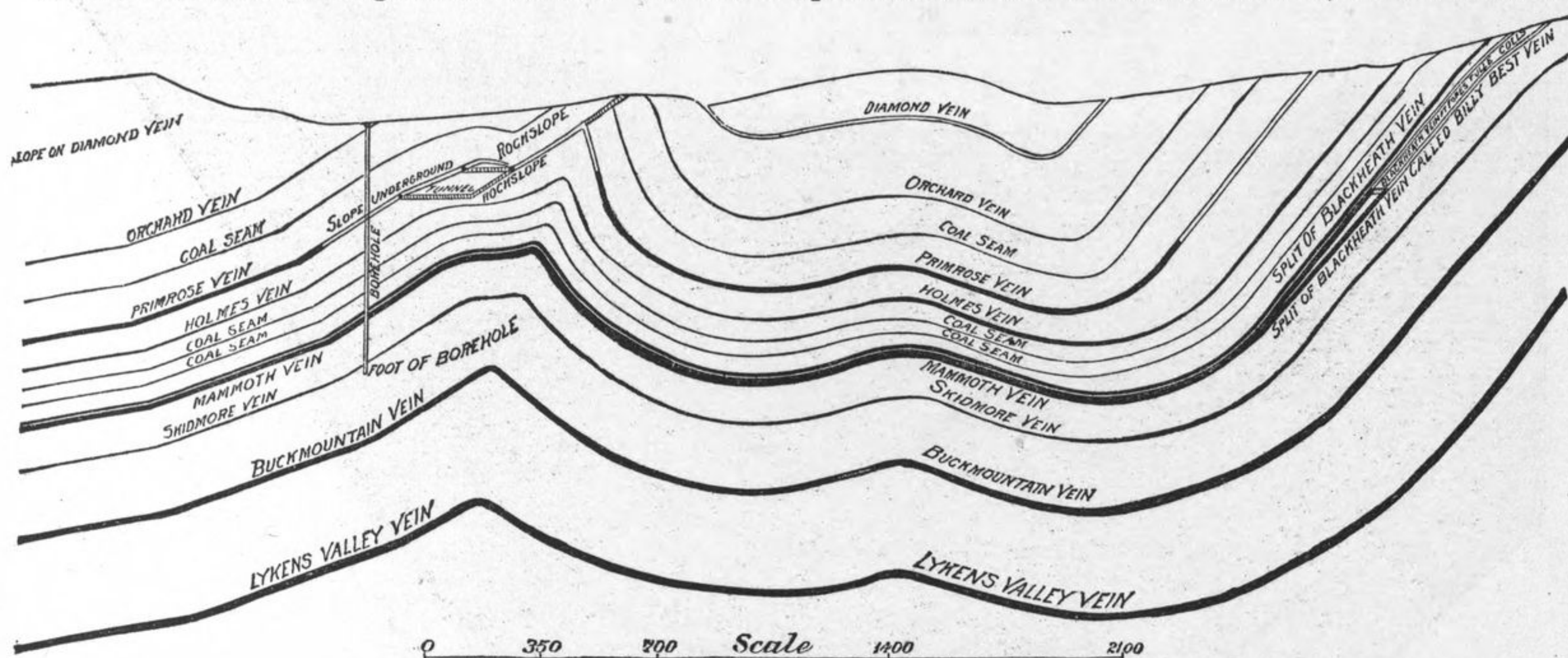


FIG. 4.—Coal-veins at Phoenix Park, Schuylkill co., Pa.

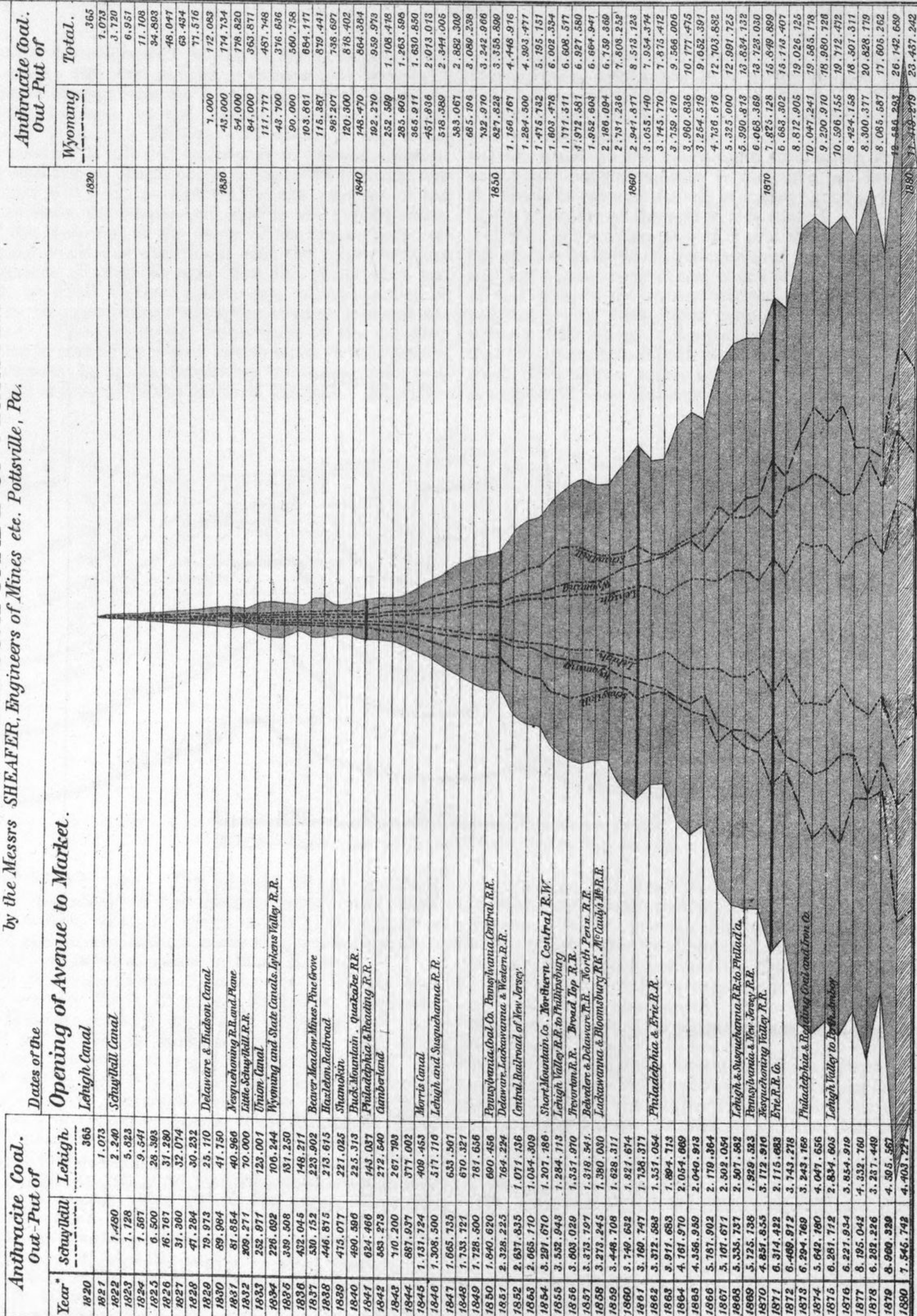
92,840,960,000 tons. The amount of coal available at the beginning of the historic period was about 26,721,093,817 tons, of which 409,597,748 tons were mined and sent to market in the sixty years from 1820 to 1880, inclusive, as shown in Plate X.

The white-ash series of anthracite beds has four members—the Buck Mountain, Skidmore, Mammoth, and Holmes, or B, D, E, and F. (See fig. 4.) Another bed, 5 feet in thickness, called the Ross bed, has been traced in some places, and named "C" by some writers, but it is scarcely extensive or distinct enough to have a separate designation. (See figs. 6, 7, 8, 9, 10.) An outlying branch of the Mammoth bed is also counted separately sometimes, and called the "Seven-foot," from its usual thickness, but it is more properly credited to the great bed with which it is immediately connected. The first in the group, B, or the Buck Mountain bed, has received little attention as yet in the First coal-field, where it averages 8 feet in thickness, though its coal is of good quality. In the Lehigh region and the western end of the Third field it becomes very important, being 16 feet in thickness at the Buck Mountain mines, at the extreme eastern end of the Second field, and increasing to a thickness of sometimes 25 to 30 feet in the central portion. In the vicinity of Scranton, in the Third field, it is only 4 feet thick. On the other hand, its neighbor, the Skidmore, Wharton (or D) bed, is 8 feet thick at Scranton, and contains excellent coal; in the Mahanoy field it is usually 10 feet thick, while in the Schuylkill region it is but 6 feet thick, and its coal is often so rough and slaty as to be unmarketable. The Mammoth bed (E) is the great bed of the anthracite regions, and produces much more of the coal sent to market than all the other beds combined. (See fig. 5.) Its thickness varies from 14 feet or less in the Scranton

district, to 20 in the Wyoming, and from 20 to 40 in the Mahanoy district, and to much more in local enlargements, but its average thickness is 25 feet. It is the bed sought after by all miners, and other beds are opened only when the section of the Mammoth within the operator's territory is being exhausted. It yields a hard, white-ash coal of great purity, which is in demand for furnace use and for other purposes requiring a clear, hot fire. The Holmes bed (F) lies about 100 feet above the Mammoth. It contains from 4 to 6 feet of hard, compact, short-grained, white-ash coal, well adapted for furnace use. The Primrose (or G) bed is 10 feet thick, and produces a gray-ash coal, softer than that of the Mammoth, but excellent for housekeepers' use. Farther west this bed becomes the famous Pittsburgh bed (or H) of the bituminous coal-field.

The measures of the Southern coal-field are shown in the accompanying cross-section of the Philadelphia and Reading Coal and Iron Co.'s shaft near Pottsville, Pa. (Plate XII.). This shaft, near the south foot of the great anticlinal axis of Mine Hill, is the deepest cut in the anthracite coal-measures of the United States, developing a greater thickness of coal-strata and coal-beds than any other shaft in the world. It is located on the east branch of Norwegian Creek, on a lateral branch of the Philadelphia and Reading Railroad, 96 miles by rail from tide-water at Philadelphia. Its mouth is 729 feet above tide-level. The shaft was sunk 108 feet to the Peach Mountain bed, 10 feet thick, one of the Upper red-ash coal series; thence down 431 feet, where the Little Tracy was found, 45 feet thick, much beyond its usual size; at 1100 feet the Diamond bed was cut, 16 feet thick, also much enlarged; at 1559 feet the shaft had passed through all the red-ash coal-beds to the Primrose or gray-ash bed, 17 feet thick, five feet more than its ordinary size; at 1600 feet, the bottom

DIAGRAM OF THE
PROGRESS OF THE ANTHRACITE COAL TRADE OF PENNSYLVANIA
by the Messrs SHEAFER, Engineers of Mines etc. Pottsville, Pa.



ESTIMATED QUANTITY OF ANTHRACITE COAL IN TONS IN THE SEVERAL COAL FIELDS - THE RELATIVE
AMOUNT OF WASTE AND QUANTITY MINED.

SOUTHERN OR SCHUYLKILL COAL FIELD. Average Thickness 25 Yards.		MIDDLE COAL FIELD. Average Thickness 15 Yards.	NORTHERN OR WYOMING COAL FIELD. Average Thickness 15 Yards.
11,306,240,000	7,537,493,334	5,654,464,000	9,199,372,000
291,189,650 Waste 145,594,325 Mined	8,758,746,666	3,902,976,000	6,133,243,000
Probable Waste 2/3	Probable Yield 1/3	Probable Waste 2/3	Probable Waste 2/3
137,956,334 Waste 87,772,877 Mined	145,148,000	145,148,000	287,055,868 Waste 143,327,944 Mined
Probable Waste 2/3	Probable Yield 1/3	Probable Yield 1/3	Probable Waste 2/3

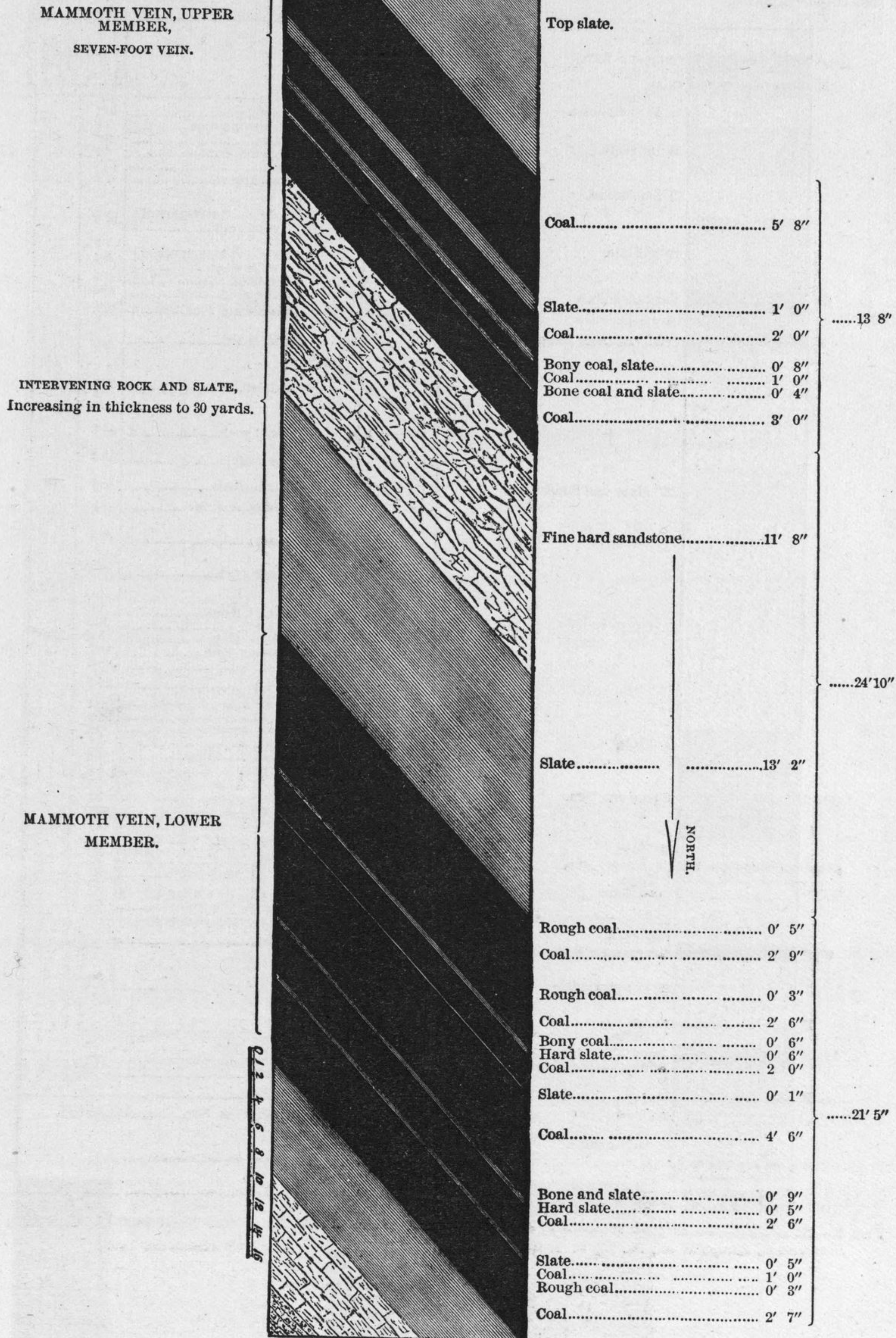


FIG. 5.—Section showing Mammoth Vein at Shenandoah Colliery [Heber S. Thompson, Eng. Girard Estate].
VOL. II.—L

of the shaft, a bore-hole was put down 376 feet to the bottom of the Mammoth coal-bed, here 21 feet thick—making a total depth of 1976 feet, and cutting thirty-two coal-beds in all, twenty-three of which were over 2 feet thick—making

A total thickness of workable coal of.....183 feet.
Also nine beds of coal below 2 feet..... 10 "
To which must be added the Skidmore and Buck
Mountain beds (below the Mammoth)..... 15 "
Total.....208 feet.

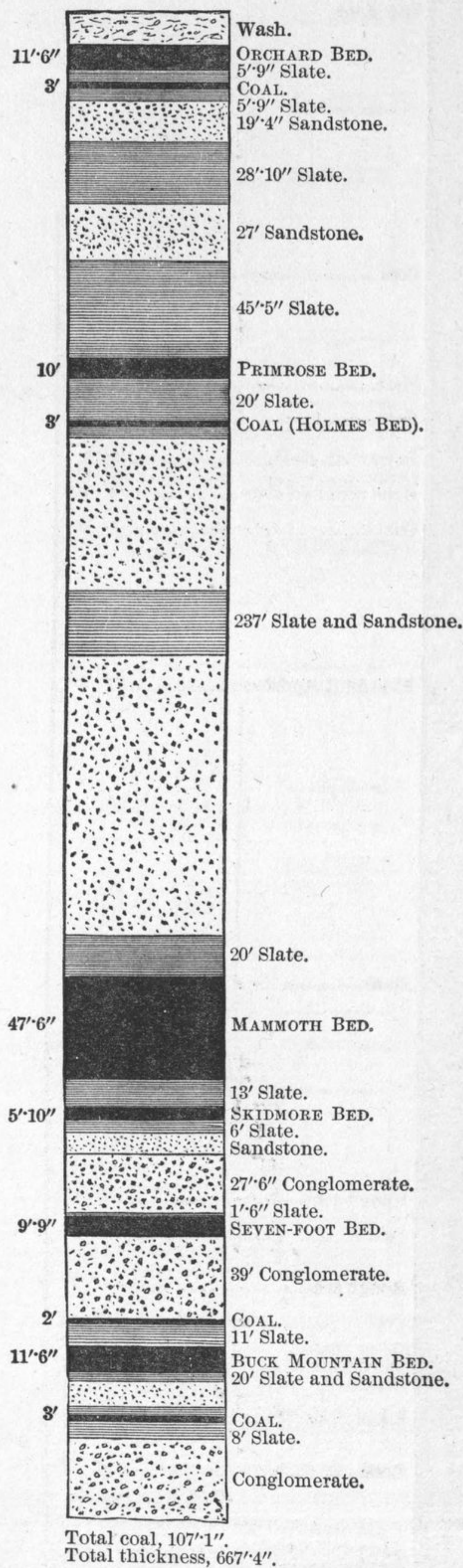


FIG. 6.—Columnar Section of Coal-Measures in the vicinity of Shenandoah, Schuylkill co., Pa. [by S. A. Beddall].

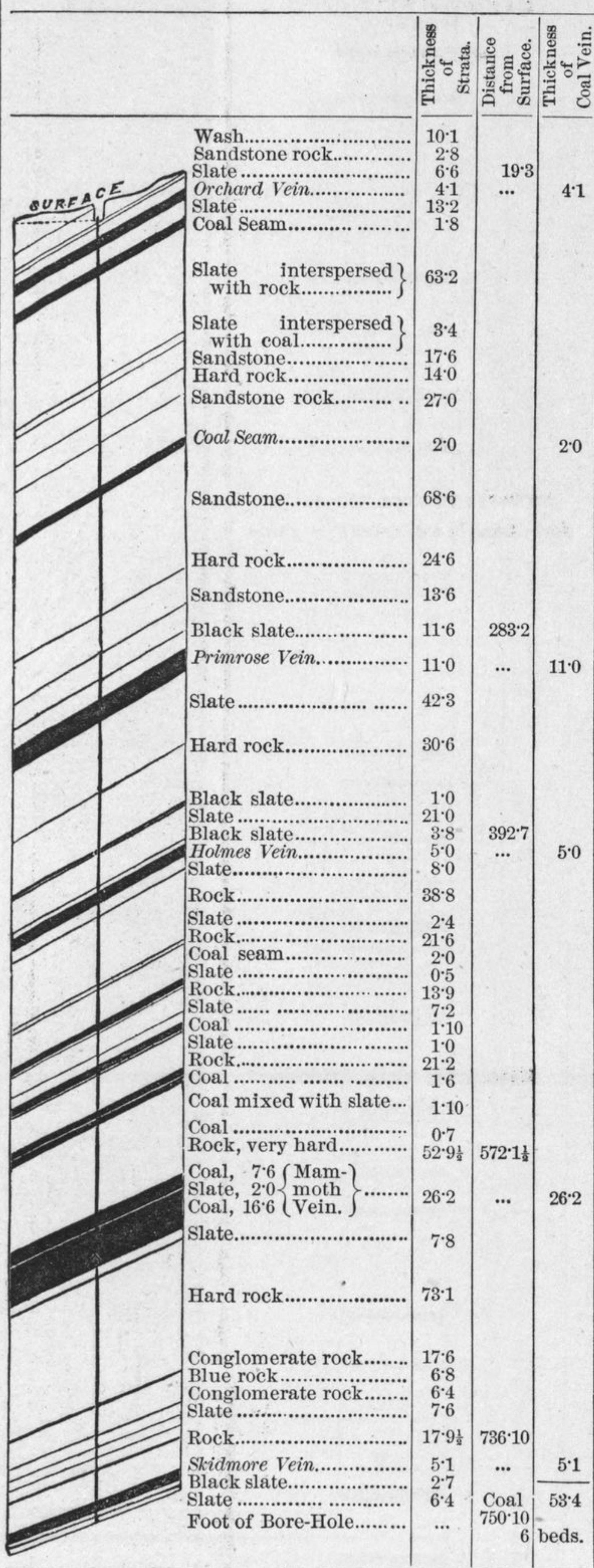


FIG. 7.—Section of Coal-Measures Cut by Bore-Hole. (Scale 120 Feet to the Inch.)

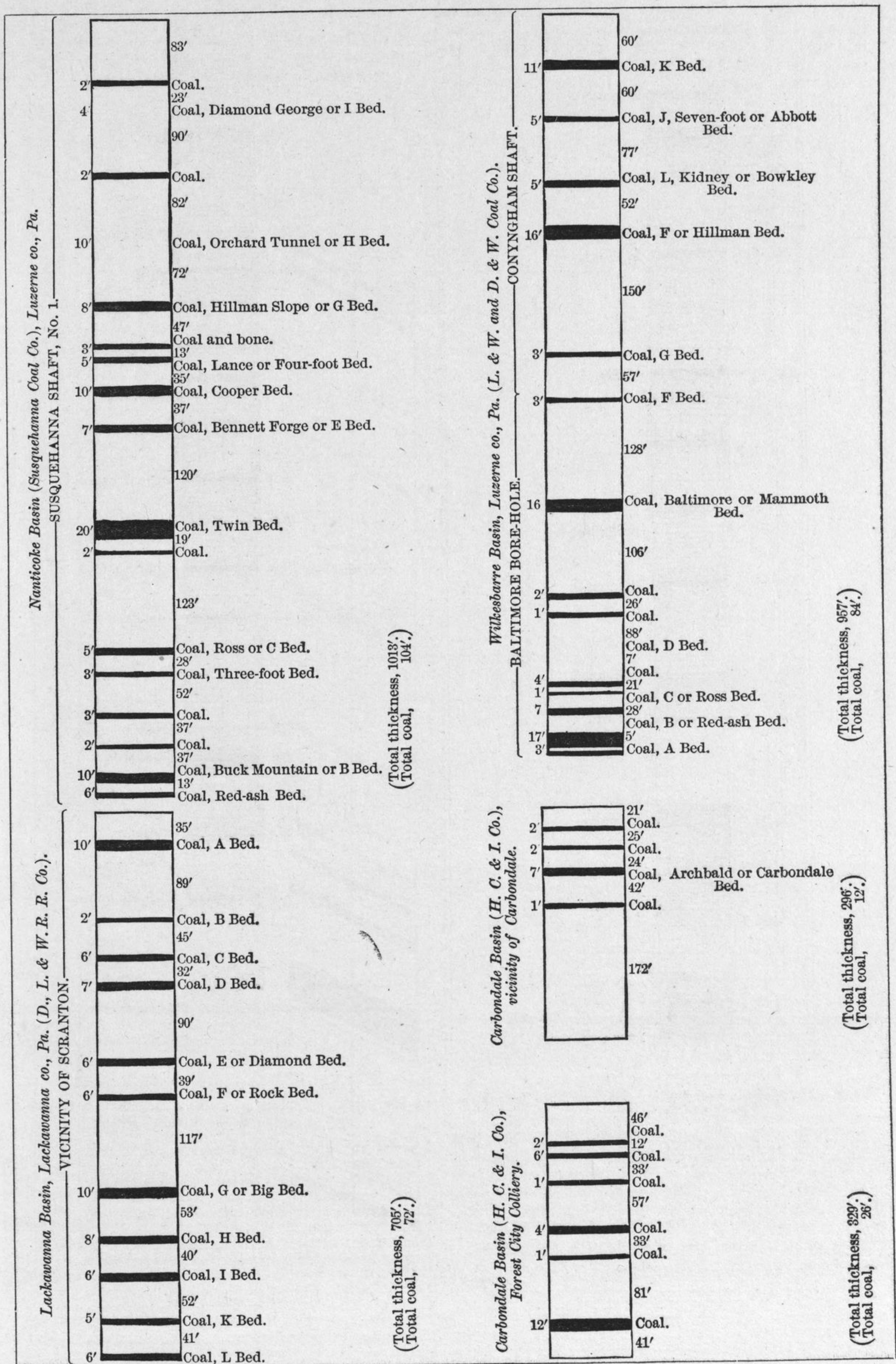


FIG. 8.—Vertical Sections of the Coal-Measures of the Wyoming or Northern Coal-field, in Luzerne and Lackawanna counties, Pa. [published by permission of the Second Geological Survey of Pennsylvania, Charles A. Ashburner, asst. in charge of the anthracite coal-fields].

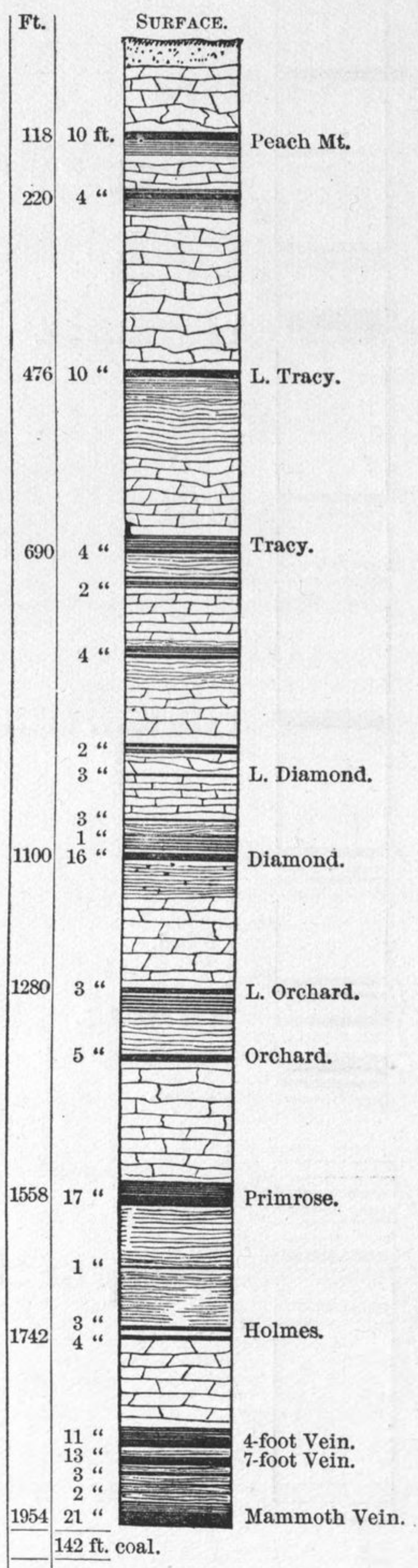


FIG. 9.—Philadelphia and Reading Coal and Iron Company's Pottsville Shaft (1882).

Statistics.—The following statistics of the Pennsylvania anthracite industry are taken from the report of the United States census of 1800, but are not believed to be strictly accurate. The number of collieries is too low, and the average output and acreage probably too high. The weights given have been reduced to tons of 2240 pounds, to agree with those used in this article:

Total number of separate establishments or collieries.....	273?
Average yearly capacity of production, tons.....	132,453
Average actual product in census year (ending June 1, 1880), tons.....	89,721
Per cent. of maximum capacity attained.....	67.28
Average capital leased, employed, and invested.....	\$550,041
Average number of hands employed.....	250
Average amount of wages paid yearly.....	\$79,414
Average value of materials used yearly.....	\$23,588

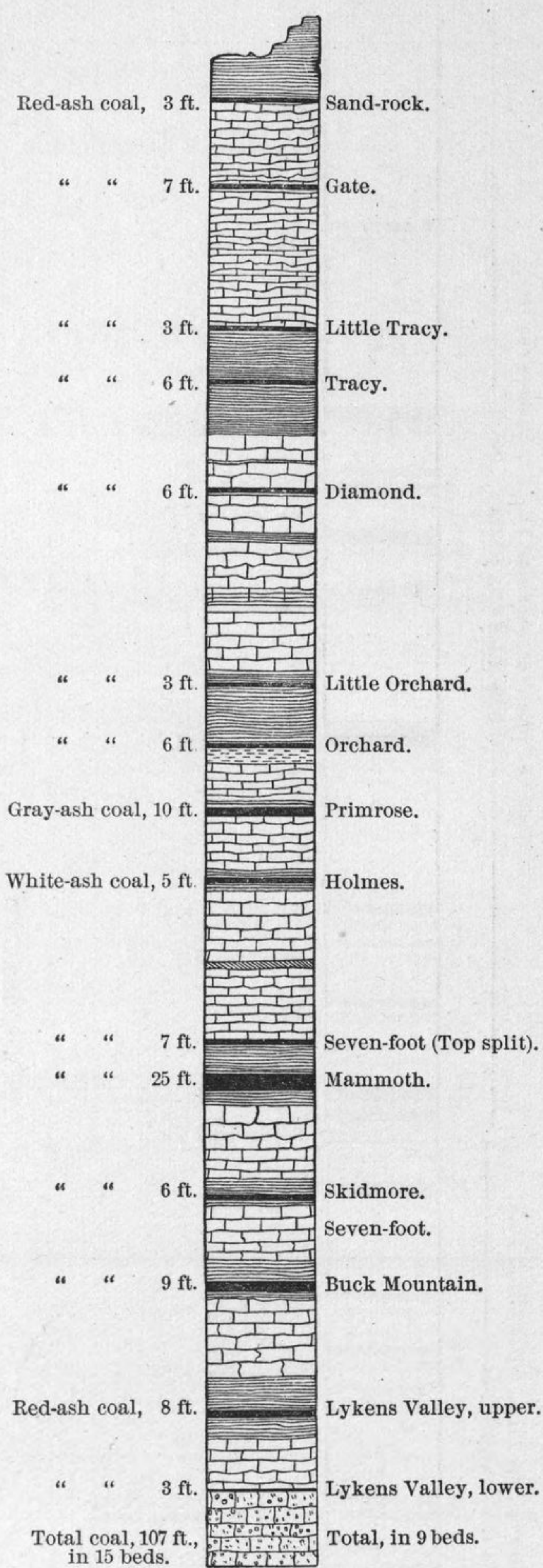


FIG. 10.—Cross-Section in the Southern Anthracite Coal-field of Pennsylvania [P. W. Sheaffer, 1880].

Average number of acres of coal-land attached to colliery.....	604?
Ratio of value of yearly product to total capacity, per cent.....	26.86
Merchantable product for year ending June 1, 1880, tons.....	24,494,036
Value of product delivered for transportation...	\$40,331,981
Average value of same per ton for transportation	\$1.65
Amount of coal washed, tons.....	1,247,237
Ratio of value of product to capital, per cent...	26.86
Ratio of actual output to capacity, per cent.....	67.28
Tons raised yearly per man.....	405.7
Tons raised daily per man.....	1.90
Maximum yearly capacity of all collieries reported, tons.....	36,403,571

The capacity of production referred to means the probable output with present force and appliances.

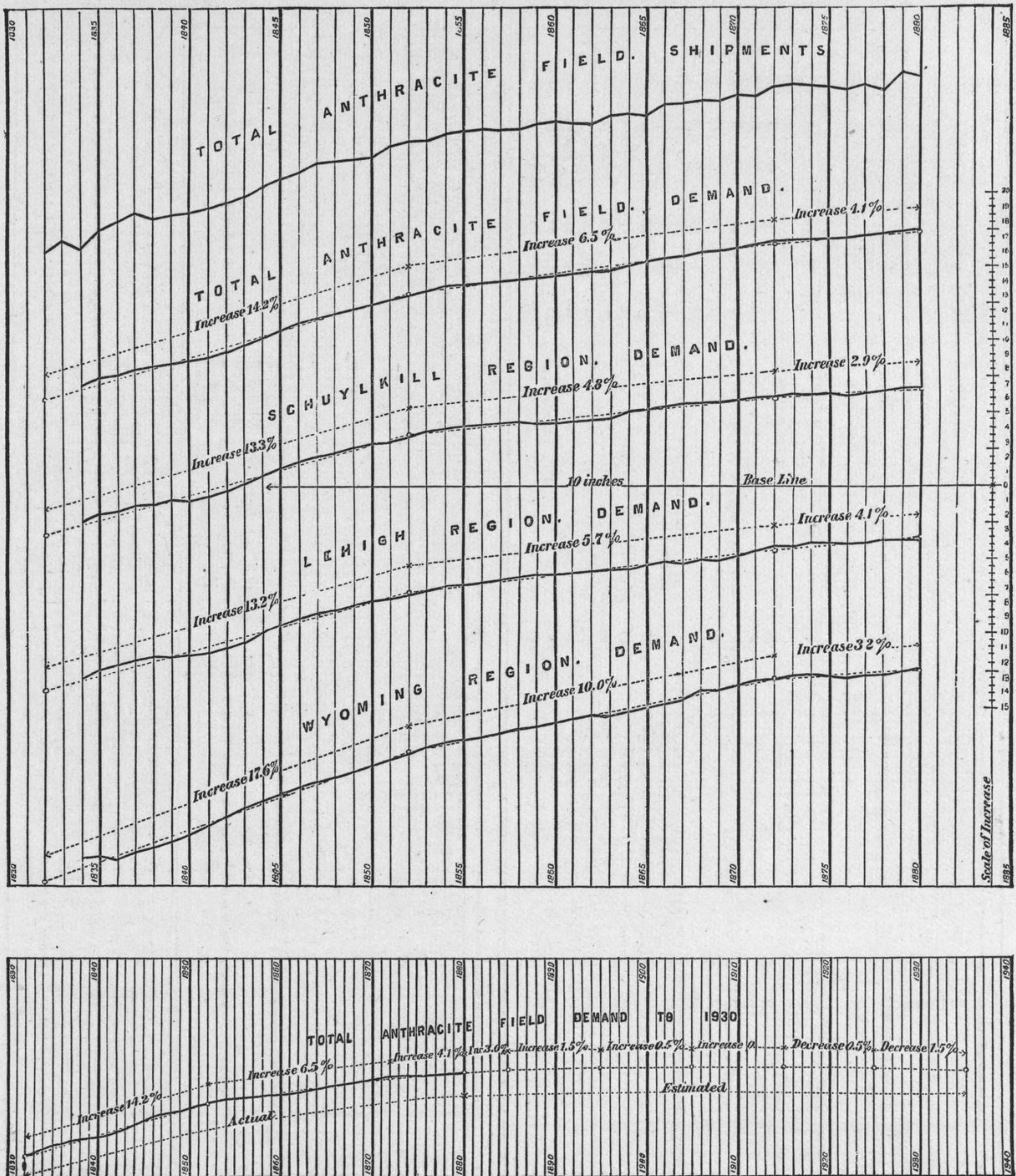


FIG. 11.—Rate of Increase of the Demand for Anthracite Coal in the United States.

The following summary, from the report of 1881 of the Pennsylvania State Bureau of Internal Affairs, is useful for comparison with the census figures, and is believed to be more nearly correct:

Total number of collieries.....	319
Average number of days worked during year.....	275.01
Total number of employés.....	75,169
Total amount paid in wages during the year.....	\$29,454,781.36
Total production of anthracite coal for the year ended Dec. 31, 1881, tons.....	27,929,129
Average amount per ton paid in wages.....	\$1.06 ⁵⁵ / ₁₀₀
Average amount of coal produced to each employé, tons.....	374

Mr. Joseph S. Harris in the above diagram (Fig. 11) shows the rate of increase in demand since 1830, and the probable rate until 1930. Table II. shows the present number of collieries in the anthracite region.

Weight and Volume.—Analyses of various anthracite coals show the following results as regard weight and volume:

Name of Coal.	Cubic feet to 2000 lbs.	Cubic feet to 2240 lbs.
Honey Brook.....	34.5	38.6
Hazleton.....	34.8	38.9
Sugar Loaf.....	34.8	38.9
Old Company's.....	34.8	38.9
Spring Mountain.....	34.8	38.9
Greenwood.....	34.8	38.9
Cross Creek.....	35.1	39.2
Council Ridge.....	35.1	39.2
Buck Mountain.....	35.1	39.2
Locust Mountain.....	35.5	39.6
Mahanoy.....	35.5	39.6
Shamokin.....	36.9	41.0
Lorberry.....	37.3	41.4

TABLE II.—List of Collieries in the Anthracite Coal-Regions of Pennsylvania April 1, 1882 [compiled by J. H. Jones, Statistician of the Combined Anthracite Coal Companies].

*	Colliery.	Railroad.	Operator.
SCHUYLKILL REGION: FIRST OR SOUTHERN COAL-FIELD.			
LYKENS VALLEY DIST.			
6	Brookside.....	P. & R. R. R.	Phila. & R. C. & I. Co.
6	Kalmia.....	"	Phillips & Sheaffer.
6	Lincoln.....	"	Levi Miller & Co.
6	Williamstown.....	N. Cent'l Ry.	Summit Br. R. R. Co.
6	Short Mountain.....	"	Lykens Val. Coal Co.
LORBERRY DISTRICT.			
5	Colket.....	P. & R. R. R.	Phila. & R. C. & I. Co.
5	East Franklin.....	"	" " "
5	Middle Creek Shaft.....	"	" " "
5	Rausch Creek.....	"	Miller, Graeff & Co.
WEST SCHUYLKILL DIST.			
3	Swatara.....	P. & R. R. R.	Phila. & R. C. & I. Co.
2	Otto.....	"	" " "
3	Phoenix Park No. 2.....	"	" " "
3	" " 3.....	"	" " "
2	Forestville.....	"	" " "
2	Glendower.....	"	" " "
2	Richardson.....	"	" " "
2	Thomaston.....	"	" " "
2	Pine Knot.....	"	" " "
2	Mine Hill Gap.....	"	" " "
2	Wood.....	"	C. Wood.
2	Black Mine.....	"	J. D. Kurtz Crook.
2	Peach Mountain.....	"	Wm. H. Harris.
2	Black Heath.....	"	" " "
3	Wolf Creek Big Diamond.....	"	J. F. Donahue.
3	Wolf Creek Diamond.....	"	Edwin Thomas.
2	Ellsworth.....	"	John R. Davis.
2	Black Valley.....	"	Edward Hoskins.
2	Dundas No. 7.....	"	Davis & Co.
2	Jugular.....	"	J. S. Hepner.
2	California.....	"	R. R. Reber.
EAST SCHUYLKILL DIST.			
2	Beechwood.....	P. & R. R. R.	Phila. & R. C. & I. Co.
2	Wadesville Shaft.....	"	" " "
2	Pottsville.....	"	" " "
2	Pine Forest.....	"	" " "
1	Eagle Hill Shaft.....	"	" " "
2	Newkirk.....	"	" " "
2	Crystal.....	"	Joseph Brady.
1	Mammoth.....	"	Mahoney & Co.
1	Repplier.....	"	John F. Quinn & Co.
2	Bonanza.....	"	Thos. Ferrebee & Co.
1	Daniel Vein.....	"	Theo. Hellman.
2	Monitor.....	"	John Denning.
3	Peach Orchard.....	"	Samuel Brown.
1	Eagle.....	"	Geo. W. Johns & Bro.
2	St. Clair.....	"	Joseph Atkinson & Co.
2	Vipond.....	"	Thos. Burke.
2	Palmer Vein.....	"	Alliance Coal M. Co.
2	Kaska William.....	"	" " "
2	Pine Dale.....	"	Louis Lorenz.
2	Coal Hill.....	"	Holahan & Basler.
1	West Lehigh.....	"	Wood & Pearce.
1	East Lehigh.....	"	Mitchell & Simons.
1	West Summit.....	"	A. Raabe.
PANTHER CREEK DIST.			
1	Colliery No. 3.....	L. & S. R. R.	Lehigh C. & N. Co.
1	" " 4.....	"	" " "
1	" " 5.....	"	" " "
1	" " 6.....	"	" " "
1	" " 8.....	"	" " "
1	" " 9.....	"	" " "
1	" " 10.....	"	" " "
1	" " 11.....	"	" " "
SECOND OR MAHANOHY COAL-FIELD.			
SHAMOKIN DISTRICT.			
7	North Franklin No. 1, red-ash.....	P. & R. R. R.	Phila. & R. C. & I. Co.
7	North Franklin No. 2, white-ash.....	"	" " "
4	Bear Valley.....	"	" " "
4	Geo. Fales.....	"	" " "
4	Burnside.....	"	" " "
4	Cameron.....	N. Cent'l Ry.	Mineral R. R. & M. Co.
4	Luke Fidler.....	"	" " "
4	Hickory Swamp.....	"	" " "
4	Hickory Ridge.....	"	" " "
4	Pennsylvania.....	"	" " "
4	Lancaster.....	"	Smith & Keiser.
4	Royal Oak.....	"	Tillett & Brother.
4	Sterling.....	P. & R. R. R.	Kendrick & Co.
4	Henry Clay No. 1.....	"	J. Langdon & Co.
4	Carson.....	"	M. E. Robinson.
4	Peerless.....	"	Cruikshank & Emes.
4	Big Mountain.....	"	Patterson & Llewellyn.
4	Buck Ridge.....	"	May, Audenried & Co.
4	Greenback.....	"	H. J. Toudy.
4	Excelsior.....	P. & R. & N. C.	Excelsior Coal M. Co.
4	Enterprise.....	P. & R. R. R.	Enterprise Coal Co.
WEST MAHANOHY DIST.			
2	Mt. Carmel Shaft.....	P. & R. R. R.	Phila. & R. C. & I. Co.
2	Reliance.....	"	" " "
LEHIGH REGION.			
GREEN MOUNTAIN BASIN.			
1	Upper Lehigh No. 2.....	L. & S. R. R.	Upper Lehigh Coal Co.
1	" " 5.....	"	" " "
1	Pond Creek.....	"	Pond Creek Coal Co.
BLACK CREEK BASIN.			
1	Sandy Run.....	L. & S. R. R.	M. S. Kemmerer & Co.
1	Cross Creek No. 1.....	L. V. & L. S.	Coxe Bros. & Co.
1	" " 2.....	"	" " "
1	" " 3.....	"	" " "
1	Middle Cross Creek.....	S. H. & W. R. R.	" " "
1	Lower.....	"	" " "
1	West.....	"	" " "
1	Highland No. 1.....	L. V. R. R.	G. B. Markle & Co.
1	" " 2.....	"	" " "
1	Jeddo " 3.....	"	" " "
1	" " 4.....	"	" " "
1	Council Ridge No. 2.....	L. V. & L. S.	J. Leisenring & Co.
1	" " 5.....	L. & S. R. R.	" " "
1	Ebervale No. 2.....	L. V. R. R.	Ebervale Coal Co.
1	" " 3.....	"	" " "
1	Black Ridge.....	"	Black Ridge Coal Co.
1	Harleigh.....	"	McNair & Co.
1	Latimer No. 1.....	"	Pardee, Bro. & Co.
1	" " 2.....	"	" " "
1	Milnesville No. 6.....	"	Stout Coal Co.
1	" " 7.....	"	" " "
1	Hollywood.....	"	C. Pardee & Co.

* Refers to the character of the coal mined at the different collieries, per Index.

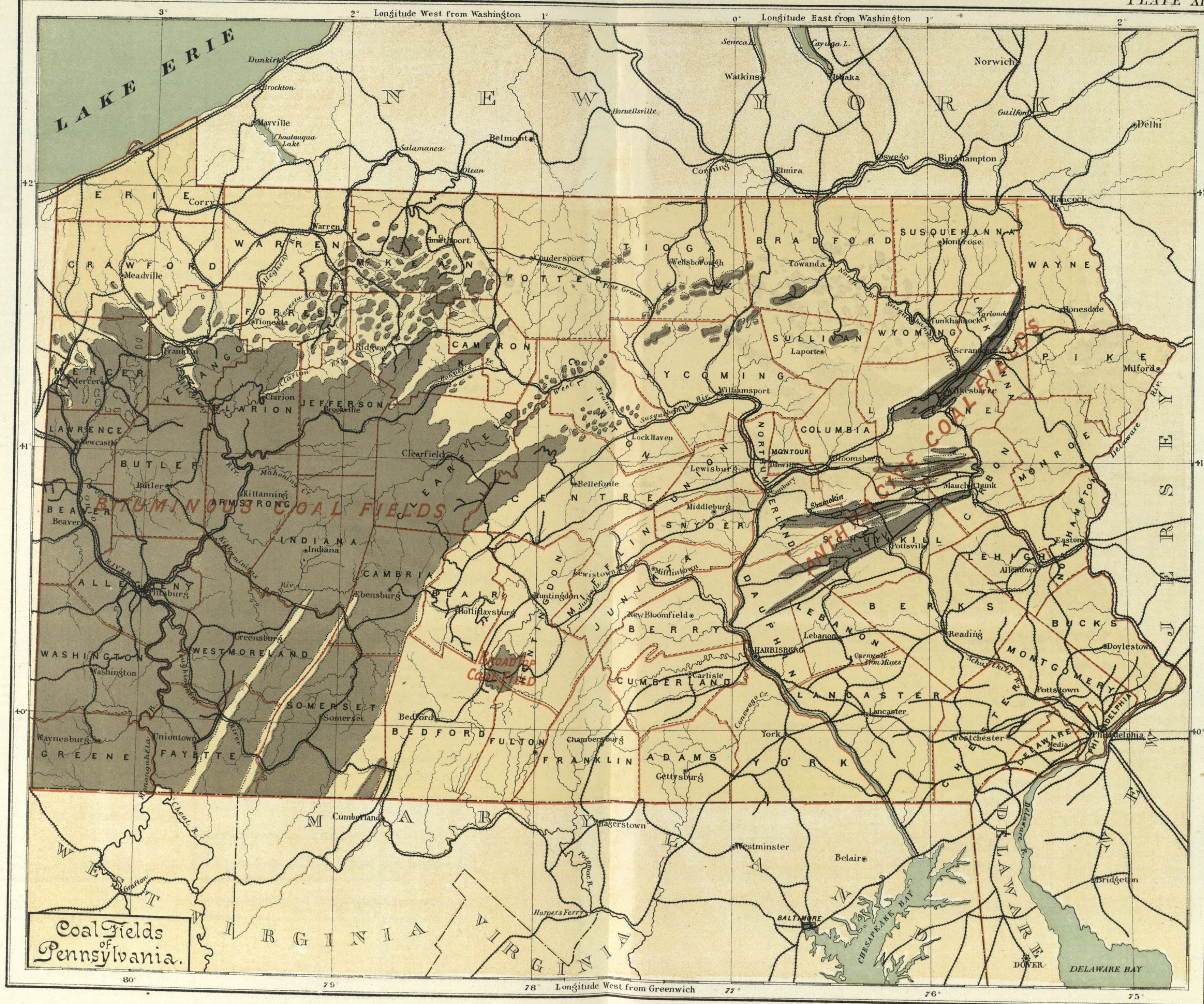


TABLE II.—(continued).

TABLE II.—(continued).				*	Colliery	Railroad.	Operator
*	Colliery.	Railroad.	Operator.				
HAZLETON BASIN.							
1	East Sugar Loaf No. 1...	L. V. R. R.	{ Linderman, Skeer & Co.	2	Heidelberg Shaft.....	L. V. R. R.	Lehigh Val. Coal Co.
1	" " " " 2...	"	" " "	8	Everhart.....	{ D. & H. } & L. & S.	Everhart Coal Co.
1	" " " " 3...	"	" " "	2	Tompkins Shaft.....	L. V. R. R.	G. R. Wilson & Co.
1	" " " " 5	"	" " "	2	Eagle.....	"	Moser, Hoole & Co.
1	Humboldt.....	"	" " "	2	Seneca Shaft.....	"	Pittston Coal Co.
1	Buck Mountain.....	"	Buck Mt. Coal Co.	2	Ravine Shaft.....	"	" "
1	South Sugar Loaf.....	"	A. Pardee & Co.	2	Twin Shaft.....	"	" "
1	Laurel Hill.....	"	" " "	2	Beaver.....	"	Waterman & Co.
1	Hazleton No. 1.....	"	" " "	2	Phoenix.....	L. & B. R. R.	Phoenix Coal Co.
1	" " 3.....	"	" " "	2	Columbia.....	"	Grove Brothers.
1	" " 6.....	"	" " "	2	Fairmount.....	{ D. & H. } & L. & S.	A. Morris & Co.
1	Sugar Loaf.....	"	" " "	2	Butler Shaft.....	"	Butler Colliery Co.
1	Cranberry.....	"	" " "	2	Hillside.....	L. V. & L. & S.	Hillside Coal & Ir. Co.
1	Crystal Ridge.....	"	" " "	2	Central.....	Pa. Coal Co.	Pennsylvania Coal Co.
1	Mt. Pleasant.....	"	Pardee, Sons & Co.	2	Barnum.....	"	" "
BEAVER MEADOW BASIN.				2	Stark.....	"	" "
1	Beaver Meadow.....	L. V. R. R.	Coxe Bros. & Co.	2	Breaker No. 2.....	"	" "
1	Coleraine No. 1.....	"	W. T. Carter & Co.	2	" " 6.....	"	" "
1	" " 2.....	"	" " "	2	" " 8.....	"	" "
1	Spring Mountain No. 1...	"	Lehigh Val. Coal Co.	2	" " 10.....	"	" "
1	" " " " 4...	"	" " "	SCRANTON DISTRICT.			
1	" " " " 5...	"	" " "	2	Anthracite.....	L. & B. R. R.	R. T. McCabe, receiver.
1	Beaver Brook No. 1.....	"	Chas. M. Dodson & Co.	2	Greenwood No. 1.....	{ D. & H. } & L. & S.	" " "
1	" " " " 2.....	"	" " "	2	" " 2.....	L. & B. R. R.	" " "
1	Spring Brook " 5.....	L. V. & L. & S.	Geo. H. Myers & Co.	2	Meadow Brook.....	"	W. Connell & Co.
1	" " " " 6.....	L. V. R. R.	" " "	2	National.....	"	" "
1	Honey Brook " 1.....	L. & S. R. R.	Leh. & Wilkesb. C. Co.	2	Park.....	{ D. & H. } & L. & S.	Bridge Coal Co. (lim.).
1	" " " " 2.....	"	" " "	2	Mt. Pleasant.....	{ D., L. & } W. R. R.	W. T. Smith.
1	" " " " 4.....	"	" " "	2	Green Ridge.....	D. & H. C. Co.	O. S. Johnson & Co.
1	" " " " 5.....	"	" " "	2	Archbald Shaft.....	{ D., L. & } W. R. R.	Del., Lack. & West. R. R.
WYOMING REGION: NORTHERN COAL-FIELD.				2	Sloan.....	"	" " "
PLYMOUTH DISTRICT.				2	Pyne.....	L. & B. R. R.	" " "
8	Salem.....	L. & B. R. R.	Salem Coal Co.	2	Taylor.....	"	" " "
8	Colliery No. 3.....	"	Susquehanna Coal Co.	2	Oxford.....	"	" " "
8	Avondale.....	"	D., L. & W. R. R. Co.	2	Dodge.....	"	" " "
2	Boston.....	"	" " "	2	Bellevue.....	"	" " "
8	Chauncey.....	"	T. P. McFarlane.	2	Hampton.....	{ D., L. & } W. R. R.	" " "
2	Gaylord.....	{ D. & H. & } L. & B.	Gaylord Coal Co.	2	Continental.....	"	" " "
2	Dodson.....	L. & B. R. R.	Plymouth Coal Co.	2	Central.....	"	" " "
2	Lance.....	"	Leh. & Wilkesb. C. Co.	2	Hyde Park.....	"	" " "
8	Nottingham.....	"	" " "	2	Diamond.....	"	" " "
8	Reynolds No. 16.....	"	" " "	2	Brisbin.....	"	" " "
2	Plymouth No. 2.....	{ D. & H. & } L. & S.	Del. & Hud. Canal Co.	2	Cayuga.....	"	" " "
2	" " 3.....	{ D. & H. & } L. & B.	" " "	2	Storrs.....	"	" " "
8	" " 4.....	"	" " "	2	Scranton Slope.....	L. & B. R. R.	" " "
2	" " 5.....	"	" " "	2	Diamond.....	{ D., L. & } W. R. R.	" " "
2	Kingston No. 1.....	L. & B. R. R.	Kingston Coal Co.	2	Dunmore Breaker.....	Pa. Coal Co.	Pennsylvania Coal Co.
2	" " 2.....	"	" " "	2	" Screens.....	"	" "
2	East Boston.....	"	W. G. Payne & Co.	2	Gypsey Grove.....	"	" "
2	Black Diamond.....	"	Haddock & Steel.	2	Leggitt's Creek Shaft.....	D. & H. C. Co.	Del. & Hud. Canal Co.
2	Maltby.....	"	S. C. Maltby.	2	Marvine.....	"	" " "
2	Mill Hollow.....	"	Waddell & Walters.	2	Von Storch.....	"	" " "
2	Ellenwold.....	"	Albright Coal Co.	2	Capouse Shaft.....	{ D., L. & } W. R. R.	Lack. Iron & Coal Co.
2	Forty Fort.....	"	J. H. Swoyer.	2	Pine Brook Shaft.....	"	" " "
WILKESBARRE DISTRICT.				2	Fairlawn.....	"	{ Fairlawn Coal Co. } (limited).
2	Lehigh Luzerne No. 1...	L. & B. R. R.	Leh. & Luzerne C. Co.	2	Jermyn Shaft.....	D. & H. C. Co.	{ D. L. & W. and D. & } H. Cos.
2	Colliery No. 1.....	L. & S. R. R.	Susquehanna Coal Co.	2	Stetler.....	L. & B. R. R.	D. N. Stetler.
2	" " 2.....	"	" " "	2	Elk Hill.....	D. & H. C. Co.	Elk Hill Coal Co.
2	" " 4.....	"	" " "	2	Pancoast.....	{ D., L. & } W. R. R.	Pancoast Coal Co.
2	" " 5.....	"	" " "	2	Lucas.....	D. & H. C. Co.	S. Lucas & Co.
2	Warrior Run.....	L. V. R. R.	A. J. Davis.	CARBONDALE DISTRICT.			
2	Franklin.....	"	Franklin Coal Co.	2	Eddy Creek.....	D. & H. C. Co.	Del. & Hud. Canal Co.
2	Hillman.....	"	H. Baker Hillman.	2	Grassy Island.....	"	" " "
2	Enterprise.....	"	A. Langdon.	2	White Oak.....	"	" " "
2	Henry.....	"	Lehigh Val. Coal Co.	2	Jermyn Slope.....	"	" " "
2	Midvale.....	"	" " "	2	" Shaft.....	"	" " "
2	Mineral Spring.....	"	" " "	2	Whitebridge Tunnel.....	"	" " "
2	Oakwood Shaft.....	"	" " "	2	Coal Brook.....	"	" " "
2	Prospect Shaft.....	"	" " "	2	Racket Brook No. 1.....	"	" " "
2	Wyoming.....	"	J. H. Swoyer.	2	" " " 3.....	"	" " "
2	Bennett.....	L. & S. R. R.	Waldell & Co.	2	Erie Shaft.....	"	Hillside Coal & Ir. Co.
2	Mill Creek.....	"	Del. & Hud. Canal Co.	2	Spring Brook.....	"	" " "
2	Pine Ridge.....	"	" " "	2	Forest City.....	{ N.Y., L.E. } & W. R. R.	" " "
2	Laurel Run.....	"	" " "	2	Throop Shaft.....	{ D., L. & } W. R. R.	John Jermyn.
2	Baltimore No. 1.....	"	" " "	2	Filer No. 1.....	"	Filer & Livey.
2	" " 3.....	"	" " "	2	" " 2.....	D. & H. C. Co.	" "
2	Conyngham.....	"	" " "	2	Eaton.....	"	Jones, Simpson & Co.
2	Hollenback.....	L. V. R. R.	R. S. Poole & Co.	2	Winton.....	{ D., L. & } W. R. R.	Pierce Coal Co. (lim.).
8	Red Ash No. 1.....	L. & S. R. R.	Red Ash Coal Co.	2	Chestnut Hill.....	"	E. E. Hendricks & Co.
8	" " 2.....	"	" " "	2	Elk Creek.....	"	Thos. Brennan.
2	Diamond No. 1.....	"	Leh. & Wilkesb. C. Co.	2	Nealon.....	"	Horan & Healey.
2	Hollenback No. 2.....	"	" " "	CHARACTER OF COAL MINED AT COLLIERIES.			
2	Empire No. 4.....	"	" " "	1—Hard white-ash.			5—Lorberry red-ash.
2	" " 5.....	"	" " "	2—Free-burning white-ash.			6—Lykens Valley red-ash.
2	Hartford No. 6.....	"	" " "	3—Schuylkill red-ash.			7—Trevorton.
2	Stanton No. 7.....	"	" " "	4—Shamokin.			8—Wyoming red-ash.
2	New Jersey No. 8.....	"	" " "				
2	Sugar Notch No. 9.....	"	" " "				
2	" " " " 10.....	"	" " "				
2	Wanamie No. 18.....	"	" " "				
2	" " " " 19.....	"	" " "				
PITTSBURGH DISTRICT.							
2	Ontario.....	L. V. R. R.	Lehigh Val. Coal Co.				
2	Exeter (W. Pittston).....	"	" " "				

NEW ENGLAND ANTHRACITES.—The graphitic anthracite of Rhode Island and Massachusetts has already been mentioned. This field contains about 400 square miles. It is located in the central part of Rhode Island and the eastern part of Massachusetts, being found in a belt of transition rocks extending from Newport Neck, R. I., to Mansfield, Mass.; but its contents are so confused and broken that they can scarcely be assigned to a series of separate beds. In some places, as at Cumberland, R. I., deposits of coal as much as 23 feet in thickness are found, but these are of so limited extent as not to repay the cost of opening and operating a mine. The coal of this field was worked as early as 1808 at the Portsmouth mine, on the island of Rhode Island, and has been mined at intervals and in many localities since, but never with profit. The Rhode Island coal is described by Prof. Charles T. Jackson, State geologist, as of rhomboidal structure, due to imperfect crystallization by heat, its analysis giving from 77 to 84 per cent. of carbon, from 7 to 10 per cent. of water and volatile matter, and from 5 to 6 per cent. of ash. The same authority gives an analysis of coal from the Mansfield (Mass.) mine, showing 90 to 92 per cent. of carbon, 2 to 4 per cent. of water and volatile matter, and 4 per cent. of ash.

An analysis of Cranston (R. I.) coal, by Prof. Shaler, gives—

Volatile matter.....	3.55	Sulphur.....0.26 Sp. gravity...1.839
Fixed carbon.....	82.25	
Ash.....	5.65	
Hygroscopic moisture...	8.55	
100.00		

According to Prof. Lesquereux, of the Second State Geological Survey of Pennsylvania, who is the highest authority on fossil flora, the coal-plants of this field correspond with those of the Salem and Mammoth anthracite and the lower Freeport bituminous beds of Pennsylvania.

VIRGINIA ANTHRACITE.—In the south-western portion of Virginia occur beds of coal proving by their analyses to be anthracite. These deposits are in the counties of Pulaski and Wythe, etc., along the southern border of Little Walker Mountain. The areas are limited. The coals have been greatly disturbed, and in many places are simply soft coal. This fact interferes with their value, so far as shipping to distant points is concerned, but they are exceedingly useful to supply the local demand for domestic uses, for railroads, and in the large zinc- and salt-works in the vicinity north of Martin's Station, in Pulaski county, and farther south-west. The following cross-section shows the presence of three distinct beds of coal, dipping about 20° south:

Regular stratified sandstone.....	30 feet.
Large bed—coal, 12 feet; slate, 4 feet.....	16 "
Top slate.....	2½ "
Hard coal.....	1½ "
Black, fine slate.....	7½ "
Coal-bed	3½ "
Bottom, hard black sandstone.	

The extent of the beds is not fully known, but they are found several miles to the north-east, and seem to occupy a long and narrow belt running from near the Potomac almost to Tennessee. They do not belong to the true Carboniferous coals, but to the upper Devonian (Rogers, No. X.) formation, and under the true coal-measures of Pennsylvania, Ohio, and North-west Virginia. Lesley speaks of this older coal-formation, "connected with the uppermost Devonian, White Mountain sandstone, No. X., as occurring in Pennsylvania, near the head-waters of the Juniata," also "on the Potomac, below Cumberland," in the northern valley of Middle Virginia, and reaching its maximum development in Montgomery county, in Southern Virginia.

Analysis of Virginia Anthracite [made by Booth and Garrett of Philadelphia].

No.	Carbon.	Vol. matter.	Water.	Ash.	Color of Ash.
1.....	87.65	7.58	0.80	3.97	Buff.
2.....	86.35	7.27	0.80	5.58	"
3.....	89.47	6.00	0.40	4.13	Light brown.
4.....	89.02	6.42	0.50	4.06	Dirty white.
5.....	88.09	6.64	0.35	4.92	Brownish.
6.....	87.40	6.10	0.45	6.05	White.
7.....	85.85	6.20	0.60	7.35	

SEMI-ANTHRACITE COAL IN PENNSYLVANIA.—An important field of semi-anthracite coal occurs in Sullivan co., Pa. The Bernice coal-basin lies between Birch Creek on the north and Loyalsock Creek on the south. The basin is canoe-shaped, 6 miles long from east to west, but hardly one-third of a mile across. Coal B outcrops west of the line of the State Line and Sullivan Railroad. This bed "B" has about 8 feet of coal in a thickness of 12 feet. A cross-section of the bed, given in *Report "G G."* of the Second Geological Survey, is as follows:

Roof—sandstone, thin-bedded, micaceous.	
Bed B	Coal.....3'0"
	Slate parting.....3' "
	Coal.....1'3"
	Slate, with coal intermixed.....1'6"
	Coal.....4'0"

The coal is bright, and is a true anthracite. Analyses of the whole bed and of each bench give—

	Water.	Vol. mat.	Mixed carbon.	Sulphur.	Ash.
Top bench.....	1.840	9.835	76.788	.647	10.890
Whole bed.....	1.295	8.100	83.344	1.031	6.230
Middle bench.....	1.800	9.650	82.373	.622	5.555
Lower bench.....	2.200	9.405	81.267	.618	6.490

By any system of classification the coal is an anthracite.

Leaving out the accidental impurities, and counting only the ignitable constituents of the fuel, we have—

Fixed carbon	91.142
Volatile matter	8.858
Proportion of vol. mat. to fixed carbon.....	1:10.289

This coal differs in appearance and structure from other Pennsylvania anthracites. It has a dull lustre, and entirely lacks the conchoidal fracture. It cannot be run through the ordinary anthracite breaker, as it would all be crushed. A special breaker is used, consisting of a plate with iron teeth; this descends and splits the coal, instead of crushing it. The Bernice mines ship from 40,000 to 50,000 tons annually.

The Progression from Anthracite to Bituminous.—In a direction across the basins northward from Bernice in Sullivan county to Gaines in Tioga and Potter counties, a distance of 50 miles, is seen the transition from anthracite to bituminous coal, the proportion of volatile matter to fixed carbon in the different basins being—

Gaines basin.....	1:1.9643
Blossburg basin.....	1:3.4939
Barclay ".....	1:4.0939
Bernice ".....	1:10.2893

The presence of an anthracite coal-bed and a semi-bituminous coal-bed in the same hillside, and only 60 feet apart, is sufficiently remarkable to call for special comment. This occurs in Sullivan county, at Bernice, and the semi-bituminous *underlies* the anthracite.

In another case in the same region a coal-bed has two benches, "the upper being semi-bituminous, the lower anthracite, with only 6 feet of slate between" (*Report Second Geol. Surv. of Penna.*).

COLORADO ANTHRACITE.—Anthracite coal of good quality has been found recently in Gunnison co., Col. Dr. A. C. Peale (in *Hayden's Survey Report for 1874*) describes locations in which anthracite or semi-anthracite coal was found from 2 to 5 feet in thickness. North of Gunnison City two beds of anthracite, from 5 to 7 feet thick, are found.

The anthracite coals of Colorado have recently attracted considerable attention; new discoveries and further developments are being made. The coals have been

discovered in several different localities, all within the limits of Gunnison county, but no systematic geological exploration has been made to show the relative situation or the conformation and identification of the beds. The coal is not a true carboniferous anthracite, but is an "altered lignite," of the Post-Cretaceous formation, changed in composition by the action of heat, which has driven off the volatile matter and water, consequently increasing the relative proportion of fixed carbon. These coals vary much in composition in different beds, and even in the same bed in neighboring localities, occurring in all stages of transition from bituminous through semi-anthracite to hard anthracite rivalling in its purity the best anthracite of Pennsylvania. The following comparative analyses demonstrate this fact. This coal is found on Ohio Creek, a branch of the Gunnison River, north-west of Gunnison, also at Crested Butte, on Slate River, where the beds have been developed, and the coal proven to be of excellent quality (No. VI. analysis). The bed has about 5 feet of pure coal, lying slightly inclined in the mountain about 500 feet above the river. In the Ragged Mountains, on the recent Indian reservation, about 10 miles north-west of Irwin, very fine deposits of anthracite coal occur. The beds are from 7 to 11 feet in thickness, with 7 feet of pure coal. They are steeply inclined, outcropping on the edge of the mountains, so as to be definitely traced for at least two miles. On Coal Creek, a tributary to Anthracite Creek, and thence to the Gunnison River, good beds of semi-anthracite coal occur. The beds are 11 feet thick, with few slate partings, and being gently inclined, are suitable for economical working. This country, being but recently developed, has not yet reached the distinction of an anthracite-producing region, but will have it in the near future. The following analyses of these coals show them to be good anthracites:

	I.	II.	III.	IV.	V.	VI.
Water.....	2.00	1.60	4.00	7.40	3.68	1.640
Volatile matter..	2.50	3.40	14.00			7.395
Fixed carbon.....	91.90	88.20	74.00	88.92	91.02	86.597
Ash.....	3.60	6.80	8.00	3.68	5.30	4.368
	100.00	100.00	100.00	100.00	100.00	100.000
Color of ash {	Dark reddish brown.	Same.	Reddish.	Reddish.	Dark brown.	Red.

Nos. I. and II. are coal from Anthracite Creek; No. III. from Oh-be-Joyful Creek (these three from Hayden's Report); Nos. IV. and V. from Rock Creek; No. VI. from Crested Butte.

Comparative analyses of anthracite from Gilberton, Pa., and from the Gunnison county beds show—

	Gilberton.	Crested Butte, Gunnison co.
Moisture	2.980	1.640
Vol. matter.....	3.380	7.395
Fixed carbon.....	87.127	86.597
Ash.....	5.856	4.368

OTHER ANTHRACITE DEPOSITS.—There is a bed of anthracite near Santa Fé, New Mexico, described by Prof. R. W. Raymond, formerly of the U. S. Mining Commission, in his report for 1870, as a true anthracite, 4 to 5 feet thick, containing 80.5 per cent. of fixed carbon. In another place, 1½ miles distant from the first, Prof. Raymond found anthracite carrying 88 per cent. of carbon and 5 per cent. of ash of a brick-red color, the bed being 3½ feet thick.

Anthracite is known to exist at Skidegate Inlet, in Queen Charlotte's Islands, and on the mainland about 40 miles distant. These beds have not yet been explored, but the writer has seen specimens, said to have come from them, which were true anthracites of excellent quality.

The analyses in Table III. show the quality of the coals from the various deposits of anthracite, both foreign and domestic. Those of Wales and Ireland are not described in this article. The deposit in North Carolina is local, and can hardly be described as a field, its analysis, however, proving it to be anthracitic. The discoveries of Western anthracitic lignites

are more recent, but the few localities mentioned show the limited area of anthracite in the world.

TABLE III.—Analyses of Anthracite Coals.

Location of coals.	Specific gravity.	Carbon.	Water and volatile matter.	Ash.
HARD WHITE ASH OF PENNA.				
Mauch Chunk, Summit Mines..	1.49	92.30	6.42	1.28
Nesquehoning, 10-ft. vein.....	1.55	86.60	6.40	7.00
Tamaqua, Skidmore Bed, East	1.57	92.07	5.03	2.90
Sugar Loaf Mountain.....	1.57	85.91	5.36	8.73
Beaver Meadow.....	1.63	85.34	9.60	5.06
Sharp Mountain.....	1.54	80.57	7.15	3.28
Gold-Mine Gap, first coal field..	1.41	83.15	10.95	6.90
Raush Gap, " " " " " "	1.45	77.23	10.57	12.30
Shamokin.....	..	89.90	6.10	4.00
Wilkesbarre, Warden's Bed.....	1.40	88.90	7.68	3.49
Lackawanna	..	91.20	4.50	4.30
Pottsville, Delaware Company	1.46	86.09	6.96	6.95
" Nealey's Tunnel, } Third Bed..... }	1.55	89.20	5.40	5.40
RHODE ISLAND.				
Portsmouth Mines.....	1.85	85.84	10.50	3.66
MASSACHUSETTS.				
Mansfield Mine.....	1.69	87.40	6.20	6.40
NORTH CAROLINA.				
Near Leakesville, Middle } Secondary rocks..... }	..	83.12	7.76	9.12
SOUTH WALES.				
Neath Abbey.....	..	91.08	5.01	4.00
Swansea.....	..	89.00	7.50	3.50
Ystalyfera.....	..	92.46	6.04	1.50
Cwm Neath.....	..	93.12	5.22	1.50
Bonville Court Bed.....	..	94.18	4.84	.98
IRELAND.				
Rushes Bed.....	..	86.42	9.85	3.73
Sweet " " " " " "	..	81.13	10.35	8.52
Pollough " " " " " "	..	79.71	10.40	9.89
The pure anthracites of the same beds, considered separately from ashes and sulphur, give—				
Carbon, 93.53; Hydrogen, 3.63; Oxygen, 2.84				
Sweet Bed.....	..	94.39;	4.05;	1.56
Pollough " " " " " "	..	92.37;	2.40;	5.23

BITUMINOUS COAL.

BITUMINOUS COAL-MEASURES OF THE UNITED STATES.—The bituminous coal-fields of this country are subdivided into four, and sometimes five, separate fields, varying in extent. These fields include only the coal of true Carboniferous formation, and not the more recent coals of the Western States and Territories.

APPALACHIAN FIELD.—The most important field in regard to quantity, and the most valuable in regard to quality, is the Appalachian, which occupies an area of 59,105 square miles. Commencing with a series of small semi-detached basins in Pennsylvania, it extends in a general south-westerly direction, gradually narrowing in its course until it reaches Alabama, where it again widens at the extreme end of the basin. The peculiar basin structure of this field is best seen in its northern half. The upper measures, with the exception of a small portion in Alabama, are wholly wanting south of West Virginia. Nearly the whole of the region occupied by this field is an elevated plateau rising to a height of 2000 feet above the sea in Tennessee, its principal depression occurring along the Ohio River below Pittsburg. Its northern and western edges have suffered from denudation, and numerous isolated patches in Northern Pennsylvania, once connected, indicate an immense amount of loss. The absence of a similar raggedness on the eastern border is regarded as indicating the operation of different forces in that region. The field contains extensive changes of level, especially in the eastern portion, and, perhaps as a consequence of these undulations, there are vast areas of denudation in Virginia, Tennessee, Georgia, and Alabama.

The details of this field in each State are given in the separate descriptions following. The measures of the whole field are similar, being subdivided into the Upper coal-measures, Barren measures, and Lower coal-measures. The coal-beds are scattered through these measures, workable veins being found in each. Local developments are noticed in some of the beds, the thickness varying. The great Pittsburg is the largest and most valuable bed, and is continuous over a large area. (Plate XI.)

ILLINOIS BASIN.—The Illinois basin has an area of 47,188 square miles. It occupies the eastern portion of Illinois, extending into the western part of Indiana, and covering the north-west portion of Kentucky. Some authors think the beds of coal in this basin are equivalents of corresponding beds in the Appalachian field. It is claimed by some that the two fields were originally connected, and that the separation is due to erosion. The lower portion of the Carboniferous series is continuous from one basin to the other, but the coal-measures themselves are separated by a wide gap. Dr. Newberry shows that the Silurian rocks in Southern Ohio constituted a mountainous ridge long before the Carboniferous era, and says the coal could not have been united in Ohio. Lesquereux endeavors to show, by a comparison of plants, that the beds can be identified, but this theory is sometimes unappreciated by geologists. In this field the beds of coal are not as thick as in the Appalachian, but the number is about the same. The thickness of the measure is greatly reduced, while the limestones are more abundant. The coals are more apt to be impure, but there is an abundance of good workable beds.

THE MICHIGAN BASIN.—The Michigan coal-basin occupies an isolated tract covering an area of 6700 square miles, located in the centre of the southern portion of the State. There are 123 feet of measures, the coal being thicker in the centre of the field than on the edges.

THE MISSOURI BASIN.—The Missouri coal-basin, the largest in area in the United States, covers 90,343 square miles. Its development has not been carried as far, nor does it contain as many or as valuable seams of coal, as the Appalachian field. The coal, as a general rule, is not as pure, and is full of sulphur. The great advantage possessed by the field is the general distribution of its coal-beds over so large an area of country, much of which is destitute of any other fuel. The field has its upper extension in Iowa, and from there covers portions of Nebraska, Iowa, Missouri, Kansas, Indian Territory, and Arkansas, with an extension into Texas. This latter is often classed as a separate basin.

In ARIZONA, near Camp Apache, a bed is mentioned belonging to the true Carboniferous coal.

Prof. Hitchcock tabulates the areas of the bitumi-

nous coal-fields of the United States for the census of 1870 as follows:

	Square miles.
<i>Appalachian Basin:</i>	
Pennsylvania.....	12,302
Maryland.....	550
Ohio.....	10,000
West Virginia and Virginia.....	16,000
Kentucky, Eastern.....	8,983
Tennessee.....	5,100
Georgia.....	170
Alabama.....	6,000—59,105
<i>Michigan Basin:</i>	6,700—6,700
<i>Illinois Basin:</i>	
Illinois.....	36,800
Indiana.....	6,500
Kentucky, Western.....	3,888—47,188
<i>Missouri Basin:</i>	
Iowa.....	18,000
Nebraska.....	3,600
Missouri.....	23,100
Kansas.....	17,000
Arkansas.....	9,043
Indian Territory.....	13,600
Texas.....	6,000—90,343
Grand total.....	203,336

Census Report of Production of Coal in the United States for the Year ending June 1, 1880, by Coal-Fields (Tons of 2000 lbs).

<i>Bituminous:</i>	
Appalachian field.....	29,842,240
Western field (Illinois, Indiana, etc.).....	8,721,101
Michigan field.....	100,800
Triassic field (Virginia and North Carolina)...	46,246
Iowa and Kansas field.....	2,232,458
All fields west of the 100th meridian.....	1,477,736
Total bituminous.....	42,420,581

<i>Anthracite:</i>	
Pennsylvania.....	28,640,819
Rhode Island.....	6,176
Total anthracite.....	28,646,995

Grand total coal production of the United States for the year ending June 1, 1880.....71,067,576

Grand total of hands employed in coal-mining. 170,585

"The production of coal in England was, in 1855, 64,661,401 tons, and in 1877 it was 136,179,968 tons, and in 1880 it was 146,818,122 tons. The English ton, however, is 2240 lbs. The number of collieries in 1880 was, in England, 3880, and in the United States, 3264."

TABLE IV.—Quantity of Coal produced in each State and Territory of the United States during the Calendar Years 1869, 1876, 1877, 1878, 1879, 1880, and 1881 [weight expressed in tons of 2240 pounds]. (Bureau Statistics of U. S.)

STATE OR TERRITORY.	1869.	1876.	1877.	1878.	1879.	1880.	1881.
<i>Anthracite.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>
Pennsylvania.....	13,866,180	21,436,667	23,619,911	20,605,262	26,142,689	26,437,242	31,500,000
<i>Bituminous.</i>							
Pennsylvania.....	7,798,517	11,500,000	12,500,000	13,500,000	14,500,000	19,000,000	20,000,000
Illinois.....	2,629,563	3,500,000	3,500,000	3,500,000	3,500,000	4,000,000	5,000,000
Ohio.....	2,527,285	3,500,000	5,250,000	5,000,000	5,000,000	7,000,000	8,250,000
Maryland.....	1,819,824	1,835,081	1,574,339	1,679,322	1,730,709	2,136,160	2,300,000
Missouri.....	621,930	900,000	900,000	900,000	900,000	1,500,000	1,750,000
West Virginia.....	608,878	800,000	1,000,000	1,000,000	1,250,000	1,400,000	1,500,000
Indiana.....	437,870	950,000	1,000,000	1,000,000	1,000,000	1,196,490	1,500,000
Iowa.....	263,487	1,500,000	1,500,000	1,500,000	1,600,000	1,600,000	1,750,000
Kentucky.....	150,582	650,000	850,000	900,000	1,000,000	1,000,000	1,100,000
Tennessee.....	133,418	550,000	750,000	375,000	450,000	641,042	750,000
Virginia.....	61,803	90,000	90,000	75,000	90,000	100,000	100,000
Kansas.....	32,938	125,000	200,000	300,000	400,000	550,000	700,000
Oregon.....	.....	200,000	200,000	200,000	200,000	200,000	200,000
Michigan.....	21,150	30,000	30,000	30,000	35,000	35,000	40,000
California.....	.....	600,000	600,000	600,000	600,000	600,000	600,000
Rhode Island.....	14,000	14,000	14,000	14,000	15,000	15,000	15,000
Alabama.....	11,000	100,000	175,000	200,000	250,000	340,000	375,000
Nebraska.....	1,425	30,000	50,000	75,000	75,000	100,000	100,000
Wyoming.....	50,000	500,000	100,000	100,000	175,000	225,000	225,000
Washington.....	17,844	100,000	150,000	150,000	170,000	175,000	175,000
Utah.....	5,800	45,000	45,000	60,000	225,000	275,000	275,000
Colorado.....	4,500	250,000	300,000	367,000	400,000	575,000	700,000
Georgia.....	.....	.....	.....	.....	100,000	100,000	100,000
Total bituminous.....	17,211,814	27,569,081	30,688,339	31,525,322	36,665,709	42,763,692	48,405,000
Total anthracite.....	13,866,180	21,436,667	23,619,911	20,605,262	26,142,689	26,437,242	31,500,000
Total anthracite and bituminous.	31,077,994	49,005,748	54,308,250	52,130,584	62,808,398	69,200,934	79,905,000

TABLE V.—*Bituminous Coal Statistics [from Report of Census of 1880].*
PRODUCTION OF BITUMINOUS COAL BY STATES EAST OF THE 100TH MERIDIAN.

Name of State.	Total.....	Alabama.....	Arkansas.....	Georgia.....	Illinois.....	Indiana.....	Iowa.....	Kansas.....	Kentucky.....	Maryland.....	Michigan.....	Missouri.....	Nebraska.....	North Carolina.....	Ohio.....	Pennsylvania.....	Tennessee.....	Virginia.....	West Virginia.....
Acres available coal-lands attached to working establishments.	410,642	4,995 81	16,028	55,051	10,407	20,128	1,600	34,635	15,112	107	3,715	1	1,200	58,639	118,311	23,743	230	46,659	
Grand total of capital, both establishments and irregular workings.	\$93,517,464	772,858 15,600 81	441,745	10,654,261	2,304,720	2,778,937	1,600 767,994	3,887 1,968,537	13,165,557	66,800 107	389,315	500 1	40,170 1,200	13,652,484	38,709,344	1,708,968	329,000	5,750,674	
Acres coal-land un-specified.	204,491	2,440 81	29,549	2,407	16,626	1,600	3,887	863	107	3,715	1	1,200	24,651	57,497	23,743	230	35,894		
Acres coal-land un-worked attached to working collieries.	206,151	2,555	16,028	25,502	8,000	3,502	30,748	14,249	...	...	...	...	...	33,988	60,814	...	...	10,765	
Acres coal-land worked out.	56,101	155	62	19,143	2,884	594	1,235	3,265	...	...	...	...	...	9,984	17,730	...	...	1,052	
Amount paid as roy-alty.	\$1,964,076	14,227	1,875	238,258	137,311	160,157	29,017	46,658	...	...	...	...	...	458,468	728,735	35,390	2,272	111,708	
Tons paying royalty (2000 lbs.).	13,689,864	86,494	15,000	2,763,857	899,356	684,754	213,490	412,341	...	...	...	...	...	2,630,108	5,099,817	141,818	17,878	724,951	
Total capital em-ployed and in-vested in estab-lishments.	\$89,999,101	705,808	441,745	10,416,552	2,268,969	2,778,937	1,947,637	13,142,257	...	...	...	...	40,170	12,965,840	37,855,794	1,703,968	329,000	5,402,424	
Value of real estate.	\$62,354,034	323,475	100,000	6,100,000	1,146,859	1,644,915	939,385	11,387,000	...	...	...	...	40,000	8,529,931	27,152,403	1,222,847	169,500	3,597,259	
Value of plant.	\$19,453,107	270,833	311,000	3,153,457	773,445	860,672	732,252	853,957	...	...	...	...	100	3,258,581	7,242,524	415,371	133,000	1,447,915	
Value of all ma-chinery, includ-ing engines.	\$2,403,211	46,400	597,184	146,908	126,218	...	51,150	129,050	...	...	...	...	25	386,904	720,189	10,750	75,100	113,333	
Horse-power of steam-engines.	24,726	425 35	8,294	1,717	1,445	1,20	522	860	235	518	...	...	...	3,835	5,391	132	793	404	
Number of steam-engines.	812	12 3	286	65	57	4	18	7	6	13	...	...	...	131	170	6	15	19	
Total employés.	96,475	5,513 130	442	16,301	4,496	5,024	3,617	2,826	3,677	412	2,599	5	4	16,331	33,248	1,092	261	4,497	
Wages paid to all classes of labor.	\$30,707,059	328,788 20,850 85,179	6,035,919	1,405,164	1,554,696	758,980	687,474	1,370,079	146,000	642,772	200 300	5,100,547	10,863,583	836,765	71,447	1,298,316			
Value of material used in mines cen-sus year.	\$4,661,662	48,583 1,135 9,500	796,149	138,604	249,820	47,485	95,995	194,942	7,750	55,756	10 50	931,298	1,754,602	47,323	11,614	251,046			
Value of total prod-uct at mines.	\$49,733,603	476,911 33,535 231,605	8,779,832	2,150,258	2,507,453	1,516,544	1,134,960	2,585,537	224,500	1,061,225	750 400	7,719,767	18,567,129	629,724	99,802	2,013,671			
Total product cen-sus year, tons.	40,940,028	323,972 14,778 154,644	6,115,377	1,454,327	1,461,116	771,142	946,288	2,228,917	100,800	556,304	200 350	6,008,595	18,425,163	495,131	43,079	1,839,845			
Number of estab-lishments.	2,943	19 14 2	590	216	227	189	65	32	6	144	1 1	618	666	20	4	129			
Number of coun-ties.	314	6 4 1	46	19	25	24	49	2	2	35	1 1	30	29	9	3	28			

Production of Bituminous Coal during the Census Year ending June 1, 1880, compared with the one ending June 1, 1870, for Mines East of the 100th Meridian.

	Per cent.
1. Gain in number of mines.....	122.0
2. Gain in yearly tonnage.....	135.0
3. Gain in value of yearly product.....	44.0
4. Gain in value of material used.....	133.0
5. Gain in amount paid as wages.....	46.0
6. Gain in total number of employés.....	133.0
7. Gain in total capital.....	54.0
8. Decrease in value per ton.....	39.0
9. Gain in tons raised per man per year.....	3.0
10. Decrease in yearly earnings.....	36.0
11. Decrease in cost of labor per ton.....	38.0
12. Decrease in cost of material per ton.....	1.0
13. Gain in per cent. of value of the product paid for labor.....	0.7
14. Gain in per cent. of value of the product paid for materials.....	3.9
15. Decrease in per cent. of value of the product left for royalty, interest, profits, etc.....	4.6
16. Gain in number of counties reporting.....	68.0

TABLE VI.—*Number of Miles of Railroad in Operation in the United States during the Years 1865, 1870, 1875, 1877-1880.*

	1865.	1870.	1875.	1877.	1878.	1879.	1880.
New Engl'd States..	3,834	4,494	5,638	5,814	5,873	5,903	5,997
Middle States.....	8,539	10,964	14,455	15,142	15,454	15,679	15,949
Southern States.....	9,129	11,163	13,287	13,812	14,079	14,333	14,908
Western States and Ters.	13,350	24,587	38,254	41,169	43,132	46,963	52,588
Pacific States and Ters.	233	1,679	2,462	3,152	3,298	3,619	4,229
Grand total.....	35,085	52,885	74,096	79,089	81,776	86,497	93,671

TABLE VII.—*Analyses of Anthracite and Bituminous Coals in all of the States of the United States.*

	Volatile Matter.	Fixed Carbon.	Ashes.	Moisture.	Sulphur.
<i>Hard Anthracite Coal.</i>					
Rhode Island.....Rogers.	3.00	77.00	16.00	.91	0.62
Massachusetts.....	3.55	82.25	5.65		
Pennsylvania.....	4.54	89.20	6.26	1.20	0.33
<i>Semi-Anthracite Coal.</i>					
Pennsylvania.....Rogers.	8.85	88.25	2.90		
<i>Bituminous Coal.</i>					
Pennsylvania.....Rogers.	15.67	41.02	12.90	0.53	
Virginia.....	33.03	62.48	5.08		
Kentucky.....	40.92	53.11	6.10	...	0.66
Indiana.....	38.16	58.34	3.50		
Southern Illinois.....	42.05	50.52	7.40		
Middle Illinois.....	43.76	47.84	8.40		
Missouri.....	43.50	51.16	5.34		
Colorado.....Macfarlane.	34.75	47.58	4.00		
Washington Territory	29.75	54.37	13.75		
Utah.....	35.22	49.90	6.30		
Oregon.....Raymond.	32.59	41.98	5.34		
California.....	40.20	49.70	3.00		
Wyoming.....Macfarlane.	20.68	64.99	1.68		
New Mexico.....	13.06	74.37	6.05		
Alabama.....E. A. Smith.	31.37	63.76	2.82		
Arkansas.....	10.80	83.48	3.51		
Arizona.....	30.55	52.50	16.40		
Iowa.....	39.24	45.42	6.77		
Michigan.....	49.00	45.00	2.00		
Maryland.....	17.53	76.16	6.81		
Wyoming and Montana.....	37.07	47.25	4.35		
North Carolina.....	16.74	49.74	33.91		
Ohio.....	56.02	93.52	8.62		
Tennessee.....	24.04	69.82	6.13		
West Virginia.....	36.98	54.64	7.29		
Western Kentucky.....	42.18	49.07	7.92		

PENNSYLVANIA BITUMINOUS COAL.—The great Appalachian coal-basin has its beginning in a series of small detached coal-fields in the northern central counties of Pennsylvania, and then extends south-west, through the State, into Ohio and Virginia. The area in Pennsylvania is extensive, spreading over portions of thirty-one counties, with a total area of coal-field, as given in the table, of 12,302 square miles. The fields are generally classified by their geographical location. Beginning at the extreme north-east and going westward, they are the Blossburg, McIntyre, Towanda, Snowshoe, Clearfield, Johnstown, Broad Top, Salisbury, and the main field of Western Pennsylvania. (Plate XI.)

The Blossburg field is located in Tioga county, covering its lower portion, below Blossburg. There are five beds of coal in a thickness of 333 feet of strata. These

beds are alphabetically designated as follows, and are given, with their thickness, the lowest being Coal A:

Coal A, Bear Creek bed.....	3-3½ feet.
“ B, Bloss bed.....	4½-5½ “
“ b, Fire-clay bed.....	1½-3½ “
“ C, Slate bed.....	2 “
“ c, Monkey bed.....	3-3½ “
“ D, Seymour bed.....	3-4½ “
“ E, Rock bed.....	2½-3 “

These beds yield a semi-bituminous coal, which is also the character of the next two basins. Coal C is a sort of cannel coal, of an inferior grade in this location; farther west it improves. These beds show great uniformity in the different openings. They generally are level and easily worked, the roof being very good. Mines have been worked here since 1840. The best bed of coal is Bed B. The greatest dip of this bed is 10°; the floor is fire-clay. The production of this region in 1880 was 921,555 tons. These coals are in good demand, being excellent steam coals, and also good for smithing purposes.

The *McIntyre* district lies in the extreme north-eastern corner of Lycoming county. The coal-beds are located some 800 feet above the creek at Ralston, the central point of the region. The width of the basin is about six miles and the length about ten miles. The coal-beds are similar to those of the Blossburg region, three of them being of workable thickness. The mines are worked similarly to those of the Blossburg region, except that, owing to the height of the coal-beds above the surrounding country, long planes are necessary to lower the coal to the railroad.

The *Towanda* coal-basin, in Bradford county, has one seam of coal, found in the neighboring McIntyre basin and similarly situated, occupying the uppermost portions of the mountains.

The *Snowshoe* region, located in Centre county, west of Bellefonte, occupies a basin eight miles in length and four in width. There are five veins of coal, three of them being workable—viz., beds E, C, and A.

Coal E, 5 feet good coal.
“ D, 1 “
“ C, 6 “ with slaty partings.
“ B, 4½ “ bony and slaty coal.
“ A, 6-3½ feet of good coal.

This coal is semi-bituminous in its character, and well adapted for steam and rolling-mill purposes.

The *Clearfield* region, situated on the Moshannon Creek, in Clearfield county, has lately become noted, and is one of the most productive of the small outlying coal-basins of the State. There are three workable seams of coal, 5 feet, 4½ feet, and 4 feet in thickness. The latter, Coal D, is principally worked. The beds, being level, are easily worked, have a good solid roof, drain themselves, and need no artificial ventilation. The coal is of exceptionally good character.

The *Johnstown* region, located in Cambria county, contains five beds of coal, shown in the following section in their descending order:

Measures	402½ feet.
Coal E, coke-yard seam.....	3½ feet.
Slate	62 “
Coal D, limestone seam.....	2½ “
Measures.....	51 “
Coal C, cement coal.....	3½ “
Measures.....	106½ “
Coal B, Peacock.....	3½ “
Measures.....	68 “
Coal A, 4 feet, 3 feet, 1 foot slate.....	1 “
Conglomerate	—
	691
	20

In this coal-region the coal is mostly used for home consumption in the large iron- and steel-works of the vicinity.

The *Broad Top* coal-basin is an independent coal-field, situated in Bedford, Huntingdon, and Fulton counties, 40 miles east of the Alleghany Mountains. The area is 81 square miles. There are five workable

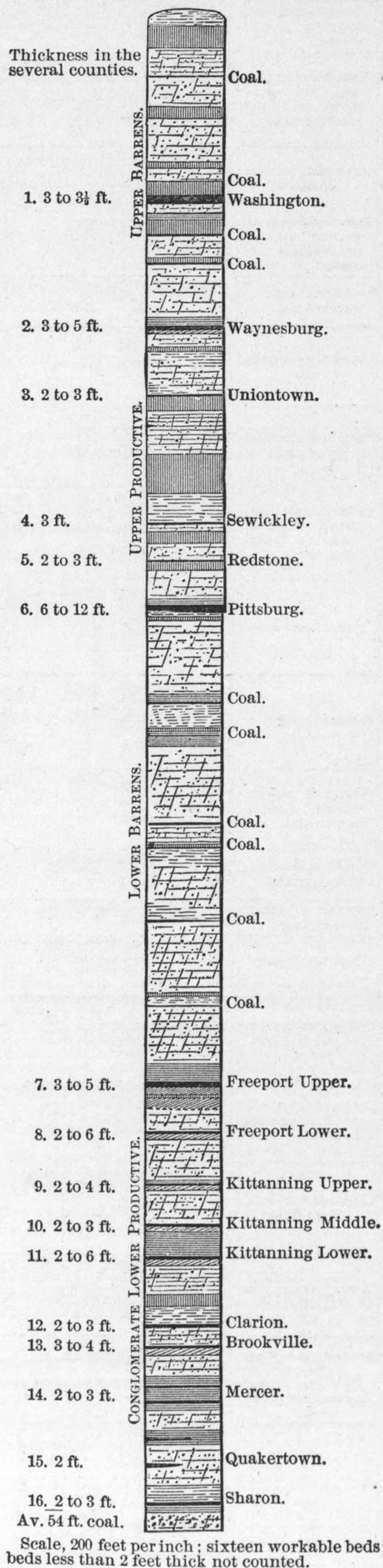


FIG. 12.—Bituminous Coals of Pennsylvania [from Second Geol. Survey, by H. M. Chance].

beds of coal, one, the principal producing bed, being from 5 to 10 feet thick.

The *Salisbury* basin, in Somerset county, is a short extension of the Cumberland coal-field of Maryland. It contains all the coals of the Lower measures and several square miles of the Pittsburgh seam.

Main Field of Western Pennsylvania.—The remainder of the bituminous coal-fields of Pennsylvania is contained in the one large field in the south-western counties. The following description of its areas and beds is extracted from an article lately written by Dr. Chance of the State Geological Survey:

"The Upper Barren measures furnish but one seam of commercial importance, the Washington bed, which attains its best development in Washington and Fayette counties, but is not persistent as a workable seam in any other county. This series of rocks contains (see fig. 12) several other seams, but they are usually very thin and of poor quality, although one, the Waynesburg "A" bed, may prove workable over a small area in Fayette county.

"*Upper Productive Coal-Measures.*—The Waynesburg bed is a seam of great importance in Greene and Washington counties, attaining also a good thickness in Fayette and Westmoreland, holding the fifth place among the productive coal-seams.

"The Uniontown bed is locally workable in parts of Fayette and Greene counties. It is of little importance, as are the Sewickley bed and the Redstone bed; which latter is also locally workable in Westmoreland and Allegheny counties, with an average thickness of from 2 to 3 feet.

"The Pittsburgh bed is the best and most valuable seam of the bituminous coal-area. It ranges from 6 to 12 feet in thickness, and, according to my estimates, contains nearly one-third of the available bituminous coal in Pennsylvania. Its most extensive areas are found in Fayette, Washington, Allegheny, Westmoreland, and Greene counties, small areas also occurring in Indiana, Somerset, and Beaver counties. The purity and quality of this coal, and the excellent character of coke made from it—the famous Connellsville—render it many times more valuable than any other seam. In parts of Washington county and in Greene county it lies deeply covered beneath a great thickness of overlying measures.

"*Lower Barren Measures.*—In Indiana, Somerset, and Butler counties this series contains several beds attaining workable size over limited areas, and in Armstrong and Beaver counties there is also a small quantity of minable coal in these measures. It will probably be worked, principally to supply the local demand.

"*Lower Productive Coal-Measures.*—In Fayette and Westmoreland counties the coals of this series contain a large amount of available coal; in Allegheny county the Freeport coals will furnish a large supply, but they are always of inferior quality.

"The Millerstown bed is locally workable in Butler county. It will be mined to meet the local demand.

"The Freeport Upper coal is workable in parts of fifteen counties. It furnishes some excellent coal, is often a superior coking coal, and in the western counties is always a strong steam, and often a good gas, coal. A small area of this seam in Clarion county is of a 'block' character, and the coal has been used raw in a small furnace (10' x 33') to smelt the limestone carbonate ores. This bed ranks third among the productive seams.

"The Freeport Lower coal is a bed of great importance in Jefferson, Indiana, Clearfield, Cambria, Armstrong, Centre, and Allegheny counties, and workable in parts of Beaver, Butler, Elk, Blair, Cameron, Westmoreland, and Fayette counties. It ranks fourth among the productive seams, and will furnish a large supply of good steam, coking, and gas coals, the character varying with the locality.

"Nearly all of the cannel coal in Pennsylvania occurs at the horizon of the Kittanning Upper coal.

It is the celebrated 'Darlington' bed. The seam often consists partly of cannel and partly of bituminous coal, but is most frequently a bituminous seam of fair quality, attaining workable thickness in parts of Butler, Armstrong, Somerset, Beaver (cannel), Indiana, Jefferson, Elk, and Lycoming counties. It holds the seventh place among the productive seams.

"The Kittanning Middle coal becomes locally workable in Butler, Lawrence, Jefferson, Armstrong, Elk, Cameron, and Clarion counties. It will furnish, probably, one-half as much coal as the Kittanning Upper bed.

"The Kittanning Lower coal in twenty-two counties attains a workable thickness, and lies above water-level, favorably situated for mining. Along the Allegheny escarpment it is an excellent coking coal, and in the western counties often a good gas coal, and always a strong steam coal. In point of production it probably ranks second only to the Pittsburgh bed; but the Freeport Upper coal may possibly equal, or slightly exceed, it in the amount of easily accessible coal. It averages from 2 to 4 feet in the western, and from 3 to 6 feet in the eastern, counties.

"The Clarion bed is formed in two subdivisions in some of the western counties, its upper split being known as the 'Scrub-grass' coal. Its output will probably be applied almost exclusively to satisfy the local demand. It sometimes furnishes coal of excellent quality, but the bed is usually quite thin.

"The Brookville bed is bed 'A' of the Allegheny escarpment counties. It will be about equally productive with the Kittanning Upper seam, but often furnishes a very sulphurous fuel.

"*Conglomerate Series.*—The Mercer Upper and Lower coals are workable over limited areas in Lawrence, Jefferson, McKean, Elk, Mercer, Venango, and perhaps in Forest county. Excepting in McKean, where their proximity to market enhances their value, and in Mercer county, where they attain their best development, they are of little importance. In Elk and Jefferson they will yield a considerable tonnage, but in the latter county at least this will be applied almost exclusively to meet the local demand.

"The Quakertown coal is workable over a small area in Mercer county.

"The Sharon coal in Mercer county is a bed of great value, but its available area will be exhausted in the near future. This horizon will furnish a small amount of coal in Crawford and Warren counties, but in the latter county it is thin and of inferior quality. Its available tonnage has been estimated on a most liberal basis.

"The area actually covered by the bituminous coal-measures in Pennsylvania is about 9000 square miles. The Upper Productive series extends over but a small fractional portion of this area; the Barren measures extend over a considerable area, hiding beneath a thick covering large areas of the coals of the Lower Productive measures, otherwise easily accessible."

TABLE VIII.—*Bituminous Coal in Pennsylvania by Counties.*
[From Second Geological Survey, by H. M. Chance.]

County.	Area in Acres.	Tonnage.	County.	Area in Acres.	Tonnage.
Allegheny.....	224,000	2,496,000,000	Greene.....	336,000	2,664,000,000
Armstrong.....	377,600	1,872,000,000	Indiana.....	446,000	2,184,000,000
Beaver.....	186,400	92,800,000	Jefferson.....	416,000	1,992,000,000
Blair.....	17,600	62,400,000	Lawrence...	105,600	398,400,000
Bradford.....	10,880	46,100,000	Lycoming...	9,600	52,800,000
Butler.....	368,000	1,704,000,000	Mercer.....	131,200	492,000,000
Cambria.....	364,800	1,756,800,000	McKean.....	12,800	43,200,000
Cameron.....	28,800	129,600,000	Potter.....	6,400	24,000,000
Centre.....	150,800	748,800,000	Somerset.....	297,800	1,770,000,000
Clarion.....	172,800	688,800,000	Sullivan.....	2,560	11,500,000
Clearfield.....	240,266	1,410,400,000	Tioga.....	16,000	129,600,000
Clinton.....	16,000	62,400,000	Venango.....	16,000	52,800,000
Crawford.....	3,200	14,400,000	Washington...	698,000	4,128,000,000
Elk.....	228,200	913,800,000	Warren.....	3,200	9,600,000
Forest.....	1,280?	3,800,000	Westmoreland..	278,400	2,428,800,000
Fayette.....	470,400	4,574,400,000	Area in acres ¹	5,600,786	
			Total.....	....	33,547,200,000

The amount of coal excluded from these estimates on account of poor quality, depth beneath water-level, or beneath a thick covering of overlying rocks, is very great. As the estimates prove the existence of an amount of easily accessible coal of good quality sufficient to supply the demand for several centuries, estimates of the tonnage of the impure seams or inaccessible areas would be of no practical value to the present generation.

¹ Area in square miles, 8°751.

TABIE IX.—Analyses of Pennsylvania Bituminous Coals
(from Second Geological Survey of Pennsylvania).

Counties.	Samples.	Water.	Volatile Matter.	Fixed Carbon.	Sulphur.	Ash.
Greene.....	17	1.14	35.736	51.755	1.795	9.105
Washington.....	21	1.16	37.107	50.993	2.064	8.719
".....	9	1.19	36.791	56.527	0.850	4.637
Beaver.....	20	1.96	39.041	50.202	1.996	6.959
Lawrence.....	14	2.11	40.450	52.514	1.373	3.255
Butler.....	11	1.91	39.883	48.967	1.968	7.222
Indiana.....	29	0.98	29.259	58.738	1.734	9.459
Westmoreland.....	27	1.14	32.273	59.227	1.500	5.971
Fayette.....	12	0.95	29.753	60.471	1.787	7.040
Somerset.....	30	1.15	19.774	67.780	1.615	9.669
Cambria.....	25	0.95	21.599	67.325	1.625	8.176
Blair.....	9	1.06	27.271	60.690	2.314	8.662
Huntingdon.....	8	0.47	16.539	72.846	1.978	8.160
McKean.....	11	2.25	34.493	46.251	2.973	14.024
Potter.....	3	1.72	32.285	55.315	1.011	9.675
Tioga.....	17	1.65	20.505	67.791	1.257	8.852
Bradford.....	7	0.82	16.946	69.264	0.672	12.291
Lycoming.....	2	1.06	17.530	72.416	0.838	8.155
Sullivan.....	12	3.24	13.031	72.740	0.611	10.380



FIG. 13.—Map of Maryland Coal-fields.

BITUMINOUS COALS IN MARYLAND.—The *Cumberland coal-field* in Allegheny county, Md., is 30 miles long, and has an average breadth of 4½ miles. Its northern end reaches into Pennsylvania, and its southern extremity into West Virginia. The main bed of coal, called the “Big seam,” is 12 feet thick in the centre of the field, 14 feet in many places, and quite regular. It produces from 5000 to 6000 tons of coal per acre. The maximum thickness of Carboniferous strata is about 1200 feet, and there are thirty beds of coal, aggregating 70 feet in thickness, but most of them are too thin to mine. The product of this region is well known in the market, as it has been mined since 1842. In 1880 there were twenty mining companies operating here, and their aggregate output was 2,136,160 tons. Besides the Big seam, there are other beds of coal, as shown in the accompanying cross-section, by Philip T. Tyson:

TABLE X.—Cross-section by Prof. Philip T. Tyson.

Feet above tide.	No.		
50	28	Shale.....	1.6
	27	Coal L.....	2.0
	26	Shaly sandstone.....	19.0
	25	Shale.....	23.6
	24	Coal K, Waynesburg.....	6.0
	23	Limestone and shale.....	12.0
	22	Fire-clay.....	13.9
	21	Unknown.....	3.9
	20	Iron in shale.....	27.3
	19	Shale.....	27.9
1950	18	Fine-grain sandstone.....	3.6
	17	Shale.....	2.6
	16	Coal, 2 in. slate, J.....	4.3
	15	Fire-clay.....	10.0
	14	Coal J, Sewickley.....	3.6
1900	13	Fire-clay.....	3.0
	12	Shaly sandstone.....	51.0
	11	Micaceous “.....	
	10	Coarse “.....	
	9	Shale.....	42.6
1800	8	Coal J, redstone.....	4.6
	7	Shale.....	2.0
	6	Coal.....	1.0
	5	Shale.....	4.9
	4	Coal.....	1.0
	3	Shaly sandstone.....	1.3
	2	Shale, ferruginous.....	1.0
	1	Main coal H, Pittsburg.....	4.8

The lower seams are 4 feet 6 inches, 3 feet 6 inches, 6 feet, and 2 feet, in a thickness of 250 feet. The lowest seam is the Bluebough coal, which is in two branches, respectively 32 inches and 8 inches thick, separated by 12 to 16 inches of shale. The next seam is the Parker coal, 2 to 2½ feet thick and 36 feet higher. The Powell seam is 30 feet higher, and said to be 3½ feet thick. The Percy seam, 20 feet higher, contains 30 inches of coal. The fifth bed, the Hall, is 30 feet higher and 4 feet thick. A sixth bed, the Rush Run coal, 2 feet thick, is still higher. Cross-sections show that the whole system of coal-measures is represented, up to the highest valuable coal-seam, but without the overlying second series of Barren measures found near the Ohio. The coal-beds of the Upper coal-measures are here in their greatest magnitude; the seams found in the Barren measures are also enlarged; and those of the Lower coal-measures are small, being split up into a large number of thin seams.

Cumberland coal is a true semi-bituminous. The coal is all taken from the mine, fine and coarse, and is not separated. It is jet black and has a glossy appearance; it is friable, and becomes pulverized in course of transportation and handling. The distance from tide-water to Cumberland is 178 miles, and to Piedmont 206 miles. By the Chesapeake and Ohio Canal the distance is 191 miles.

TABLE XI.—Analyses by Prof. W. B. Rogers.

	Carbon.	Water and vol. mat.	Ash.
Brantzburg.....	73.40	19.72	7.88
Olive (12-foot seam).....	79.08	16.28	6.64
MacDonald's (Abraham's Creek, 3d seam).....	74.00	18.60	7.40
Stony River (Hardy co., lower seam).....	79.16	15.52	5.32

TABLE XII.—The Shipments of Cumberland (Md., U. S.) Coal from the Mines during 1880 were—

Name of Company or Mine.	To B. and O. R. R.	To C. and O. Canal.	To Penna. R. R.	Local.	Total.
Consolidation Coal Co.....	372,482	166,402	673	28,687	568,244
New Central Coal Co.....	131,793	64,783	153,079	2,800	352,455
George's Creek Coal and Iron Co..	197,290	38,309	....	836	236,435
Borden Mining Co.....	5,624	101,622	43,298	8,830	159,374
American Coal Co.....	37,490	87,350	53	541	125,434
Maryland Coal Co.....	17,356	94,279	1,756	612	114,003
Franklin Coal Co.....	102,821	....	....	....	102,821
Hamp. and Baltimore Coal Co....	72,553	11,706	14,478	295	99,032
Potomac Coal Co.....	77,431	....	....	263	77,694
Atlantic and George's Creek C. } C. Co.....	62,792	....	....	3,050	65,842
Davis & Bro. (W. Va. mines).....	54,843	....	....	....	54,843
George's Creek Mining Co.....	50,538	....	....	....	50,538
Blaen Avon Coal Co.....	4,583	38,674	....	1,763	45,020
Swanton Mining Co.....	41,643	....	98	383	42,124
Cumberland Coal and Iron Co....	....	....	25	22,915	22,940
Piedmont Coal and Iron Co.....	3,094	....	....	....	14,591
Piedmont (Empire Mine).....	11,497	....	....	....	....
Union Mining Company.....	25	....	....	4,445	4,470
North Branch Coal Co.....	233	....	....	....	233
Grant Coal and Iron Co.....	67	....	....	....	67
	1,244,155	603,125	213,400	75,420	2,136,160

COALS OF VIRGINIA.—There are several detached coal-fields in the Mesozoic rocks of Virginia east of the Alleghany Mountains. The latest and best account of them is contained in a paper published in 1878 by Oswald J. Heinrich, E. M., from which the following abstract is made: The Richmond deposit, or Richmond coal-basin, generally known as the Richmond coal-field, is by far the most important of these deposits. It extends from the northern county-lines of Goochland and Henrico counties, across the James River to the Appomattox River, lying in Powhatan, but mainly in Chesterfield county. About 11 miles west of Richmond it extends upon both sides of the James, but mainly upon the south. Its shape somewhat resembles the contour of a plum, with its peduncle pointing north, formed by a narrow branch extending northward from Tuckahoe Creek for about 6 miles, averaging about 1 mile in width. Including the northern spur, the length of this basin is about 31½ miles, over 24 miles of it in the main body. The width varies from 7½ to 10 miles, comprising in all an area of about 189 square miles. At least two workable beds of coal are known to exist in this basin. The lower is 566 feet

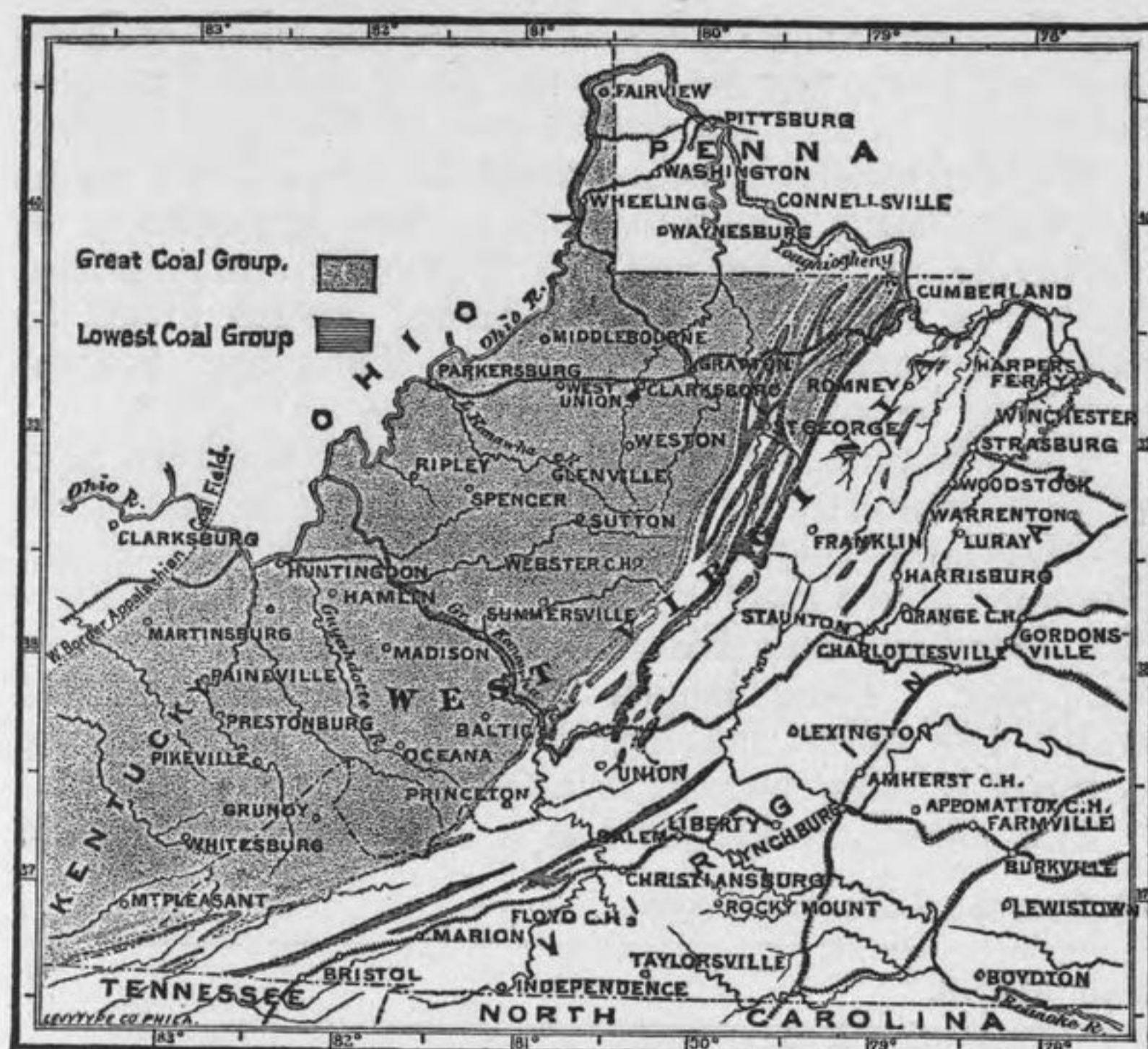


FIG. 14.—Virginia and West Virginia Coal-fields.

from the granite floor, and is from 3 to 5 feet thick, and the upper, or Big bed, is from 20 to 40 feet thick. The distance between the two beds is about 50 feet. A third bed, 1 foot thick, lies about midway between them. The Big bed is frequently split into two divisions, with from 5 to 10 feet of slate and sandstone between. The beds pitch at angles varying from 20° to 60° or 70°, but the average pitch may be assumed to be 25° to 35°.

The "strike" or course of the measures is about N. 12° to 15° E. Although this coal has been known and used since 1700, it is still almost untouched, only about 500 acres of the 120,960 in the field having been exhausted. "These 500 acres are principally divided into about six localities—namely, the mines about Carbon Hill, National, Midlothian and vicinity, and Clover Hill, upon the line of the eastern outcrop, at the extreme northern and southern points, and about in the middle of the border-line of 28 miles in extent; also for about 10 or 12 miles upon the extreme northern point of the western outcrop, in the vicinity of Dover, and the mines south of James River; in all, say 38 to 40 miles of outcrop, the circumferential line of the basin being about 75 miles." The coal of this basin yields about 9000 feet

TABLE XIII.—Annual Production and Shipments of Coal from the Richmond Coal Basin, in Tons of 2000 Pounds.

Fiscal year, Oct. 1st to Sept. 30th.	Shipped by Richmond, Fred. and Potomac R. R.	Shipped by James River and Kanawha Canal.	Shipped by Richmond and Danville R. R.	Shipped by Clover Hill and Richmond and Petersburg R. R.	Miscellaneous transportation by wagons.	Consumed at the mines; est'd 7 per cent. of production, except where otherwise obtained.	Total amount shipped.	Total amount produced.	General Remarks.
1822 to 1842	...	...	...	...	...	...	1,925,000	1,925,000·00	{ Total amount, according to R. C. Taylor's and other reports.
1843	18,000 est.	...	...	14,300 est.	57,051	6,254·57	89,351	95,605·57	Previous to 1841 Deep Run produced about 18,000 tons, taken as average until 1847, when the mines stopped.
1844	18,000 "	18,418	...	14,300 "	57,051	7,543·83	107,769	115,312·83	Ch. C. & I. M. Co. raised 213,508 tons from 1841 to 1851, or 21,351 tons on an average.
1845	18,000 "	36,446	...	14,300 "	57,051	8,805·79	125,797	134,602·79	Midlothian Co., est. 35,700 tons on an average from 1843 to 1852; books burned at the evacuation of Richmond.
1846	18,000 "	23,462	...	18,000 "	57,051	8,155·91	116,513	124,668·91	Transportation on old Richmond horse railroad up to 1851 from Midlothian district.
1847	18,000 "	27,446	...	25,000 "	57,051	8,924·79	127,497	136,421·79	Clover Hill R. R. books burned at the evacuation of Richmond; amount est. from 1843 to 1852 by the treasurer of the company.
1848	...	30,797	...	25,000 "	57,051	7,899·36	112,848	120,747·36	
1849	...	37,997	...	30,000 "	57,051	8,753·36	125,048	133,801·36	
1850	...	35,937	...	36,000 "	57,051	9,029·16	128,988	138,017·16	
1851	...	27,531	17,432·40	43,000 "	39,619	8,940·74	127,582·40	136,523·14	
1852	...	21,752	34,955·25	43,000 "	...	6,979·49	99,707·25	106,686·74	
1853	...	21,098	15,620·69	58,352	...	6,654·97	95,070·69	101,725·66	
1854	...	20,533	43,454·00	59,895·36	...	8,671·74	123,882·36	132,554·10	
1855	...	21,152	35,621·95	60,961·60	...	8,241·45	117,735·55	125,977·00	
1856	...	19,084	38,842	41,279·84	...	6,944·42	99,205·84	106,150·26	
1857	4,000 est.	28,824	24,274	50,216·32	...	7,511·98	107,314·32	114,826·30	
1858	4,000 "	17,477	29,918	54,904·64	...	7,434·70	106,299·64	113,734·34	
1859	4,000 "	14,156	30,834	50,391·04	...	6,956·67	99,381·04	106,337·71	
1860	3,495 "	21,305	32,315	47,999·84	...	7,358·04	105,114·84	112,472·88	
1861	500	20,146	18,353	49,502·88	...	6,195·13	88,501·88	94,697·01	
1862	...	20,612	29,146	56,680·96	1,500 est.	7,555·73	107,938·96	115,494·69	Miscellaneous transportation, estimated by hauling in wagons during the war.
1863	...	19,608	42,000 est.	41,628·16	1,500 "	7,331·52	104,736·16	112,067·68	R. & D. R. R., no reports kept in consequence of depreciation of currency during the war.
1864	...	20,000 est.	42,190	40,751·20	1,500 "	7,300·87	104,441·20	111,742·07	J. R. & K. Canal, estimated; books being burned with the office at the evacuation of Richmond.
1865	...	20,000 "	42,000 est.	5,312·72	1,500 "	4,916·89	68,812·72	73,729·61	R. & D. R. R., the same reason as in 1863.
1866	...	19,842	25,918	20,512·80	...	4,639·09	66,272·80	70,911·89	R. F. & P. R. R., no coal shipped during the war, the Deep Run mines belonging to a Northern company.
1867	6,289·2	41,150	19,700·1	18,384·24	...	5,286·65	85,523·54	90,810·19	
1868	2,605·5	45,280	14,782	27,223·84	...	6,292·39	89,891·34	96,183·73	
1869	9,179·07	38,682	20,433	39,709·21	...	7,560·23	108,003·28	115,563·51	
1870	2,904·03	31,100	26,734	23,560·16	...	5,900·87	84,298·19	90,199·06	
1871	2,078	11,860	34,288	47,037·20	...	6,668·42	95,263·20	101,931·62	
1872	57	13,167	29,175	47,295·36	...	6,278·60	89,694·36	95,972·96	
1873	3,027	13,792	38,025	40,019·84	...	6,640·47	94,863·84	101,504·31	
1874	824	20,440	18,690·21	36,542·24	...	5,354·75	76,496·45	81,851·20	
1875	5,404	19,301	14,453·08	43,744·96	...	5,803·21	82,903·04	88,706·25	
1876	...	8,682	16,321·64	28,366·00	...	3,812·00	53,369·64	57,181·64	
1877	...	6,841	14,741·49	34,197·00	...	12,127·80	55,779·49	67,907·29	
Total	138,362·80	793,918	750,217·81	1,287,369·41	502,027	250,725·59	5,396,895·02	5,647,620·61	

of gas, of 14 candle-power, per ton. Three varieties are found, often in close connection—viz., glance coal, a deep-black, glassy, very brittle coal, having the appearance of hardened pitch; lamellar coal, a brownish-black substance of a dull resinous lustre and comparatively tough; and fibrous coal, a mineral charcoal occurring in thin layers between the other two.

The same coal, but of an inferior character, being much contaminated with iron pyrites, occurs near Farmville, where several seams from 1½ to 6½ feet thick have been partly explored. It has also been found in the field extending from Danville into North Carolina.

The Richmond basin, although so slow in development, lies so close to tide-water, and contains so large a quantity of excellent coal, that it must become an important mining-field in the near future. (See Tables XIII., XIV.)

The *Acquia deposits* extend from Mount Vernon to

the Massaponax, 40 miles, their greatest width at Potomac Creek or at the Massaponax River, about 8½ miles—comprising in all a superficial area of 174 square miles.

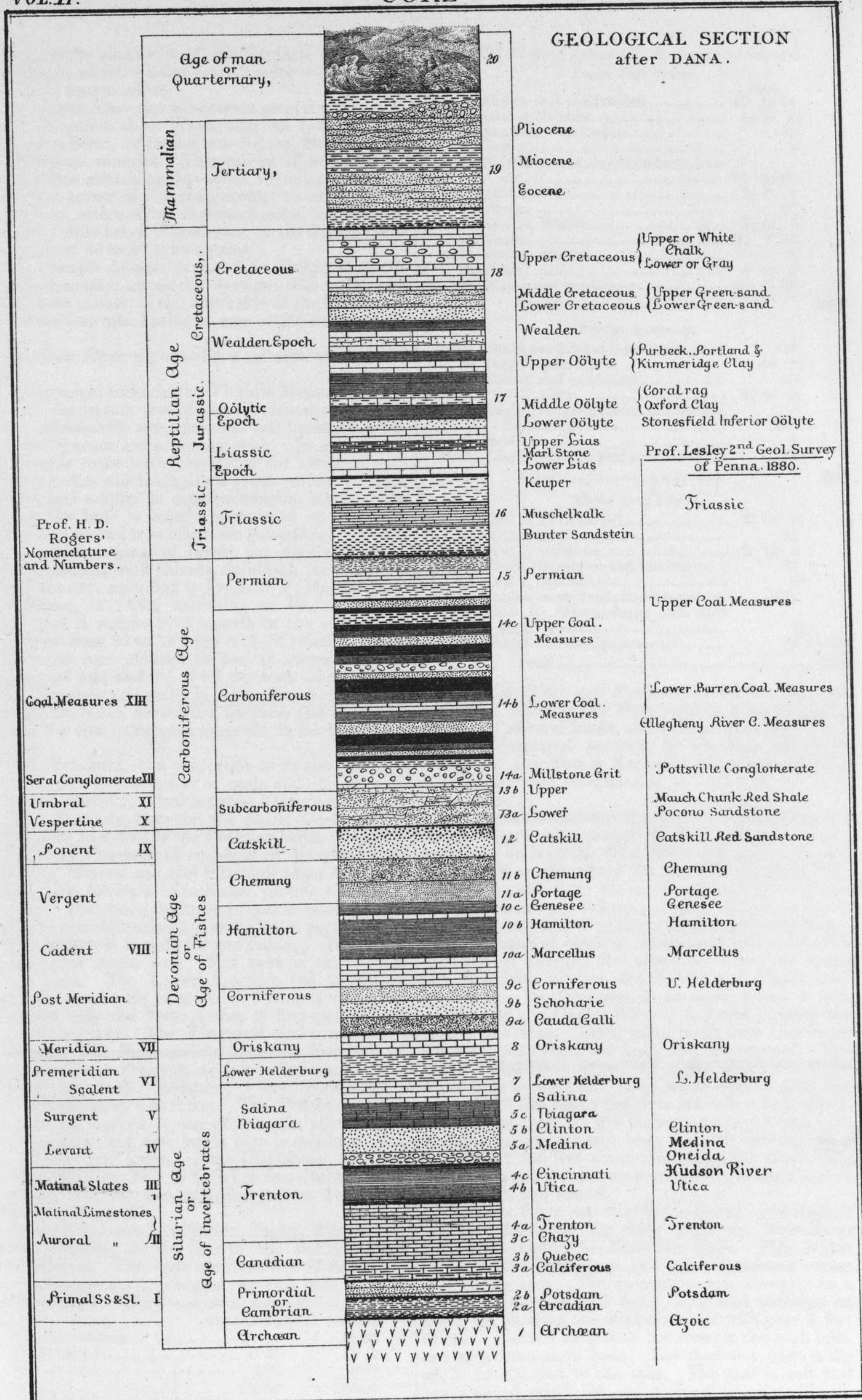
The *Farmville deposits* contain the two isolated basins upon the north and south side of the Appomattox at Farmville, in Cumberland and Prince Edward counties, known as the Farmville coal-basin; length about 13 miles, and average width 2 miles. Their area is computed to be about 20.5 square miles.

The *Potomac deposits* form the most northern part of this (western) division. Commencing in the State of Maryland, they extend from the north side of the Potomac above the falls, through the counties of Fairfax, Loudoun, and Fauquier, to Robertson's River in Culpeper. Their length is 74 miles, and greatest width 14½ miles, making the entire area of country covered by this formation about 651 square miles.

The *Barboursville field* is a small area in Orange

TABLE XIV.—Analyses of Coal from the Richmond Basin.

SOUTH OF JAMES RIVER.							
Name of Pit.	By whom Analyzed.	Moisture.	Volatile Matter.	Fixed Carbon.	Ash.	Sulphur.	Coke.
EASTERN OUTCROP.							
Clover Hill (Coxe's Mines).....	Prof. Johnson.....	1.339	30.984	56.831	10.132	.514	66.963
" " " "	W. B. Rogers.....	—	29.12	65.52	5.36	—	70.88
" " " "	G. W. Andrews.....	—	38.50	55.00	6.50	—	61.50
Stone Henge.....	W. B. Rogers.....	—	36.50	58.70	4.80	—	63.50
Creek Company Shaft.....	Prof. Johnson.....	1.450	26.788	60.30	8.57	2.89	68.872
Mills & Reed, Creek Shaft.....	W. B. Rogers.....	—	38.60	57.80	3.60	—	61.40
Greenhole Shaft.....	" "	—	31.17	67.83	2.00	—	69.83
Midlothian, average.....	Prof. Johnson.....	2.455	29.738	53.012	14.737	.058	67.749
" " new shaft.....	" "	0.670	31.208	56.40	9.44	2.286	65.840
" " screened	" "	1.785	34.295	54.063	9.655	.202	63.718
" " 900-ft. shaft....	" "	1.172	27.278	61.083	10.467	—	71.550
" " {	B. Silliman and O. P. }	2.000	31.62	58.26	7.67	—	66.310
" " {	Hubbard.....	—	31.60	61.10	7.10	—	68.20
" " {	J. H. Alexander.....	—	31.60	61.10	7.10	—	68.20
" " Grove Shaft,	" "	—	31.60	61.10	7.10	—	68.20
1875, screened.	A. S. McCreath.....	1.03	38.23	54.27	6.47	1.52	60.74
Midlothian, average.....	" "	1.05	36.49	46.702	15.758	2.23	62.468
Maidenhead	W. B. Rogers.....	—	32.83	63.97	3.20	—	67.17
English Co., old shaft	" "	—	35.82	53.36	10.82	—	64.18
" " middle bench....	" "	—	28.40	66.50	5.10	—	71.60
" " top bench.....	" "	—	28.80	61.68	9.52	—	71.20
Chesterfield Mining Co.....	Prof. Johnson.....	1.896	28.719	58.794	8.634	1.957	67.428
Willis's Pit (Ætna Shaft).....	Clemson.....	—	28.80	66.60	4.60	—	71.20
WESTERN OUTCROP.							
Powhatan Pits.....	W. B. Rogers.....	—	32.33	59.87	7.80	—	67.67
Scott's Pit.....	" "	—	33.70	60.86	5.66	—	66.52
NORTH SIDE OF JAMES RIVER.							
EASTERN OUTCROP.							
Carbon Hill, bit. upper seam....	O. J. Heinrich.....	1.40	20.60	60.80	17.20	Not de-	78.00
" " second seam	" "	0.40	18.60	71.00	10.00	—	81.00
" " carbonite	" "	1.57	9.64	79.93	8.86	Consid-	88.79
" " average	Prof. Johnson.....	1.785	23.959	59.976	14.28	—	74.256
" " natural coke.....	" "	1.116	11.977	75.081	11.826	—	86.907
" " carbonite	Dr. W. Wallace, of Glasgow	1.56	14.26	81.61	02.24	0.33	83.85
WESTERN OUTCROP.							
Anderson's Pits (Dover).....	W. B. Rogers.....	—	28.30	66.78	4.92	—	71.70
" " "	Clemson	—	26.00	64.20	9.80	—	74.00
T. M. Randolph.....	W. B. Rogers.....	—	30.50	66.15	3.35	—	69.50
Coalbrookdale.....	" "	—	29.00	66.48	4.52	—	71.00
" 1st seam.....	" "	—	24.00	70.80	5.20	—	76.00
" 2d seam.....	" "	—	22.83	54.97	22.20	—	77.17
" 3d seam.....	" "	—	24.70	65.50	9.80	—	75.30
" 4th seam.....	" "	—	21.33	56.07	22.60	—	78.67
Cranches, upper seam.....	" "	—	30.00	64.60	5.40	—	70.00
Waterloo	" "	—	26.80	55.20	18.00	—	73.20
Deep Run Basin.....	" "	—	26.16	69.86	5.00	—	74.86
FOR COMPARISON.							
Westmoreland, Pa., Gas Coal....	Booth & Garrett.....	1.30	31.45	61.45	5.80	1.04	67.25
Campbell's Creek, W. Va., splint.	Riverside Iron Co	1.88	35.64	61.07	1.41	—	62.48
" " 2d seam	W. B. Rogers	—	32.24	64.16	3.60	—	67.76
" " 3d seam	" "	—	33.68	57.76	8.56	—	66.32
Cannelton, Gas Coal.....	Ford	—	35.10	62.90	2.00	—	64.90
Raymond City.....	Vinton.....	—	33.00	60.10	6.90	—	67.00
Lingan, Cape Breton.....	Chandler.....	—	35.20	60.80	4.00	—	64.80
Newcastle, England.....	"	—	32.70	65.55	1.75	—	67.30
" "	McCreath.....	0.69	30.29	64.69	2.81	1.52	67.50



county, on the south side of the Rapidan, of an elliptical shape, about 9 miles long, 2 miles wide, with an area of 14 square miles.

The *James River deposits* contain several occurrences of the formation about Warminster, on both sides of the James River, extending into Nelson, Buckingham, and Fluvanna counties. They consist of isolated, narrow patches stretching for about 18 miles, from the south-west corner of Fluvanna county, about the Hardware River, with a width of about 5 miles, to a distance of about 1 mile below Warminster, on the James. The area is about 40 to 45 square miles.

The *Danville deposits* extend from Falling River, in Campbell county, across the Staunton River, through Pittsylvania county, to the north side of the Dan River, just above Danville, having an area of 260 to 272 square miles.

The *Dan River deposits* have an area of about 14 miles.

The principal rocks in the Virginia Mesozoic formation are sandstones and shales of various grades and colors; occasionally conglomerates and limestones, fire-clays and igneous rocks, are met with. In some places the igneous rocks have penetrated the series of sedimentary rocks, which display a great variety of color, texture, and solidity in rapidly-changing strata. The coal of the beds is mostly bituminous in character, caking readily, and is excellent for gas-making. It consists of thick laminae of bright jet, highly resinous, often alternating with thinner dull-black laminae. Its specific gravity, according to Profs. O. P. Hubbard and B. Silliman, is 1.292, according to Prof. Johnson, 1.246; and it weighs 2075 pounds to the cubic yard. It contains from 30 to 38.5 per cent. of volatile matter, 59 to 66 per cent. of fixed carbon, an average of 5.58 per cent. of ash, and 0.6 to 1.7 per cent. of sulphur.

The Mesozoic anthracite is hard, of iron-black color, sub-metallic lustre, conchoidal fracture, and closely resembles the true anthracite, especially in the Dan River deposits.

WEST VIRGINIA.—In proportion to its size, no State surpasses this in the variety of coals and area of coal-measures. Out of fifty-four counties, but six are destitute of coal. In many, however, the coal is deeply buried.

The *First coal-field* is the Potomac basin, a continuation of the Cumberland coal-field of Maryland. At Piedmont, Mineral co., the Pittsburgh seam is worked 14 feet thick, having a 1½-inch slate parting 4 feet from the floor. The entire thickness of coal is mined, but as it is here semi-bituminous, having lost a portion of its volatile matter, it is unfit for gas-making. It is, however, a good steam coal. The next is the *Preston county basin*. The Upper Freeport bed is worked here. At the Austin mine the coal-seam is 8 to 9 feet thick, but only the lower 4 feet is first-quality coal. The coal is coked. The Kingwood coal is worked 4½ feet thick. The *Monongahela basin* has five beds of coal—the Lower Freeport, 4½ feet; Pittsburgh, 10 feet (9½ feet clear coal); Redstone, 5 feet; Sewickley, 6 feet; Waynesburg, 5 to 6 feet. The Pittsburgh bed is the only one worked to any extent. In this basin it makes valuable gas coal, but is high in sulphur. The coke is hard and tough. Near Clarksburg, Harrison co., the Pittsburgh bed is found 9 feet thick. Near Wheeling, Ohio co., the same bed is from 5 to 7½ feet thick (5 feet worked).

Gas coals are mined in Marion, Taylor, Ritchie, and Preston counties, on the line of the Baltimore and Ohio Railroad. The beds are from 6 to 11 feet thick. The Clarksburg region contains very rich beds, from 10 to 12 feet thick. They analyze as follows:

	Clarksburg bed.	Cannel.
Volatile matter.....	56.74	49.21
Fixed carbon.....	41.66	45.43
Ash.....	1.60	5.36
	100.00	100.00

Gas made per gross ton, 12,839 cubic feet, 16 candle-power; coke, 37½ bushels, of 45 pounds.

West Virginia Section [W. B. Rogers (abridged)].

Lower Coal Group.

Nos.		Feet.
1 to 5.	Shales and sandstones.....	46 to 64
6.	Coal A, friable.....	1½ to 2½
7.	Sandstone and shale.....	30
8.	Coal B.....	1
9 to 13.	Sandstones, shales, limestone, iron ore.....	17 to 67
14.	Coal C.....	1 " 2
15.	Shale.....	12
16.	Coal D, friable.....	3½ to 4
17.	Shale.....	30 " 40
18.	Coal E, thin.....	1
19.	Shale.....	5 to 6
20.	Mahoning sandstone.....	60 " 70
Total.....		299

Barren Measures.

21-29.	Shale, sandstone, limestone.....	144
30.	Coal F, poor.....	1 to 1½
31-33.	Shales and sandstone.....	53
34.	Coal G, slaty.....	2½ to 3
35-38.	Shales, conglomerates, sandstones, limestone.....	201
39.	Coal G.....	2
40-41.	Limestone and shales.....	16
Total.....		420

Upper Coal Group.

42.	Coal H (Pittsburg).....	6½ to 9½
43, 44.	Shale and limestone.....	22
45.	Coal I, redstone.....	3 to 4
46-52.	Shale, limestone, and sandstone...	31
53.	Coal J, Sewickley.....	5½
54-65.	Shales, sandstones, and limestones	211
66.	Coal K, Waynesburg and two smaller seams.....	7½
67, 68.	Shales and sandstones.....	20 — 310
Total.....		1029

The *New River and Kanawha coal-fields*, the most important fields in the State, contain a better quality of coal of several kinds, and a large quantity. They are well developed naturally by the deep cañon-like channel of the New or Kanawha River, exposing the beds at different elevations in the sides of its rocky boundaries.

The Kanawha coal-region proper lies on the Kanawha River, below the junction of the New and Gauley rivers, and along its branches, Coal River, Pocotalico, Elk, and Greenbrier creeks, where the beds are exposed. The strata rise gently from the mouth of the Elk to the falls of the Kanawha. Above this point the strata dip to the south-east, and then gradually rise to Gauley Mountain. A band of black or bluish-black siliceous rock is seen several hundred feet above the river, and marks the boundary between the Lower and Upper coal-measures. Its thickness is in some places 6 feet. Farther up the Gauley River it is found forming the tops of the hills. Thirty miles north from Charleston the coal-seams below the black rock are exposed. Two broad undulations return the strata above the river. Four beds of coal are above water-level. At a distance of 60 feet above the river is a 6-foot bed, affording the best coal; 45 feet higher is a 1-foot 6-inch bed; 200 feet higher, a 4-foot bed; and 150 feet higher, a 4-foot bed; 266 feet above this occurs the black flinty shale. Some of these coals are good gas coals, others hard splint and cannel.

The New River coal-field lies in Fayette and Raleigh counties, bordering for forty miles the New River from Quinnimont to Kanawha Falls. This region contains the bituminous and semi-bituminous steam and coking coal. The mountains rise abruptly to a height of 800 to 1200 feet. The coal outcrops on the river, showing two workable beds with over 3 feet of coal. Farther back from the river, in the high hills, are seen three more beds. The measures have a dip of 75 to 100 feet to the mile. The coal is soft and easily mined, ventilation and drainage being readily obtained. This coal makes an excellent coke, showing a better analysis than the famed Connellsville coke of

Western Pennsylvania. At Quinnimont the seam worked is 3 feet thick, and is 1000 feet above the river, being brought down a long plane to the coke-ovens. The coal is a soft semi-bituminous, yielding 63 per cent. of coke. Sixteen miles down the New River, at Fire Creek, a higher seam is worked. The coal is less friable at Hawk's Nest. Thirty miles west of Quinnimont the Nuttall vein is worked at an elevation of 75 feet above the river, having fallen 1500 feet in thirty miles. At Ansted, 3 miles north-east of Hawk's Nest, a bed of the Lower coal-measures is worked, the thickness being 11 feet. This region is developed and brought into connection with markets by the Chesapeake and Ohio Railroad. The shipments for 1880 and 1881 were as follows:

	1880.	1881.	Gain, 1881.
Cannel.....	43,180	25,183	
Gas.....		229,564	
Splint and block.....	526,990	177,786	143,877
New River and other steam		263,517	
Coke.....	36,374	77,376	41,002
Total movements.....	606,444	773,426	166,982

The increase in the total movement was one of over 27 per cent.; that in movement of bituminous coal, exclusive of cannel, was also over 27 per cent.; the gain in coke movement was one of over 112 per cent. Nor do these quantities represent all the coke made along this road, for the coke output along the Chesapeake and Ohio Railroad in 1881 may be put down as not far from 100,000 tons.

Adding the cannel to the other gas coal, this shows that over 250,000 tons of gas-making coal were sent to market over the Chesapeake and Ohio Railroad in 1881. But this does not represent the production of these coals on the Great Kanawha (nor does the return of "splint and block" represent the output of those kinds there), for a large proportion of the output of these coals in that region is sent down the rivers in barges.

TABLE XV.—Analyses of West Virginia Coals and Coke—New River Region.

Locality.	Moist-ure.	Fixed Car-bon.	Vol. Matter.	Ash.	Sul-phur.
<i>Coals:</i>					
Quinnimont Lump.....	0.76	79.26	18.65	1.11	0.23
" Slack.....	0.83	79.40	17.57	1.92	0.28
Fire Creek coal.....	0.61	75.02	22.34	1.47	0.56
Longdale (Sewell).....	1.03	72.32	21.38	5.27	0.27
Nuttallburg.....	1.35	70.67	25.35	2.10	0.57
Hawk's Nest.....	0.93	75.37	21.83	1.87	0.26
Ansted.....	1.40	63.10	32.61	2.15	0.74
<i>Coke:</i>					
Quinnimont.....	...	93.85	...	5.85	0.30
Fire Creek.....	0.11	92.18	...	6.68	0.61
Sewell.....	...	93.00	...	6.73	0.27
Nuttallburg.....	...	92.22	...	7.53	0.92
Connellsville, Pa.....	...	87.26	...	12.00	0.74

TABLE XVI.—Analyses from Prime's Report on the Centennial Exhibit.

Locality.	Moist-ure.	Volatile Com-bustible Matter.	Fixed Car-bon.	Sul-phur.	Ash.
Piedmont, Mineral co.....	0.82	19.36	75.86	0.71	3.96
Austen, Preston co.....	0.11	31.12	66.29	0.64	2.48
Kingwood, top of bed.....	0.34	31.47	65.66	0.58	2.53
Monongahela county:					
Upper Freeport bed.....	0.63	28.06	54.28	0.77	17.03
Pittsburg ".....	0.39	38.64	54.77	2.54	6.20
Redstone seam.....	0.37	37.88	54.36	2.87	7.39
Sewickley bed.....	0.44	35.78	54.31	3.10	9.47
Waynesburg seam.....	0.74	35.36	56.35	0.71	7.55
Despard, Harrison co.....	...	40.00	53.30	...	6.70
Murphy's Run, ".....	1.58	37.10	49.08	2.84	9.40
Wood's Run, Ohio co.....	1.74	42.97	50.99	2.88	4.30
Hartford, Putnam co.....	3.43	44.38	46.88	1.57	5.31
Osborn, Wayne co.....	2.30	40.43	48.72	0.76	8.55
<i>Cannel Coal.</i>					
Falling Rock Creek, Elk River	...	43.20	50.80	...	6.00
Peytona, Boone co.....	...	46.00	41.00	...	13.00

Grahamite was found in Ritchie co., in West Virginia. The vein is vertical, 4½ feet thick and three-

quarters of a mile long; but the mines are now exhausted. Its analyses show 55 per cent. of volatile matter, 42 per cent. of fixed carbon, and 3 per cent. of ash.



FIG. 15.—Map of North Carolina Coal-fields.

NORTH CAROLINA.—The *Dan River field*, as already noted, extends into North Carolina. Its length is 40 miles, of which 32 miles are in North Carolina, and its breadth varies from 4 to 7 miles. It contains two beds of semi-anthracite coal, each 18 inches thick, separated by 1 foot of slate. They are of little importance.

The *Deep River coal-field* is in the form of a trough 30 miles long by 3 wide, and runs south-west from Granville county. It contains five coal-beds, all differing in the character of their contents. The first is a 3-foot bed of highly-bituminous coal, having 32.8 per cent. of volatile matter, 63.8 per cent. of fixed carbon, and 4 per cent. of ash; the second, 1 foot thick, is semi-bituminous, and contains 23.6 per cent. of volatile matter, 72.6 per cent. of fixed carbon, and 4 per cent. of ash; the third, an anthracite, 3 feet thick, contains 6.6 per cent. of volatile matter, 83.8 per cent. of fixed carbon, and 9.6 per cent. of ash; the fourth and fifth are coal only in name, one being plumbaginous slate 2 feet thick, bearing only 10.4 per cent. of carbon to 78 per cent. of ash, and the other, a 4-foot bed of plumbago, containing 16.2 per cent. of carbon and 74 per cent. of ash.

The bituminous coal of this field is valuable for smelting and gas-making, and, like that of the Richmond field in Virginia, awaits only development to form an important addition to the wealth of the State. In some localities bituminous coal of lower quality, semi-bituminous, carbonite, semi-anthracite, and natural coke, are found. The "carbonite" Mr. Heinrich considers only a semi-bituminous coal, generally carrying a large amount of earthy impurities. It is of a dark iron-gray or grayish-black color, dull or semi-metallic lustre, compact and even very tough, but not hard to cut. It contains about 11 per cent. of volatile matter, 80 per cent. of fixed carbon, and from 9 to 20 per cent. of ash; also, considerable sulphuret of iron. Its hardness is 2.5, specific gravity 1.323. This mineral is often called natural coke, but the true natural coke is more porous, has a more metallic lustre, and bears a greater resemblance to artificial coke. It has been formed from bituminous coal by the heat of neighboring igneous rocks.

OHIO.—The coal-field of Ohio, which extends through more than 10,000 square miles of the State, is part of the great Allegheny field. It extends from Geauga county on the north to Lawrence county on the south, and from Jefferson county in the east to Holmes county in the west, its length being about 180 miles and its width about 80 miles. Its greatest development is along the Ohio River between Bellaire and Pomeroy, where the coal-bearing rocks are from 1400 to 1500 feet thick, and enclose thirteen workable beds of coal of an aggregate thickness of 40 to 45 feet. (See figs. 17, 18.) North and west from this line the strata rise towards the margin of the basin, and one after another of the coal-beds comes to the surface, till the lowest of the series crops out and marks the limit of the region. The thirteen workable beds found along the Ohio River are not all persistent. Only two of the series—No. 6, or the "Great Vein" of Perry county, where it reaches its greatest development, and No. 8, or the Pittsburg bed—are found of workable



FIG. 16.—Map of Ohio Coal-field.

dimensions over great areas. Bed No. 1, however, is considered the most valuable wherever found in workable condition. It is the block coal of the Mahoning Valley, called elsewhere "Massillon" and "Jackson" coal, and is a bed of great excellence, its coal, in most places, being especially adapted for smelting iron in a raw state. In the Mahoning Valley it ranges from a mere trace to a thickness of 7 feet, its general workable thickness being from 2½ to 5 feet. It is thinly laminated, and is broken by transverse cleavage into cubical blocks, whence its distinctive name. The faces of the laminae are often covered with mineral charcoal, and the whole bed is made up of alternate layers of coal and "mother of coal." It is highly prized for furnace use, as it can be dumped into the hopper just as it comes from the mine, without coking or other preparation. The blocks are sufficiently firm to support the weight of the materials with which they are intermingled, and retain their shape, without swelling or softening, until they are consumed. This bed, however, is very uncertain in its localities, and no rule save actual search can be made for assuming where it may be found.

TABLE XVII.—Analyses of Ohio Coals from Different Beds (Newberry).

Coal, No.	Locality.	Moisture.	Volatile Combustible Matter.	Fixed Carbon.	Ash.	Sulphur.
I.	Mahoning county.....	2.47	31.83	64.25	1.45	0.56
II.	Holmes co. (cannel)...	2.15	28.65	52.70	16.50	2.13
III.	Holmes co. (cannel)...	3.90	40.50	49.95	5.65	1.55
III.	Yellow creek.....	2.50	36.60	56.30	4.60	2.05
IV.	Coshocton co. (cannel)	1.50	44.40	44.50	9.60	1.72
IV.	Stark co.....	7.00	30.80	59.50	2.70	0.65
V.	Columbiana co.....	1.15	40.45	53.75	4.65	3.51
VI.	Columbiana co.....	1.60	29.29	64.50	4.00	2.80
VI.	Muskingum co.....	3.47	37.88	53.30	5.35	2.24
VII.	Jefferson co.....	1.40	30.90	65.90	1.80	0.98
VII.	Saline co.....	1.70	34.30	59.50	4.50	1.62
VII.	Carroll co.....	2.80	30.20	64.10	2.90	1.23
VIII.	Harrison co.....	2.44	32.36	59.92	5.28	2.62

The State Inspector of Mines' report for 1880 shows 246 collieries in twenty-seven counties.

This coal-region is an excellent illustration of the "peat-bog" theory of the formation of coal. The beds rest on the Waverley sandstone, the upper surface of which was worn into a series of hollows by some erosive action previous to the formation of the coal, and in these hollows the present coal-deposits are found, the original shape being so clearly apparent that the basins are commonly called by the miners "swamps." The coal is always thickest at the bot-

tom of these "swamps," and decreases gradually as it rises, until it runs out at or near the original rim of the basin, unless it is suddenly cut off by a "wash-fault," or seam of foreign matter deposited in the bed of some ancient water-course, which washed away the peat before it had time to harden into coal. Sometimes two or more of these "swamps" are found side by side, the coal-bed being continuous from one to the other, but always very thin on the ridges between them. These ridges are never marked by "wash-faults."

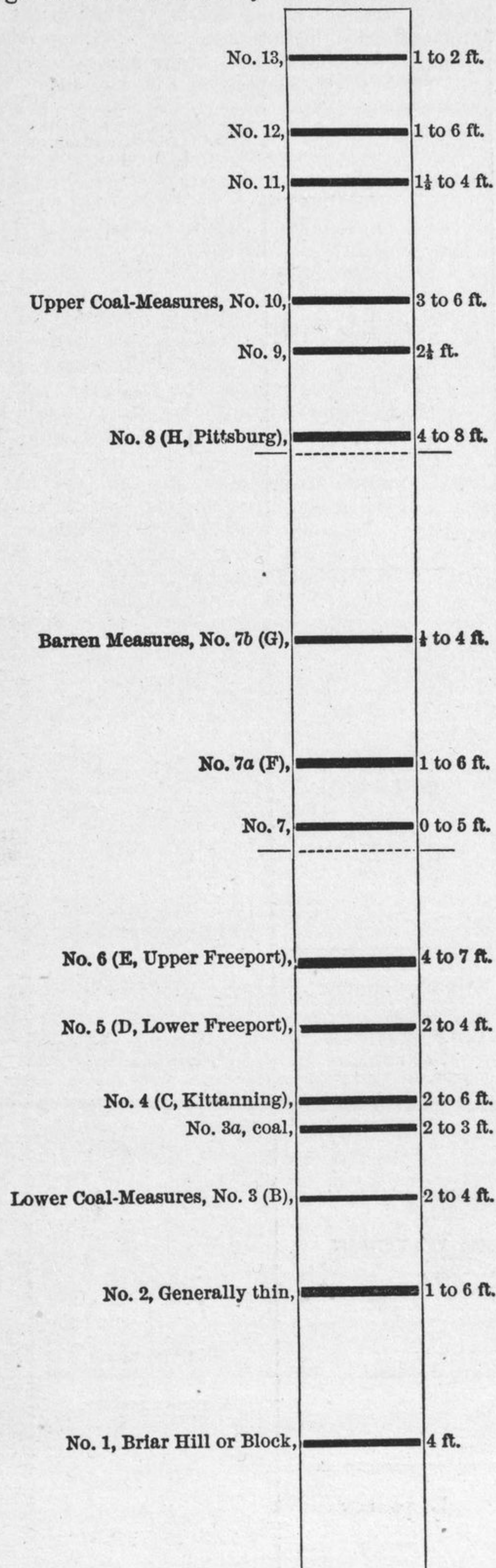


FIG. 17.—Coal-Measures of Ohio [Newberry]. (Scale 200 ft. to Inch.)

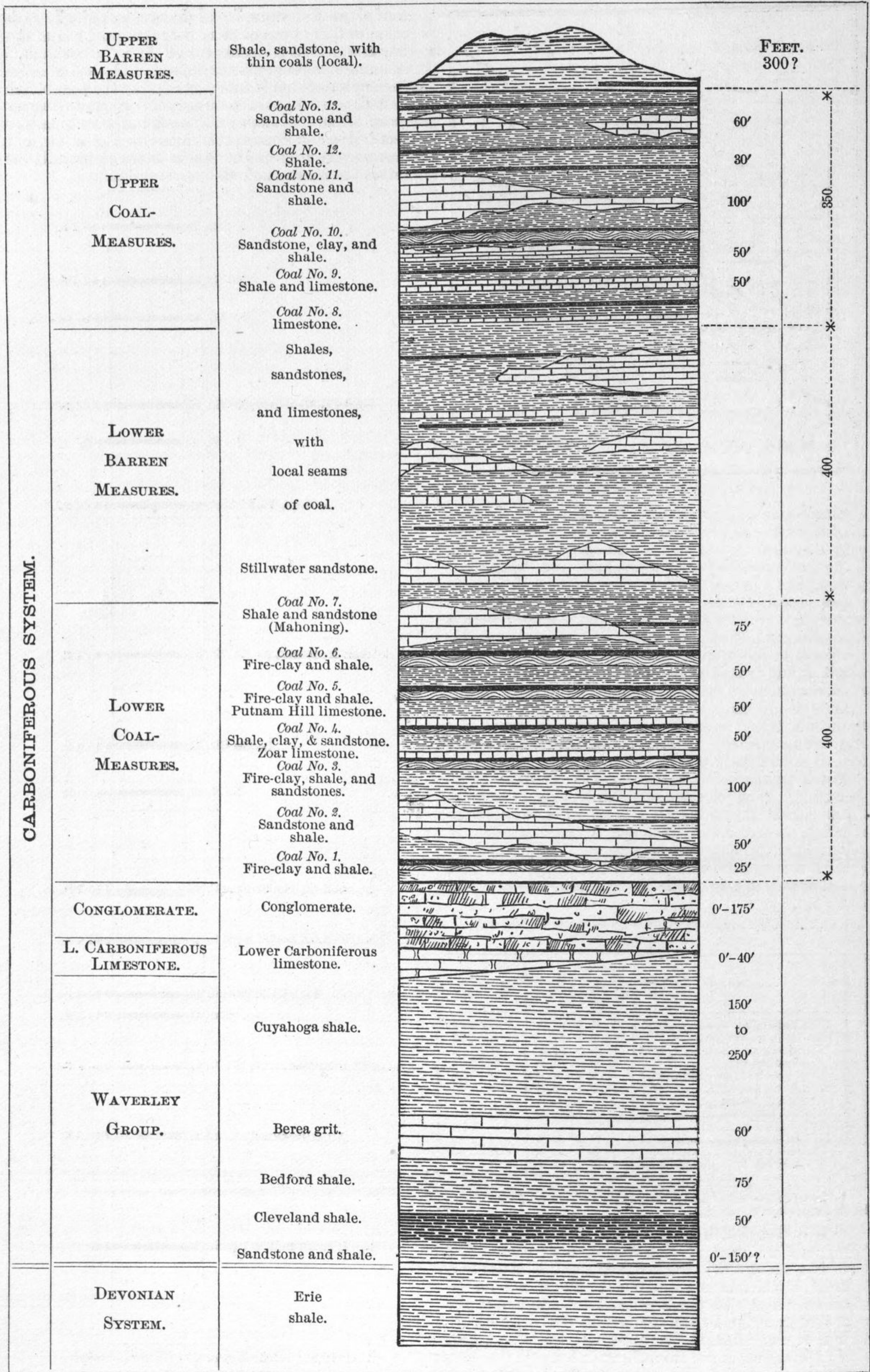


FIG. 18.—Section of the Carboniferous Rocks of Ohio [from Prof. J. S. Newberry].

The report of the census of 1880 gives the coal-statistics of Ohio for the year ending May 31, 1880, as follows: Tons of coal produced, 6,437,725; value, \$8,281,979; number of large mines, 216; number of employes, 15,622; number of small mines, 383; number of employes, 1350. The number of men employed was 16,331, of whom 13,626 were miners; they received wages aggregating \$5,100,547. There were employed 131 steam-engines, of 3835 horse-power and valued at \$386,904. The amount employed as working capital is returned as \$1,177,328, the value of the plant at \$3,258,581, and the value of the real estate at \$8,529,931, making a total capital invested and employed in the industry of \$12,965,840. On 2,630,108 tons \$458,468 were paid as royalty. In the list of counties Perry stands first, with 913,974 short tons, followed by Trumbull with 722,265, Columbiana with 515,602, Belmont with 399,747, Meigs with 359,678, Stark with 347,820, Hocking with 331,170, Jefferson with 324,070, Athens with 310,750, and Tuscarawas with 255,495 tons.

TABLE XVIII.—Census Statistics of the Coal-mines of Ohio for the Year ending May 31, 1880.

Counties.	Tons.	Value.	No. of Large Mines.	No. of Em-ployés.	No. of Small Mines.	No. of Em-ployés.
Athens.....	589,195	\$598,898	12	1,219	14	51
Belmont.....	452,754	456,890	16	716	35	138
Carroll.....	20,692	27,227	2	43	18	49
Columbiana.....	541,466	596,264	18	1,332	16	52
Coshocton.....	62,990	74,494	4	159	11	49
Gallia.....	19,941	20,311	1	23	16	35
Guernsey.....	168,480	184,400	5	314	10	34
Harrison.....	45,860	45,860	3	52	14	72
Hocking.....	176,852	176,000	4	349	3	5
Holmes.....	17,460	26,190	1	21	10	25
Jackson.....	196,452	249,385	18	587	21	72
Jefferson.....	388,199	350,543	13	768	10	66
Lawrence.....	118,929	149,105	6	300	4	6
Mahoning.....	347,635	693,826	15	1,095	1	10
Medina.....	106,000	170,000	2	312		
Meigs.....	388,786	469,203	11	1,106		
Monroe.....	1,600	2,000	...	...	1	8
Morgan.....	10,520	10,915	...	...	16	34
Muskingum.....	129,869	133,504	8	181	43	182
Noble.....	21,520	24,350	1	19	14	31
Perry.....	1,058,254	1,142,934	19	1,988	8	43
Portage.....	26,500	60,625	2	132	1	4
Scioto.....	7,443	10,637	...	...	13	21
Stark.....	344,397	492,951	15	1,346	31	143
Summit.....	130,165	224,413	7	494	4	63
Trumbull.....	673,206	1,383,370	14	2,041	7	11
Tuscarawas.....	246,229	309,352	15	605	27	105
Vinton.....	61,908	82,882	2	190	12	30
Washington.....	28,800	30,200	1	30	9	19
Wayne.....	55,623	85,250	1	200	14	42
Totals.....	6,437,725	\$8,281,979	216	15,622	383	1400



FIG. 19.—Map of Kentucky Coal-fields.

EASTERN KENTUCKY.—Kentucky contains portions of two great coal-basins, the eastern part of the State being covered by the Appalachian basin, the western by the Illinois basin. The coal-field of the eastern portion extends westward from the State boundary on the east, and is limited on the west by an irregular line running north-east and south-west through the counties of Greenup, Carter, Morgan, Powell, Owsley, Jackson, Laurel, Pulaski, and Wayne. It includes fifteen counties and parts of five others, covering altogether 8983 square miles. The coal measures are divided into two

series, the upper one corresponding to the Lower coal-measures of Pennsylvania and Ohio. These upper measures contain the best coal. The general dip of the measures is to the south-east. A great dislocation divides the coal-field into two zones—one north-west of Pine Mountain, and the other south-east. The entire thickness of the measures is between 2500 and 3000 feet. Twelve coal-beds are known to exist above the great conglomerate, and two or three are below it. The latter occur all along the western margin of the field, being from 4 to 5 feet thick. Greenup county, on the Ohio, has a good cannel coal. The sub-conglomerate coals are similar to the same class of coals in West Virginia on the Kanawha.

The first bed above the conglomerate is equivalent to the Ohio Briar Hill coal. It varies in thickness from 15 inches to 5 feet. The coal is generally splint, or free-burning. Near the Ohio the coal is not as good as it is a few miles back from the river. The second bed covers a wider extent of territory, but is not very good. It is from 2 to 2½ feet thick. The third bed (the Kittanning coal of Pennsylvania) varies from 2½ to 6 feet in thickness on the Big Sandy River. The coal is usually bituminous, though with a streak of cannel. The fourth bed is less persistent than No. 3. The coal is cannel, with sections of bituminous. It is from 2½ to 5 feet thick, but in some places is wanting. It is sold as the Hunnewell cannel. The fifth bed is from 38 to 40 inches thick. It is mined at the Buena Vista furnaces, and is of good quality. The sixth bed, Keys Creek or River Hill coal, is over 2 feet thick. The seventh bed is the Coalton coal, which is extensively worked. The coal is a splint and good for furnace use. It is from 3½ to 6 feet in thickness. Coal No. 8 is mined at Coalton, where it is 4 feet thick, but is inferior in quality to No. 7. Nos. 9, 10, and 11 are found in Lawrence county. They are of little value.

TABLE XIX.—Analyses of Kentucky Coals [from Owen's Geological Survey of the State].

No. of Bed.	Locality.	Moist-ure.	Vol. com-bustible matter.	Fixed carbon.	Ash.	Sul-phur.
1	Lawrence co.....	3.50	36.30	57.30	2.90	1.15
2	Carter co.....	4.10	34.60	55.25	4.77	1.41
3	{Greenup co. (av.) 5 analyses}.....	3.56	35.00	52.34	9.02	2.59
4	Carter co.....	0.60	66.30	28.30	4.80	1.32
5	Lawrence co.....	3.20	32.30	53.00	11.50	1.20
6	{Boyd co. (av. 4) analyses}.....	3.27	33.77	54.51	8.91	1.56
7	Coalton (av. 12 anal.)..	5.19	32.04	55.59	6.71	1.68

WESTERN KENTUCKY.—The extension of the Illinois coal-field into Kentucky covers the extreme north-western portion of the State, and includes ten counties, with parts of five others, having an area of 3888 square miles of coal-measures. The number of coal-beds in this region has been differently stated, an extensive fault and upheaval making it difficult to identify them. There are, in places, twelve beds, but the number varies with the locality. In the analyses below, the beds are lettered, starting from the top and going to the base of the measures. There are but four principal seams.

Coal "A," commonly known as "No. 12," extends over a large area, but is not mined extensively, being near the surface and not in good working condition. Its thickness varies from 3 to 6 feet, and the character changes from a "firm, glossy, black, dense" coal to a "soft and rather fragile" coal. It cannot be used for furnaces in the raw state, but makes an excellent coke.

Coal "B" is untrustworthy and full of slips. It is more persistent than "A," but has a clay parting. A layer on the top of the bed is a rich gas coal.

Coal "D"—"No. 9" of the geological survey—varies in general quality. It is usually hard and compact, with layers of fibrous coal. It has a uniformly large percentage of sulphur, occurring in the coal in bands. The thickness of the bed is 4 to 6 feet. It has a good roof and is worked extensively.

Coal "E" is of good quality, but varies in thickness, sometimes being absent entirely, and sometimes being from 3 to 3½ feet thick.

Coals F, G, H, I, and J are not of great value. "H" is 5 feet, "I" is from 1 to 3 feet, and "J" is from 2 to 3½ feet in thickness. Coal "L" is extensively found, but poor.

The *Breckenridge* cannell is rich in gas and oil. The seam is from 22 to 38 inches thick, and is remarkably dense and tenacious. The coal is so rich that, previous to the discovery of petroleum, oil was distilled from it. The following table of analyses is compiled from Prime's *Centennial Report on Coal*:

TABLE XX.—Analyses of Western Kentucky Coals.

Bed.	Moist-ure.	Vol. matter.	Fixed carbon.	Ash.	Sul-phur.
Coal A (average).....	4.15	33.14	55.71	7.00	1.87
" B (average).....	3.65	38.40	51.87	6.06	3.12
" C (gas-coal layer).....	4.60	40.10	51.35	3.95	1.49
" D (average).....	3.82	35.41	52.11	8.41	3.33
" J (Christian co.).....	3.70	32.56	50.04	13.70	3.72
" L (average).....	4.23	33.21	54.19	8.35	1.50
Breckenridge cannell.....	1.44	62.40	28.20	7.96	2.44



FIG. 20.—Map of Tennessee Coal-fields.

TENNESSEE.—Through the eastern part of Tennessee the elevated Cumberland table-land crosses the State in a north-east and south-west direction. The coal-fields of the State are coextensive with this table-land. The borders, especially on the west, are irregular, being notched by valleys. The coal-measures cover an area of 5100 square miles, or one-eighth of the area of the State. At the northern line the table-land is 71 miles wide. Toward the south it narrows, and is but 50 miles wide. The region has a generally level top. East of the centre the Sequatchie Valley divides it from the middle part southward into two parallel arms or extensions. The valley is 60 miles long, and but 3 to 5 miles wide. The lower Carboniferous rocks are 1200 feet thick in Tennessee. In the high ridge of the table-land the measures are much thickened, and have a total thickness of 2500 feet. There are nine seams of coal, of which six are over 3 feet in thickness. The sub-conglomerate coals embrace the whole coal-region of the State except the north-eastern and a portion of the eastern sections. The Sewanee division is the arm between the Sequatchie Valley on the east and the Alabama line. The main Sewanee seam is from 3 to 7 feet. There are four thin seams below this. The coal is generally good, but varies. In Grundy county the seams sometimes swell out to 3, 4, and 9 feet. The Upper coal-measures, in which is the Sewanee coal, cover one-fourth of this division of table-land. The Sewanee coal is of good quality, with little sulphur, and is semi-bituminous. It is very fragile, owing to its peculiar structure. The *Ætna* coal-seam is in the Lower coal-measures, and is 3 feet thick. The principal mines are in Marion and Grundy counties. The sub-conglomerate coals are at intervals of 10, 50, 20, and 25 feet below the conglomerate, and are seldom over 3 feet, or of workable thickness. At the *Ætna* mines five seams of coal are opened—three seams, the "Walker," "Kelly," and "Ætna" beds, being 5 feet 6 inches, 4 feet, and 3 feet thick, respectively.

TABLE XXI.—Analyses of Coals in Tennessee.

	Carbon.	Volatile matter and water.	Ash.
Addison's Creek, Cumberland } Mountains..... }	83.22	9.00	7.78
Crow Creek.....	77.70	14.00	8.30
Sewanee Mining Co.....	79.56	14.21	6.25
Tracy City.....	65.50	29.00	5.50
Upper Seam, Marion.....	59.50	38.00	2.50
Etna.....	74.20	21.39	4.41
Chattanooga, Hamilton co.....	63.90	26.80	9.30
Coal Creek, Anderson.....	55.00	40.00	5.00

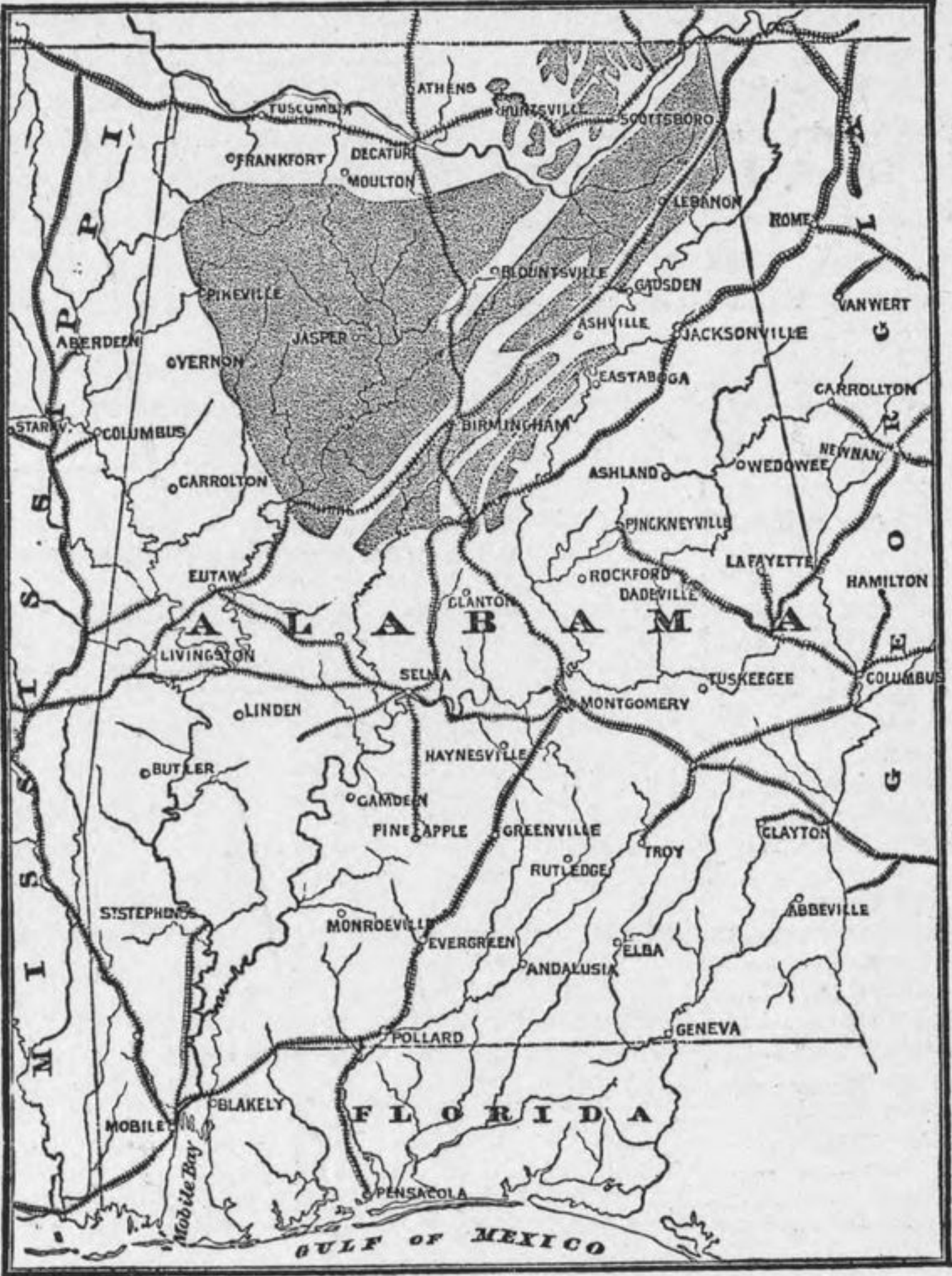


FIG. 21.—Map of Alabama Coal-fields.

ALABAMA.—This State contains the southern extremity of the Appalachian coal-field, which extends into the upper portion of the State and covers about 5500 square miles. There are three separate basins, the largest and most important being the *Warrior* coal-field, extending nearly across the State, covering the whole of Hancock and Walker and parts of the surrounding counties. Its shape is peculiar, being narrow at the north-east, and widening greatly at the south-west extremity. Its area is 5000 square miles. To the south-west of this field, in Bibb, Shelby, and Jefferson counties, lies the *Cahaba* coal-field. It lies N. E. and S. W., is 75 miles long and 10 miles wide, but is narrow at the northern end. It contains from 180 to 200 square miles. The *Coosa* coal-field lies east of the Cahaba, and on the north-west side of the Coosa River. It is 36 miles long by 8 wide, and contains 150 square miles.

The coal-measures of Alabama contain ten or twelve beds of workable thickness, from 2 feet upward. They are separated into two groups, as in the other portions of the Appalachian coal-basin. The lower group contains seven or eight beds, with an aggregate thickness of from 30 to 35 feet; the upper group contains three or four beds, with a total thickness of 12 feet. The lower coals are separated by an enormous thickness of rock. The coals of the Cahaba basin are generally free from shale partings (according to R. P. Rothwell), and are the best in the State. The largest bed is 12 feet thick, of good coal. The beds are given in the following order, the highest in position being the first:

No. 9, Helena seam.....	4 feet 0 inches.
" 8, Beaver Dam seam.....	3 " 6 "
" 7, Little Pittsburg seam.....	2 " 0 "
" 6, Moyle ".....	2 " 0 "
" 5, McGinnis ".....	2 " 6 "
" 4, Buck ".....	3 " 6 "
" 3, Cahaba ".....	4 " 0 "
" 2, Cahaba ".....	3 " 6 "
" 1, Gould ".....	28 feet 3 inches.

A great fault limits the Cahaba coal-field on the east. The Warrior coal-basin is best developed in Jefferson co. The coal-seams are from 2 feet to 6 feet in thickness, and the coal is excellent for steam purposes. The following analyses are from the reports of E. A. Smith, State geologist:

TABLE XXII.—Analyses of Alabama Coals.

Bed.	County.	Moist-ure.	Vol. matter.	Fixed carbon.	Ash.	Sul-phur.
CAHABA BASIN.						
Cahaba.....	Shelby.....	1.66	33.28	63.04	2.02	.525
McGinnis.....	.....	1.91	32.65	63.91	1.53	.630
Moyle.....	.....	1.93	32.84	59.64	5.59	3.780
Little Pittsburg.....	.....	2.05	33.47	62.20	2.28	.641
Conglomerate.....	.....	2.13	30.86	64.54	2.47	1.480
Helena.....	.....	2.54	29.44	66.81	1.21	.528
Montevallo.....	.....	2.13	27.03	66.22	4.62	.502
WARRIOR BASIN.						
Townley.....	Walker.....	3.007	29.084	63.352	4.557	.71
Jagger.....	".....	3.091	29.044	56.537	11.328	.574
Burnett s.....	Marion.....	3.694	35.380	58.517	2.409	1.730
Pratt Co.'s.....	Upper Jefferson.....	1.474	32.288	59.503	6.735	1.224
".....	Lower ".....	1.529	30.683	63.686	4.102	.612

GEORGIA.—The coal-measures of the Appalachian basin enter the extreme north-west corner of Georgia (see Map of Tennessee), and occupy an area varying from 150 to 170 square miles, according to different authorities—viz., Taylor, 150; Hitchcock, 157½; Rogers, 170 square miles. This field extends from immediately south of Chattanooga, Tenn., in a south-west direction, and enters Walker co., Ala. Samples of coal from the field in Georgia show it to be similar to coals of Alabama and Tennessee. The following analysis is given by Prof. Safford:

Ash.....	2.50
Carbon.....	40.75
Volatile matter.....	56.75
	100.00



FIG. 22.—Map of Michigan Coal-field.

MICHIGAN.—A detached field of coal is found in Michigan. It is situated in the central part of the southern portion, embracing nearly thirteen counties, with an area of coal-measures of 6700 square miles. The measures occupy a shallow basin, the longest axis being nearly co-incident with the axis of Saginaw Bay.

The measures are 123 feet thick, and contain one seam of bituminous coal 3 or 4 feet thick; toward the centre of the basin there are several other beds. On Six-mile Creek is the greatest thickness of coal, one seam being 5 feet, and three others 2 feet, in thickness. In quality the coal is inferior, and it is used only for home consumption, not competing with that of adjacent States. Its analysis is—fixed carbon, 45; volatile matter, 49; ash, 2.0, water, 2.0, sulphur, 2.0 per cent.

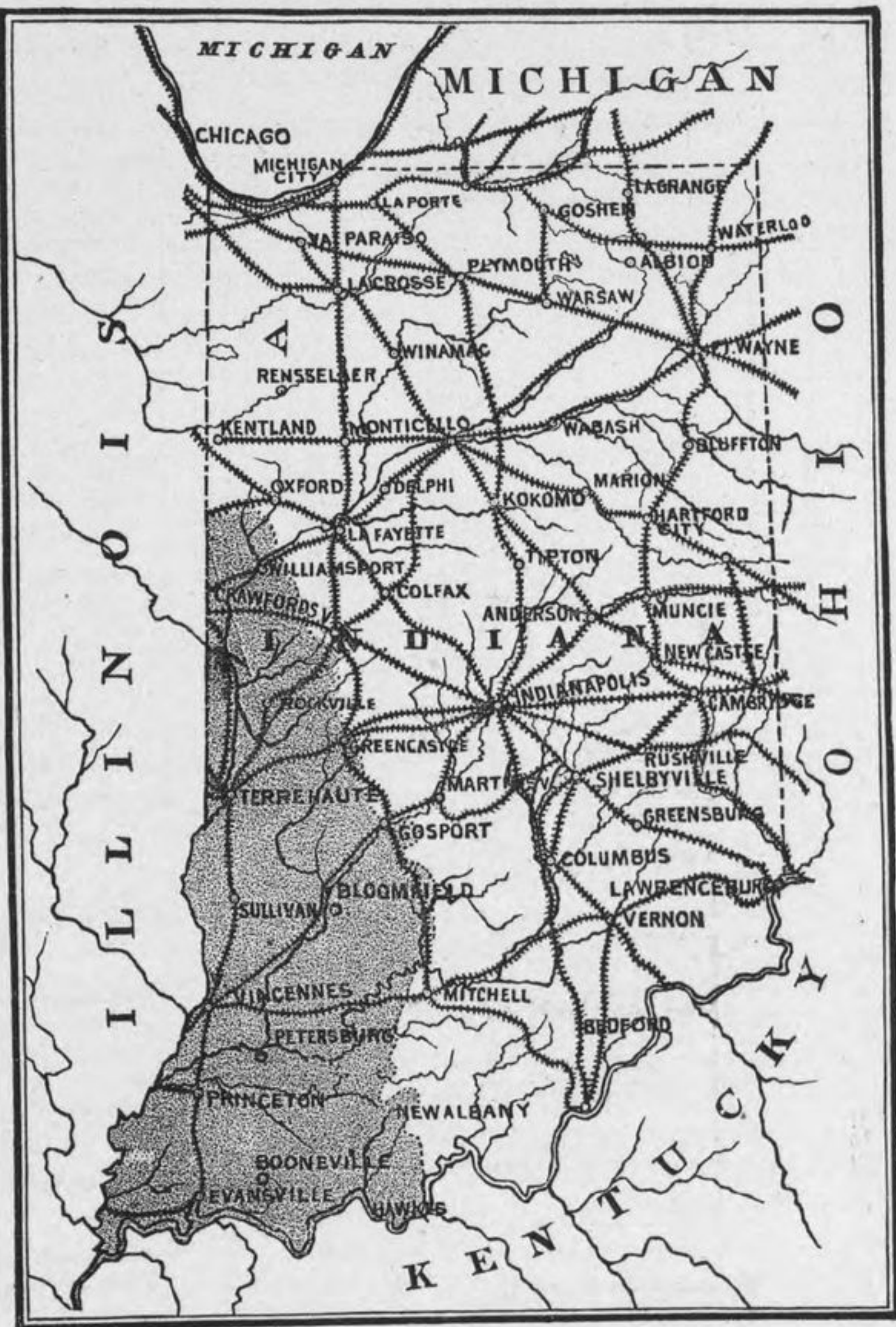


FIG. 23.—Map of Indiana Coal-field.

INDIANA.—The Illinois coal-field extends into the western part of Indiana, covering an area in that State of about 6500 square miles. Prof. E. T. Cox, State geologist, reports the coal-measures to be about 650 feet in thickness. The coal lies in two well-defined zones, the eastern extending along the border of the field from the Ohio River, in Perry county, to Warren county in the north. This zone is 150 miles long, with an average width of 3 miles. Its area is about 450 square miles, and its contents are non-coking bituminous, or block, coal. The beds are traversed by a joint-seam, which separates the coal into cubical blocks, whence its name. This peculiar structure makes the coal easy to mine and handle, and it is usually dislodged without blasting. Block coal has a laminated structure, and is composed of thin alternate layers of dull but vitreous coal and fibrous mineral charcoal. Like slate, it splits readily into thin sheets, but breaks with difficulty "across the grain." Its chemical composition is similar to that of the coking coals, but, unlike them, it does not swell or run together when burning, but retains its shape until entirely consumed, when it leaves a small quantity of white ash without a trace of clinker. In most mines it is remarkably free from sulphur.

The western zone comprises rather more than 6000 square miles, and contains three or more workable beds, besides a number too thin for working. They average from 4 to 10 feet in thickness, and have a total average thickness of 10 feet, with a maximum of 20 feet. The beds in this State are lettered from A to N, but C, D,

and E have not been developed. F, I, and K are the principal block coals; L is the "Mammoth" bed. In Vermilion county its thickness ranges from 5 to 7 feet, divided by shale or fire-clay partings into two or more seams, the lower of which contains from 30 to 36 inches of block coal, while the upper is coking coal. "K" is mined at Washington, Daviess county; it is a bright, clean-looking gas coal, which finds a ready market in St. Louis and at all accessible points. Its specific gravity is 1.294; weight, 80.87 pounds per cubic foot. Further data respecting the Indiana coal-beds will be found in the accompanying cross-sections:

TABLE XXIII.—Analyses of Indiana Coals by the State Geological Survey.

	Moisture.	Volatile matter.	Fixed carbon.	Ash.
<i>Caking Coals:</i>				
Parke co.....	4.50	45.50	45.50	4.50
Sullivan co., coal "M".....	2.35	45.25	51.60	0.80
Clay co.....	7.00	39.70	47.30	6.00
Spencer co., coal "L".....	3.50	45.00	46.00	2.50
<i>Block Coals:</i>				
Clay co.....	8.50	31.00	57.50	3.00
Martin co.....	2.50	44.75	51.25	1.50
Daviess co.....	5.50	36.00	53.50	5.00

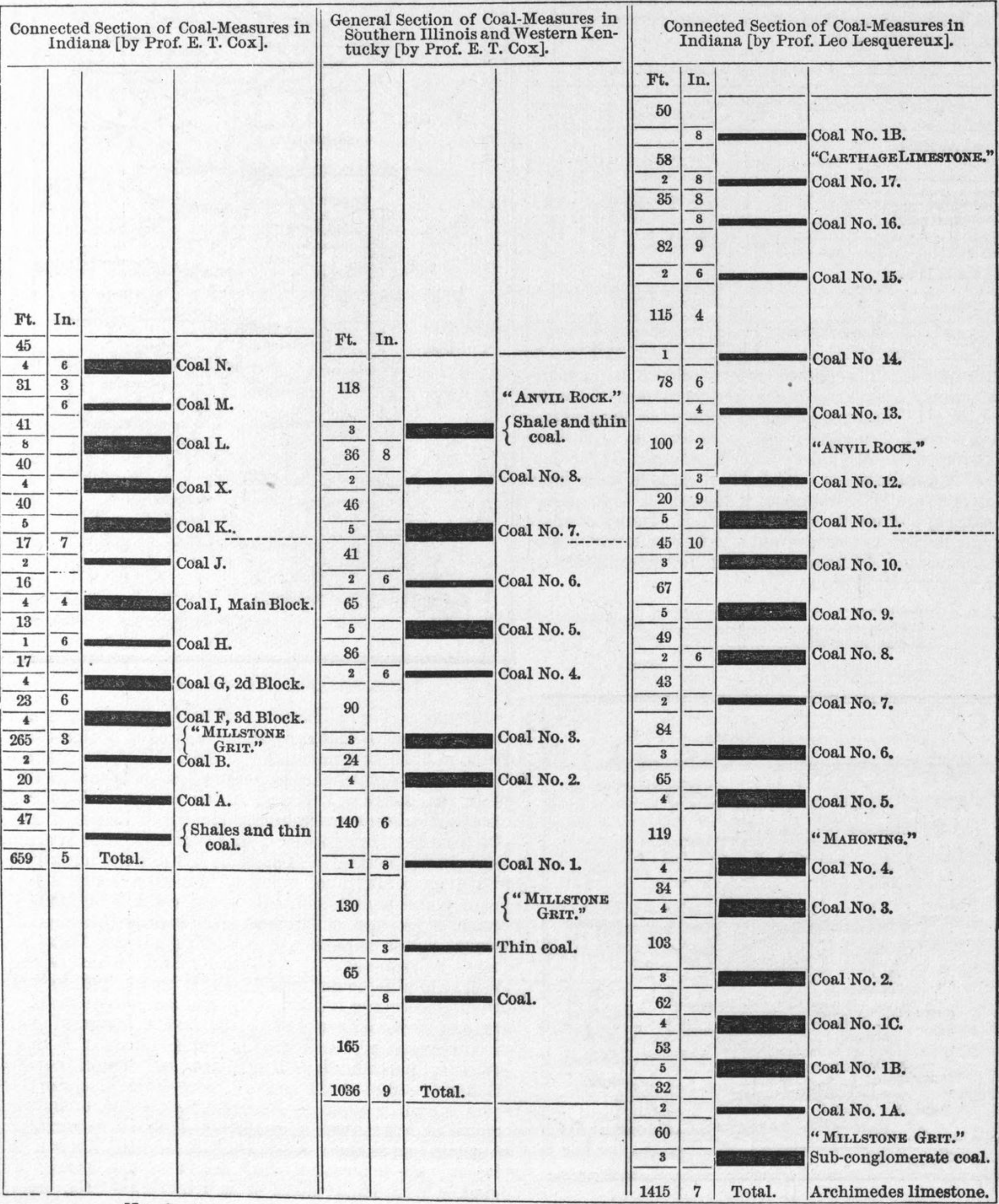


FIG. 24.—From Prof. E. T. Cox's State Geological Report of Indiana for 1870.

ILLINOIS.—The coal-field of Illinois occupies an area of 36,800 square miles. The coal-measures are not as thick as those of the Appalachian field, and the beds, of which there are six of workable size, are irregular, often wanting where they should be found, and containing an inferior quality of coal. The total thickness of coal is 24 feet. The field covers all that portion of Illinois south of an irregular line running south-east

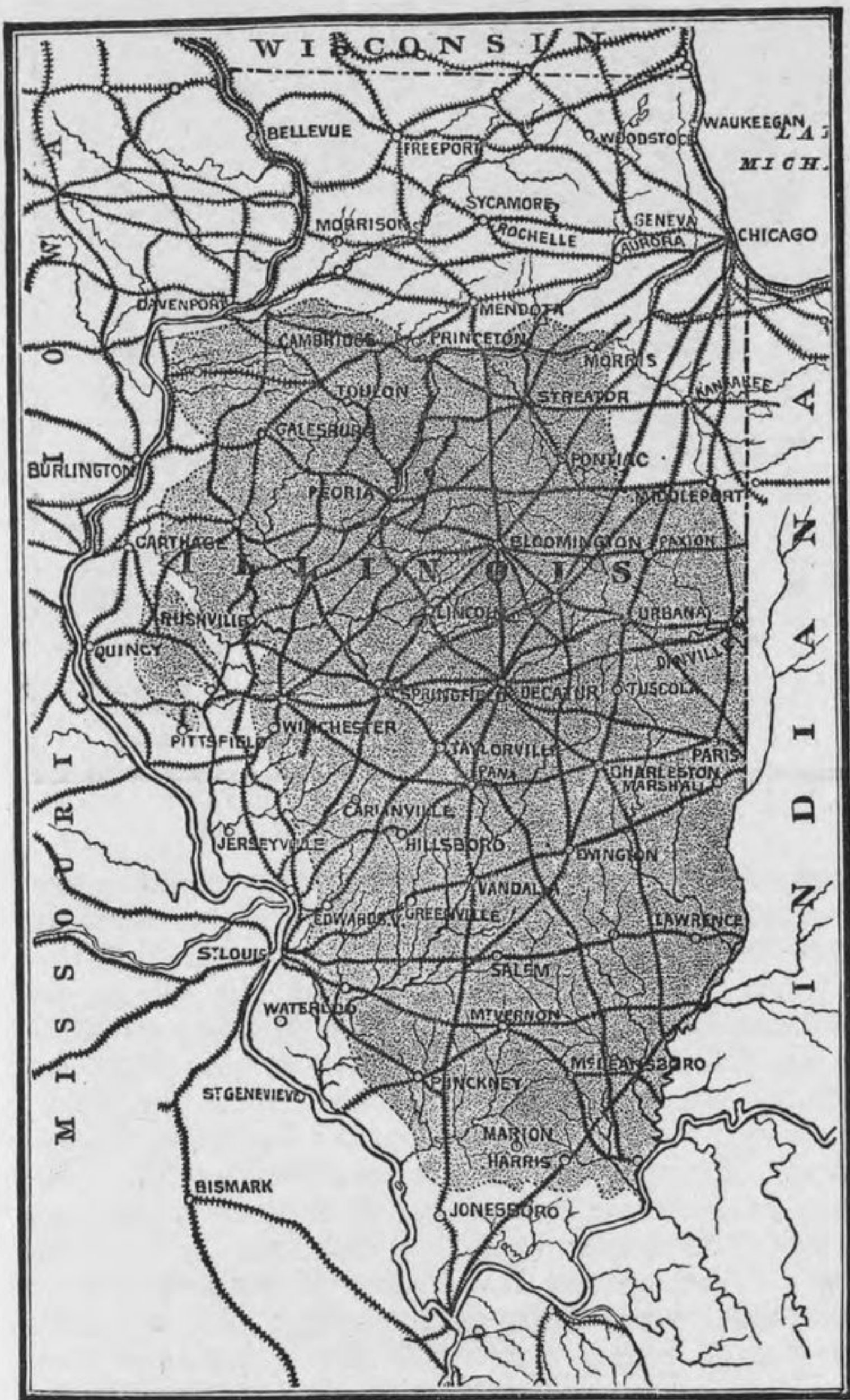


FIG. 25.—Map of Illinois Coal-field.

through Henry, Bureau, La Salle, Grundy, Kankakee, and Iroquois counties, with the exception of a narrow strip along the eastern edge of the Mississippi River. The Carboniferous system contains a thickness of 2500 feet of strata, but the coal-measures proper are but 500 feet thick. The lower coal-seams are found only in the central and southern portions of the State, while the northern portion contains only the upper seams. This distribution of the coal-measures is the result of a sinking of the northern portion during the coal era. The country generally is level prairie, but 42 miles above Cairo is an elevation and fault running nearly east and west across the southern portion of the State. Another axis of disturbance extends north-north-west and south-south-east from La Salle to the Wabash River, in Wabash county. This disturbance took place after the deposition of the coal-formation, and it is the only disturbance of a general character.

There are ten seams of coal in a vertical thickness of 600 feet—six from 2½ to 6 feet, and four from 2 feet to a few inches. (See fig. 24.) They are numbered and described from the bottom up, as follows: No. I., 2 to 3 feet of coal, quality fair, uncertain in the north; No. II., 2 to 5 feet of coal, excellent quality and much worked; No. III., 3 to 4 feet, somewhat local, found in Schuyler county; No. IV., 4½ feet, only found at Cuba, Fulton county. No. V. is the most reliable coal; it is of good quality and free from sulphur, and is extensively worked near Springfield. No. VI., 3 to 7 feet. In the southern portion of the State it is quite thick, from 6 to 7 feet. In Peoria, Fulton, and La Salle counties it is 4 to 5 feet thick. The coal is not as good as No. V., and is generally lighter and softer. The seams above this are not thick enough to be workable. The coal is generally reached by shafts from 200 to 400 feet deep. The dip is very slight and mining is easy.

In the *Du Quoin* district, Perry county, the fault

brings the Lower coal-measures near the surface, and seams of 6 and 7 feet are within 50 or 75 feet of the surface, and easily accessible. Seams Nos. V. and VI. are worked. The coal is of excellent quality, and has a good clay-shale roof. The basin is subject to some irregularities.

In the *Big Muddy* district, Jackson county, the coal occurs near the surface. The lower seams produce a good block coal, similar to that of Indiana, which, owing to the proximity of St. Louis, is valuable for iron manufactures. The coal, however, is not as good as the block coal of Indiana.

From the *Belleville* district, St. Clair county, St. Louis obtains most of its bituminous coal. The county contains 450 square miles of coal, embracing five beds, two of economic value. Coal-seam No. VI. is principally worked. Its general thickness is 5 to 7 feet, with limestone roof. The coal is regularly stratified. The lower coal-seams contain more sulphur and the quality varies.

At *Neelysville*, Scott county, coal is extensively mined, but a still more productive region is at *Danville*. The coal is a fat, caking coal, 6 feet thick, lying nearly level. It contains sulphur, but in such a way that it can be easily thrown out. Its main fault is friability and tendency to slack on exposure. It makes good, strong steam coal.

The coal of *La Salle* is of importance from its proximity to Chicago. The anticlinal axis before mentioned occurs in this county. East of the axis the Lower coal-measures are only found with one workable bed, inclined very slightly. West of the axis both lower and upper coals are found. Between the Illinois River on the south and the Vermilion River on the east there are three workable beds. The upper seam, No. VI., is 4½ to 5 feet thick; No. V., 3 to 9 feet, usually 6 feet; the lower, No. II., 4 feet. The middle bed, No. V., is the most popular. The upper bed is a light, dry, free-burning coal and a good steam coal, but is hard to mine. The middle bed is purer coal than No. VI. The lower coal is most highly bituminous, cakes in burning, and throws off heavy soot. Its drawback is too much sulphur.

Taken in all its bearings, there is perhaps no more interesting coal-field than that locally known as the *Wilmington* district, on account of the superior qualities of its product as a household and steam fuel when compared with other Illinois coal, and its geological position. The territory underlaid with coal to which this name was originally given embraced a small area, including only the south half of sections 31 and 32 (township 33 north, range 9 east) in Wilmington township, and sections 5, 6, 7, 8, 17, 18, 19, 30, and 31, with occasional outliers in sections 3, 4, and 9, and possibly in sections 20, 28, 29, 30, and 32 (township 32 north, range 9 east) of Reed township, in Will county, comprising 11 square miles of workable coal within the known basin. Borings indicate the presence of coal in sections 30 and 33 in Wilmington township, but of a soft, shelly nature, unprofitable for mining (*Jasper Johnson, M. E.*).

There is but one workable seam of coal in *Will county*, though many persons still believe there is another bed below the one now being worked all over the field. The quality of Illinois coal is lowered by the presence of much sulphur and a large amount of moisture. The valuable feature is the quantity.

The following table of analyses shows the character of the various Illinois coals in the principal regions:

TABLE XXIV.—Analyses of Illinois Coal.

	Moisture.	Volatile matter.	Fixed carbon.	Ash.
Du Quoin Region.....	8.5	40.4	48.1	3.00
Big Muddy ".....	6.5	31.2	60.8	1.50
Belleville Region:				
Caseyville.....	6.0	33.8	55.2	5.00
Belleville.....	5.5	39.5	49.6	5.4
Belshas.....	8.10	35.56	47.74	8.60

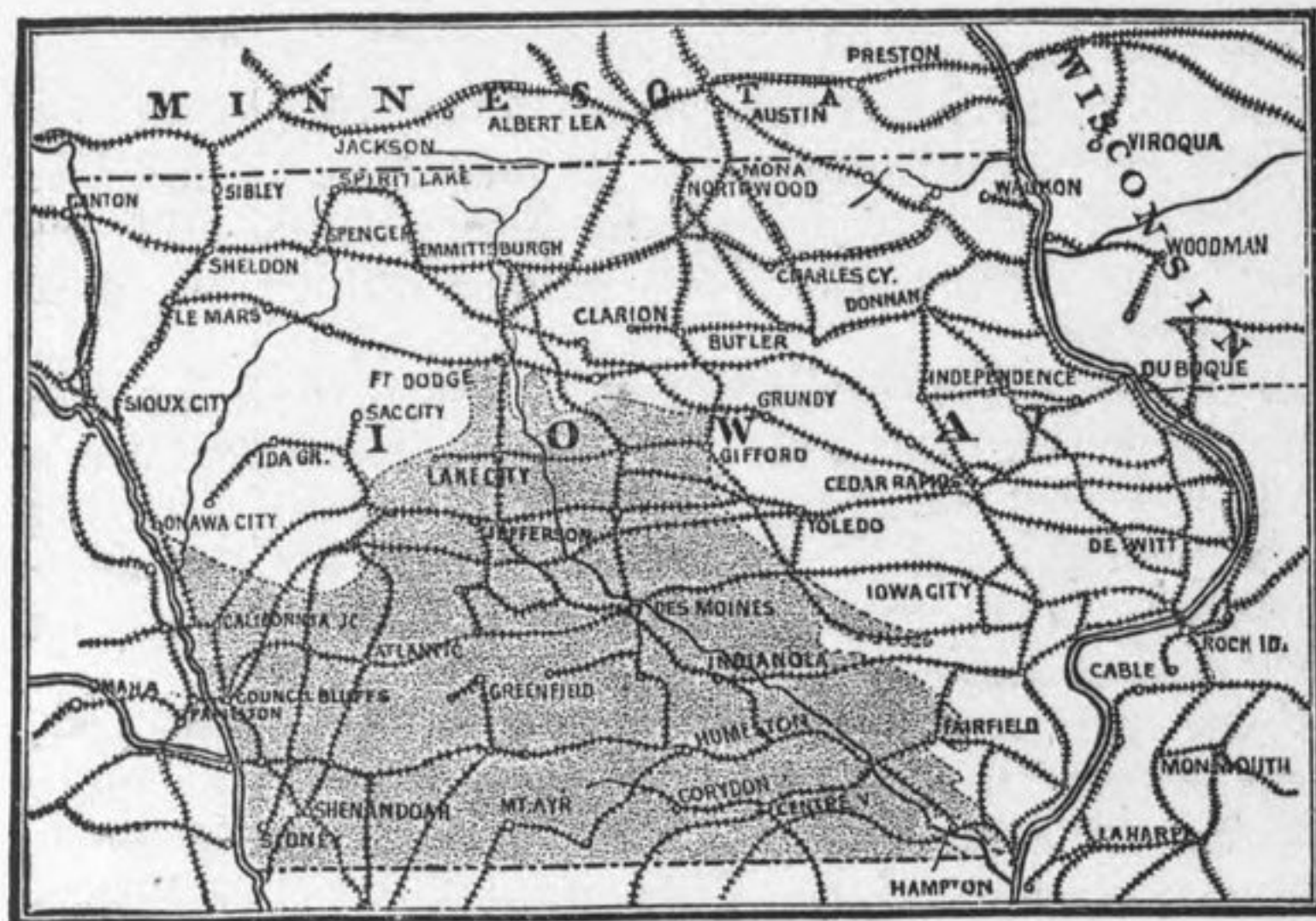


FIG. 26.—Map of Iowa Coal-field.

COAL IN IOWA.—The Missouri coal-basin occupies nearly one-half of the State of Iowa. The measures are separable into upper, middle, and lower divisions. The whole field extends in a north-west and south-east direction through the State, from Van Buren county to Keokuk, Marshall, and Harden counties; then west to Fort Dodge, Webster co.; and on the south a line through Harrison to Madison and Lucas counties is the limit. The Lower coal-measures comprise the productive coals of the strata, the Upper formation containing but one bed of coal, with a maximum thickness of 20 inches. The thickness of the Lower coal-measures is 200 feet. They contain two beds of coal, irregular in thickness, swelling sometimes to 5 feet. (See section below.) On the Des Moines River such a thickness of workable coal is found. The coal north of this river is detached in patches and isolated basins, the great body being south of the river. In Webster county there are three beds of workable coal, the upper one, 5 feet thick, being the best. In Hamilton county one bed, 4 feet thick, is found. In Boone county the coal is very deep and not much mined. There are two distinct beds, the lower 4 feet and the upper 2½ to 3 feet thick. At Des Moines the coal is mined from three seams in close proximity. The Middle coal-measures occupy only a small, narrow region. The Upper measures, as before said, are generally distributed, but contain little workable coal. The coals are all fat, adhesive, and close-burning bituminous, similar in structure to those of Illinois, but of inferior quality. The percentage of water is quite high and variable.

An average of sixty-four analyses made by the State geologist gives—moisture, 8.57; volatile combustible matter, 39.24; mixed carbon, 45.42; ash, 6.77 per cent.

Iowa Cross-Section [by C. A. White].

Nos.	Lower Division.	Thickness, Ft. In.
	Sandstone and shales.....	200 0
	Workable beds, about.....	2-3
	<i>Middle Division.</i>	
1-3.	Shales, limestones, etc.....	43 0
4.	Coal, Lacona.....	1 8
5-7.	Sandstones and shales.....	40 0
8.	Coal, Panora.....	1 0
9-15.	Shales, etc.....	26 8
16.	Coal, Wheeler.....	1 3
17-32.	Shales, sandstones, limestones.....	152 0
33.	Coal, Marshall.....	1 8
34-41.	Shales, etc.....	55 0
42.	Coal, Lynsdale.....	2 0
42, 44.	Shales.....	14 0
	<i>Upper Division—Muterset Section.</i>	
2-5.	Limestone, etc.....	84 0
6.	Coal.....	1 6
7-16.	Limestones, clays, carbonaceous shales, etc..	94 0
Total.....		717 1

MISSOURI.—The geological survey of Missouri, by Mr. G. C. Broadhead, shows that the coal-measures comprise an area of 22,995 square miles, including 160 square miles in St. Louis county, 8 in St. Charles, and a few outliers in Lincoln and Warren; the remainder lying in North-west and Western Missouri. There are 8406 square miles of Upper or Barren measures; 2000

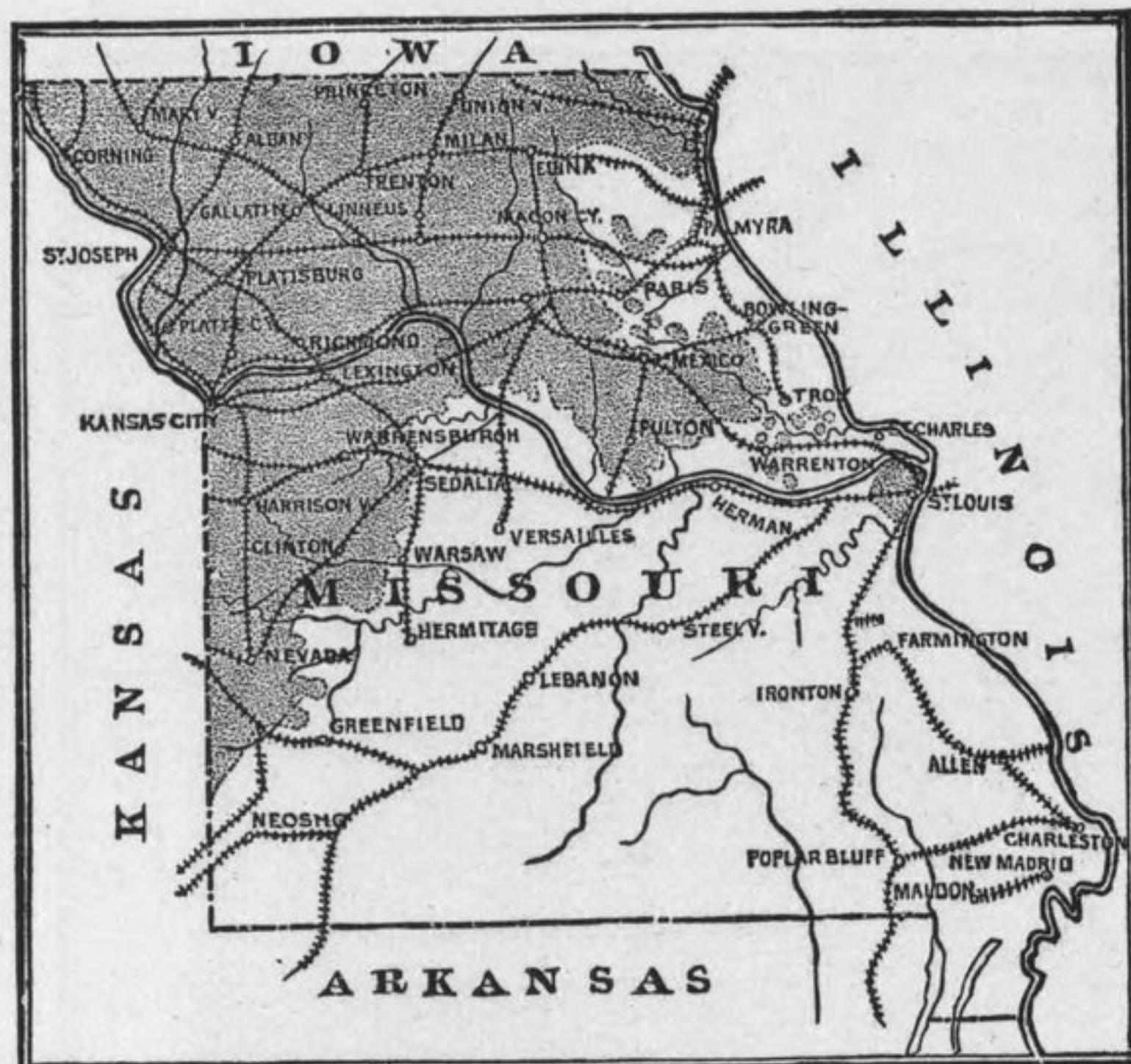


FIG. 27.—Map of Missouri Coal-field.

square miles exposed Middle measures; 12,420 square miles of exposed Lower measures. The aggregate thickness of the Upper measures is 1317 feet, but they contain only 4 feet of coal in their beds, the two largest beds being each 1 foot thick. The Middle coal-measures are 324 feet, and contain 7 feet of coal, with two workable seams, respectively 21 and 24 inches thick; one other, of 1 foot, is worked under favorable circumstances. There are six seams too thin to work. The Lower measures are from 250 to 300 feet thick, and have five workable seams of coal, varying from 1½ to 4½ feet thick. There are also thin seams varying from 6 to 11 inches thick: in all, 13 feet 6 inches of coal—total, 1900 feet of coal-measures, 24 feet 6 inches of coal. (See Table XXV.) That from the thicker seams is gen-

TABLE XXV.—Cross-Section of the Coal-Measures of Missouri [by G. C. Broadhead].

No.	Thickness.	Counties.
1	Lower Division. Coal, clay 10 in. at base...	2 ft.
2	Measures.....	13 ft.
3	Coal.....	11 in.
4	Measures.....	11 ft.
5	Coal.....	2½-4 ft. 5 in.
6	Measures.....	48 ft.
7	Coal.....	2 ft.
8	Measures.....	4 ft.
9	Coal.....	8 in.
10	Measures.....	18 ft.
11	Coal.....	1 ft. 8 in.
12	Measures.....	18 ft.
13	Coal.....	7 in.
14	Measures.....	52 ft.
15	Coal.....	1½ ft.
	<i>Middle Division.</i>	
16	Measures.....	50 to 90 ft.
17	Coal.....	21 in.
18	Measures.....	14 ft.
19	Coal.....	7 in.
20	Measures.....	36 ft.
21	Coal.....	2 ft.
22	Measures.....	70 ft.
23	Coal.....	1 ft.
24	Measures.....	164 ft.
25	Coal.....	3 in.
26	Measures.....	379 ft.
	<i>Upper Division.</i>	
27	Coal.....	10 in.
28	Measures.....	207 ft.
29	Coal.....	12 in.
30	Measures.....	392 ft.
31	Coal.....	12 in.
32	Measures.....	339 ft.

erally sold at ten cents per bushel. The product of a thin seam, 10 to 14 inches thick, on the Nodaway River, is sold at twenty cents per bushel. The miners, it is said, prefer to work a bed from 2 to 2½ feet thick to one of greater thickness, and consider all beds over 18 inches thick as workable coal; but if so, they differ from those of other States. The estimated area within which workable coal may be reached within 200 feet of the surface is about 7000 square miles.

TABLE XXVI.—Analyses of Missouri Coal [by G. C. Broadhead].

County.	Sulphur.	Water.	Volatile matter.	Carbon.	Ash.
Ray.....	2.41	10.05	38.55	45.40	6.00
Pettis.....	4.41	3.95	33.10	46.26	16.69
St. Louis.....	...	9.55	38.28	42.99	9.18
Henry.....	...	5.14	37.91	46.82	10.13
La Fayette.....	...	6.36	36.28	47.80	9.56
Johnson.....	...	7.29	42.27	46.95	3.49
Lincoln.....	2.63	8.50	39.50	46.45	5.55
Carroll.....	...	2.97	36.36	47.83	12.84
Saline.....	...	6.02	40.33	42.09	11.56
Livingston.....	...	5.38	42.27	44.98	7.37
Nodaway.....	...	3.53	42.72	40.71	13.04
Callaway.....	...	7.43	38.90	45.85	7.82
Andrew.....	...	8.94	34.75	45.38	10.93
Cass.....	...	7.80	33.20	55.75	3.25
Chariton.....	...	5.82	38.01	54.53	1.64
Macon.....	...	12.05	40.75	43.50	3.70



FIG. 28.—Map of Arkansas Coal-field.

ARKANSAS.—The coal-measures of Arkansas cover an area of 9043 square miles along the course of the Arkansas River in the western portion of the State. The measures lie horizontally, consequently the coal is easy of access. Two beds of coal have been opened, but only the lower is of workable thickness. The best coal yet found in Arkansas is the Spadra coal, in Johnson county, a semi-anthracite, which in some places is 3½ feet thick. The seams of coal on both sides of the river are from 10 inches to 1 foot in thickness. In Sebastian county the coal is 4½ feet thick, with two clay partings of 1 inch each: 1 foot of the top coal is shaly. In the southern part of Franklin and Johnson counties the coal is 2 feet thick. The accompanying analyses (Macfarlane, p. 499) show the character of the coal:

	Water.	Volatile matter.	Fixed carbon.	Ash.
Sebastian co.....	1.40	12.35	82.25	4.00
Long's.....	3.80	10.70	84.10	1.40
Yell co.....	3.00	11.40	80.40	5.20
Johnson co. (11 in.).....	2.00	7.75	88.75	1.50
Crawford co. (1 ft.).....	1.00	15.20	80.80	3.00
Spadra Creek.....	0.50	7.90	85.60	6.00

“These analyses,” Dr. Owen says, “prove the coal to be semi-bituminous, like some of the coal in George’s Creek Valley, Md.; but, in fact, these coals contain more carbon, and are anthracite or semi-anthracite. Being far richer in fixed carbon than most of the coals

in the Western States, they are therefore almost twice as durable in the fire, with proper access of air. The existence of a semi-anthracite or semi-bituminous coal in the West is the more surprising as the formation is level and undisturbed, bearing but little evidence of metamorphism or change by internal heat. There is, however, rock of undoubted igneous origin 60 miles south of Johnson county, in Hot Springs county. The igneous rocks are no doubt near enough to the surface to have excited an igneous action, and to have expelled the greater portion of the gaseous matter. The peculiar fissured structure of the Spadra coal favors the idea that the volatile matter was expelled not only by prolonged chemical action, but by heat, which causes an expansion of the particles, and that severing the coal gives it a friable tendency and a peculiar subdivision into cuboidal lumps.”

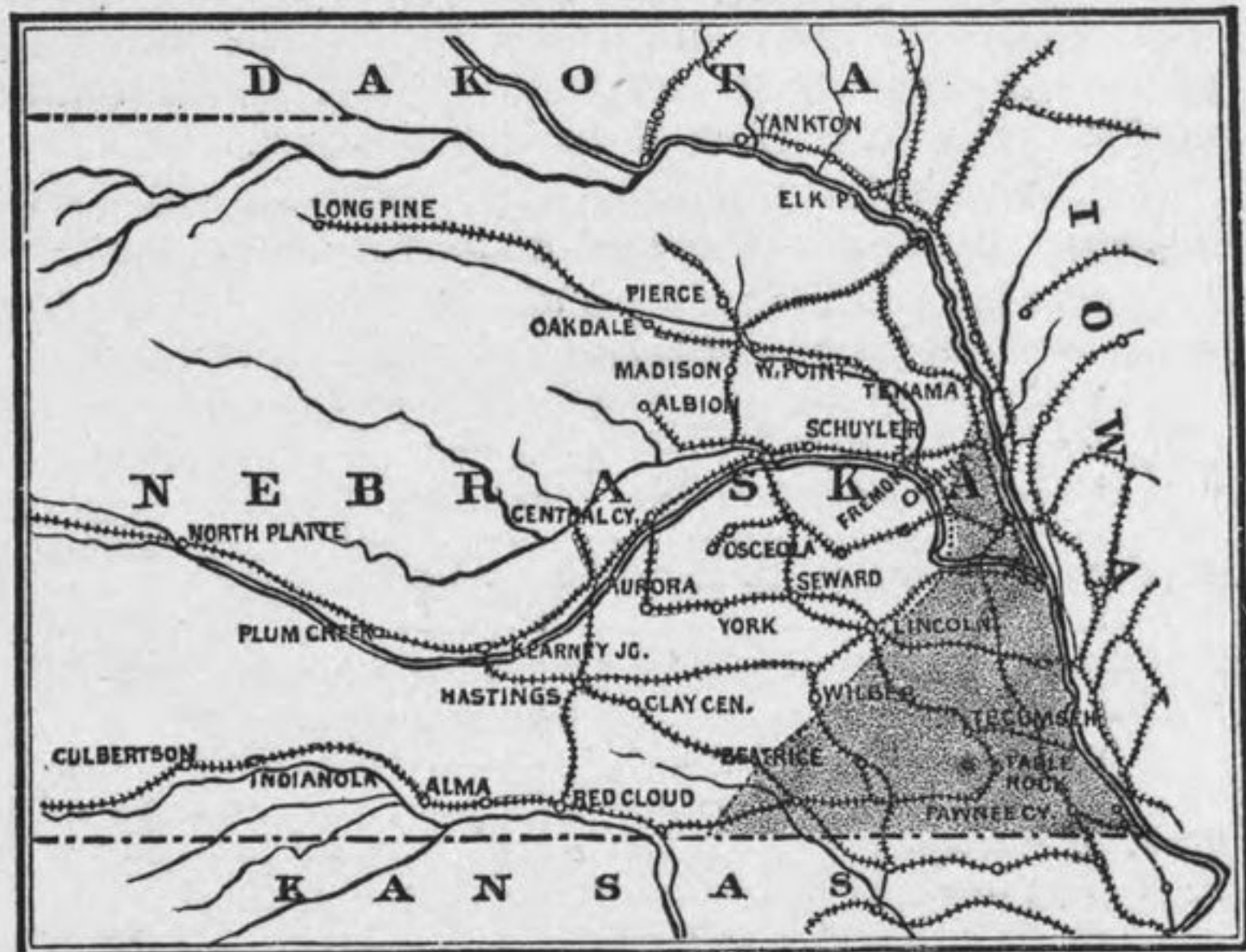


FIG. 29.—Map of Nebraska Coal-field.

NEBRASKA.—The vast treeless prairies of Nebraska would make its coal-deposits peculiarly valuable, but most of the State is beyond the western rim of the Missouri field, and the coal of the rest is in beds too thin to be worked profitably. The coal-bearing area of the State is a triangular section in the south-west corner. Several beds are found in this, but the coal, though sometimes of good quality, is only from 5 to 22 inches in thickness, and will not pay for mining. Prof. Hayden, after an exhaustive examination of the field, declares that the rocks of the Nebraska coal-field belong to the Upper Barren measures and contain no workable beds. In favorable locations the thin seams are mined for local use, but are scarcely able to supply even this demand.

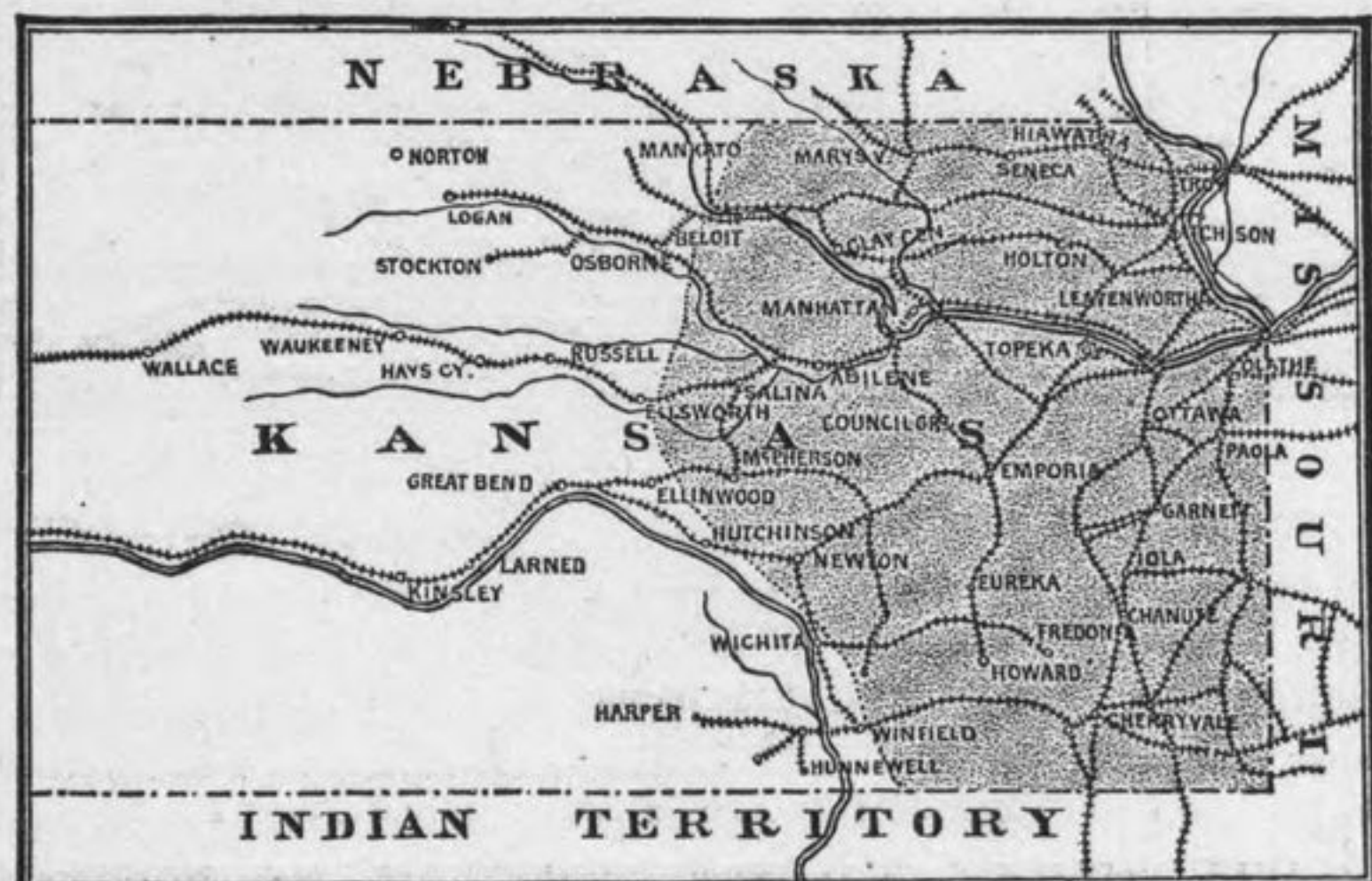


FIG. 30.—Map of Kansas Coal-field.

KANSAS.—The coal-fields of this State are a continuation of the measures of Iowa and Missouri. They occupy the whole of the eastern portion of the State, bounded on the west by an irregular north-west and south-westerly line through Marshall, Lynn, Wilson, and Montgomery counties, and covering an area of 17,000 square miles. The coal-measures are nearly horizontal, with a slight dip to the north-west. No faults are found in the beds. The upper portion of the measures con-

tains only traces of coal. Most of the coal crops out in Upper Kansas, and is not very thick, but furnishes a supply for domestic uses. The coal is not pure, owing to its being so near the top of the measures. The seams are thin in the northern portion of the State; in the lower portion there are two beds of uniform quality and thickness. The first, the Osage seam, found in Linn and Bourbon counties, is 2 feet thick; and the second, or Cherokee, the most important bed in the State, crops out in the centre of Cherokee county, extending thence into the Indian Territory. It is 6 feet thick on the average, and of good quality. These beds are the productive ones of the State. The coal is 300 feet below the surface. At Leavenworth, and in that portion of the State, shafts have been sunk 710 feet before finding coal. The Kansas coal is a good bituminous, does not crumble, and differs from most Western coals in being remarkably free from sulphur.

In *Western Kansas* there are thick beds of brown coal. The beds crop out west of Salina, in Saline county. They are from 3 to 7 feet thick.

Prof. Swallow, State geologist, gives the following summary section of the coal-measures of Kansas:

1. Lower Carboniferous formation.....	120 feet.
2. Lower coal series, contains 24 layers, 5 beds of coal—(1) 6 to 10 in., (2) 3 ft., (3) 2 to 4 in., (4) 2 to 6 in., (5) 5 to 7 in.....	353 "
3. Fort Scott marble series, 7 layers—coal-bed 2 ft. 6 in.....	23 "
4. Fort Scott series, 12 layers, 2 coal-seams—6 ft. and 16 in.....	142 "
5. Pawnee limestone series, 9 layers—6 in. coal...	112 "
6. Marais des Cygnes series, 25 layers, 4 seams of coal—(1) 2 to 3 ft., (2) 1 ft. to 2 ft. 6 in., (3) 1 ft. 8 in. to 2 ft. 9 in., (4) 2 in.....	303 "
7. Well Rock series, 11 layers—coal 1 to 5 in.....	238 "
8. Spring Rock series, 9 layers, 2 seams of coal—6 in. to 1 ft. and 4 to 8 in.....	88 "
9. Cave Rock series.....	75 "
10. Stanton limestone series, 5 layers—coal 12 to 30 in.....	74 "
11. Chocolate limestone, 10 layers.....	79 "
12. Upper coal-measures, 56 layers, 3 seams of coal—1 to 3 in. and 4 to 10 in.....	391 "

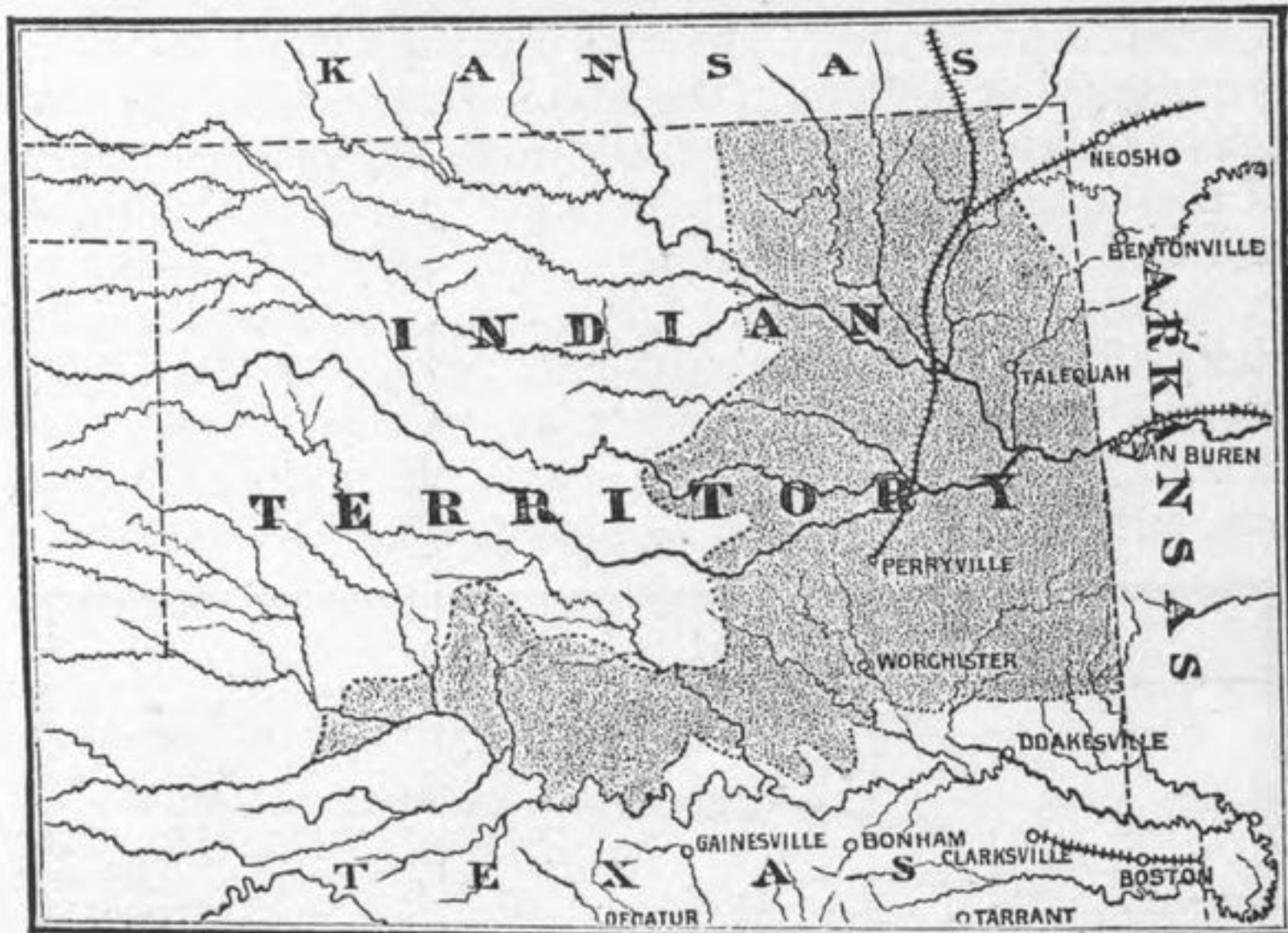


FIG. 31.—Map of Coal-field of Indian Territory.

INDIAN TERRITORY.—Indian Territory has 13,600 square miles of coal-measures, with some good coal, but its character and other details have not been ascertained. At McAllister is an extensive bed of valuable bituminous coal. Within three miles of that place a plot of at least 1000 acres is worked by the Osage Mining Company, a Kansas corporation, and produces eighty cars of coal a day, all of which is sold to the Missouri, Kansas, and Texas Railroad, or shipped *via* the Missouri, Kansas, and Texas Railroad to Texas. It is a very superior gas coal. The vein is also worked at Savannah, ten miles south, and again crops out at Atoka, forty-five miles south, on the Missouri, Kansas, and Texas Railroad, and is known to stretch far to the east. The Choctaw Nation leases to the Osage company.

It will have been noticed that the coal-field of Kan-

sas evidently extends over the north line, and that of Arkansas over the east line, of the Territory occupied by the Indian tribes who were removed west of the Mississippi River. The coal-field of Texas also approaches the south line of that Territory. All these facts indicate the existence of important fields of coal.

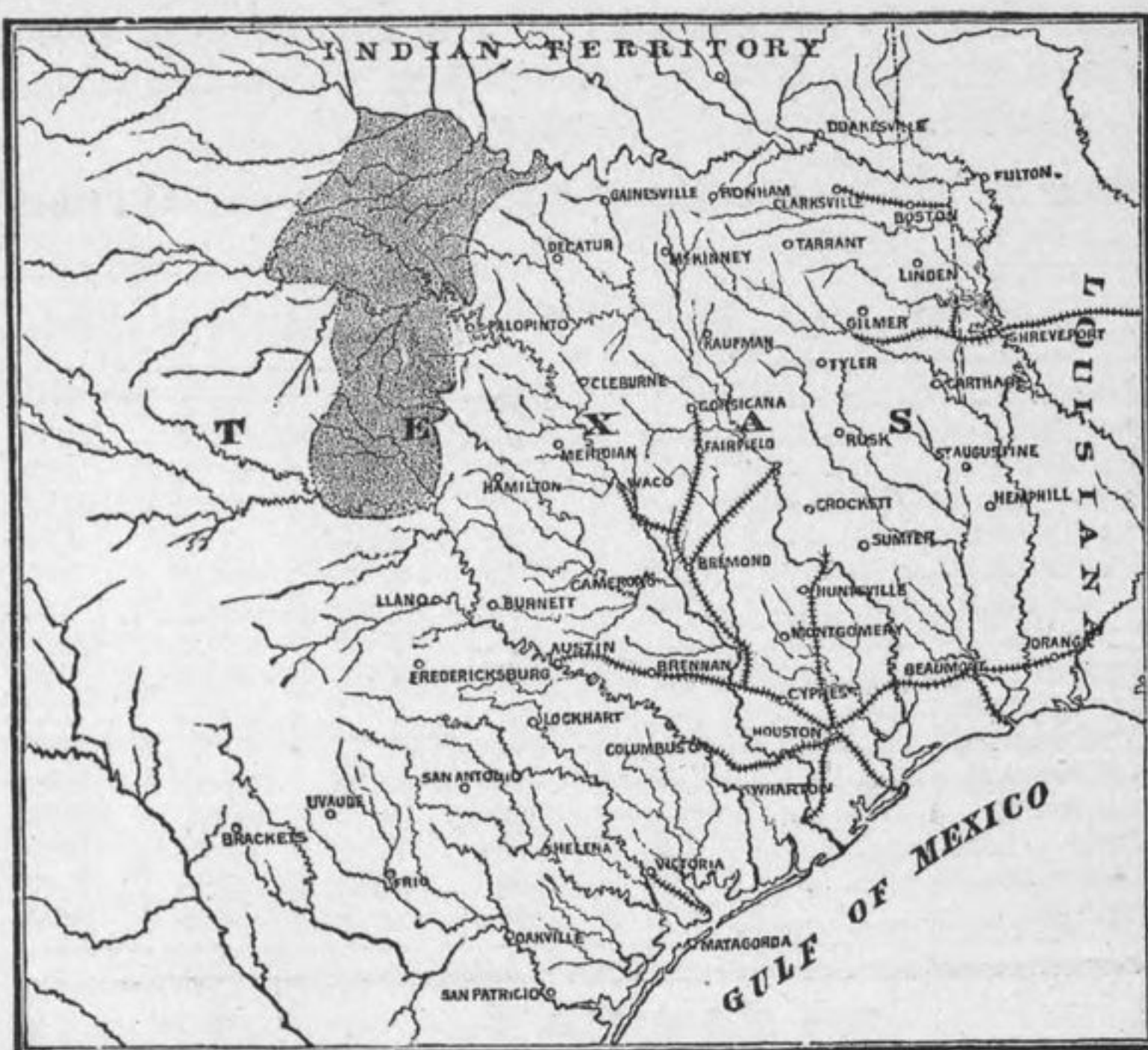


FIG. 32.—Map of Texas Coal-field.

TEXAS.—An outspur of the great Missouri coal-field covers the north-eastern portion of the State of Texas for about 6000 square miles. This coal is a regular bituminous. The formation belongs to the Carboniferous age. It extends into Stephens and Young counties, where explorations have shown the presence of two beds, about 40 feet apart. Some beds are 3 feet in thickness, and others vary from 4 to 6 feet. The strata lie nearly horizontal and cover a very large area. The quality of the coal is not very good, being high in ash and full of sulphur. This coal-field extends south to the Colorado River. An analysis of this coal is added:

Analysis of Coal, Young co., Texas.

Moisture.....	10.00
Volatile combustible matter.....	30.75
Fixed carbon.....	46.59
Ash.....	11.96
Sulphur.....	.70
	100.00

Lignites occupy large areas in Texas. One bed runs south-west through the State, commencing at the Sabine River, 20 miles below the 32d parallel of north latitude and extending to the Rio Grande River. Another bed of lignite runs parallel to this through Cass county and on through Cherokee county. There is a small field of coal in Brown, Coleman, Comanche, and Hamilton counties. This is said to be a semi-anthracite. Good cannel coal is reported to be found in Webb county. It belongs to the Tertiary formation, and makes a good gas coal.

LIGNITES AND LIGNITIC COAL.

The lignitic coals of the western portion of the United States are destined to play an important part in the industrial development of that part of the North American continent, as they are, with few exceptions, the only form of mineral fuel to be found west of the 100th meridian. Lignite is the stage next above peat in the formation of coal, and varies greatly in both appearance and chemical composition. Its color varies from light yellow to deep brown or black. Some writers restrict the term "lignite" to fuel which shows a distinct woody structure, and make a separate variety of the more compact and higher grade between this and bituminous, which they call "brown" coal. The distinction is more apparent in Europe than in America, as in this country the gradations are so minute

as to make it almost impossible to say where the lignites end and the brown coals begin.

As might be supposed from their intermediary position between peat and true coals, lignites belong to a later geological period than the Carboniferous. They occur principally in Cretaceous and Tertiary formations, but the beds, which often are of great thickness, present the same general characteristics as those of the true coals. Like them, each bed is underlaid by a seam of fire-clay, the soil in which the plants grew, and overlaid with shales and sandstones; and, like them, they are regularly interstratified with the surrounding rocks. Many instances occur, too, in which local causes have changed portions of lignite beds to bituminous, and even to anthracite, the coal in each case being simply a higher development of the lignite; showing that they are essentially the same substance.

Lignites of the Eastern Hemisphere.

LIGNITES have been used in Europe for many years, though their inferior qualities as heat-producers make them less popular than the true coals. They are found in England, France, Germany, Spain, Switzerland, Greece, Scandinavia, Russia, Austria, and perhaps other European countries, as well as in the island of Madeira, in Greenland, Iceland, Asia Minor, Persia, Siberia, Thibet, India, Australia, Tasmania, and indeed in most parts of the globe. In many places where the geological formation makes the presence of lignites probable they have not yet been sought for, and in many other places they have been found, but not worked. Some varieties emit a disagreeable smell when burning; some, like the "Cologne earth" of Germany, crumble to powder when dried, and are used as pigments. The following are analyses of *European* and *Australian* lignites:

	Carbon.	Hydrogen.	Oxygen and nitrogen.
Bovey, Devon.....	67.9	5.8	26.3
Cologne.....	67.0	5.3	27.7
Tasmania.....	71.9	5.6	22.5
Auckland.....	72.2	5.4	22.4
Hungary (slightly fibrous).....	72.5	5.4	22.1
" (more fibrous)....	74.9	5.2	19.9

Prof. Thorpe (*Coal*, p. 176) gives the following table of averages, showing the progressive changes in chemical composition relatively to a constant amount of carbon:

	Weight of 1 solid cubic foot in lbs.	Carbon.	Hydrogen.	Oxygen and nitrogen
Wood.....	30	100	12.3	86.8
Peat.....	70	100	9.7	54.7
Lignite.....	70	100	8.3	40.0
Brown coal.....	75	100	7.4	29.7
Bituminous coal...	80	100	6.4	13.4
Anthracite " ...	90	100	2.6	2.3

The figures in the column showing the approximate weight of a cubic foot of the several substances are instructive as indicating the joint effect of compression and of the gradual destruction of cellular structure in increasing the density of the product.

American Lignitic Coal.

The lignites of Western America resemble the "brown coals" of Europe in holding a large amount of water, the proportion of this ingredient in most of them being from 12 to 15 per cent., though some have as low as 4 and others as high as 20 per cent. They do not show a woody or fibrous structure, but are compact and generally black, with a very high lustre, resembling in appearance some of the bituminous coals; with which, indeed, they are, for practical purposes, almost identical. Only the geologist can distinguish between the best lignites

TABLE XXVII.—*Proximate Analyses of Western Lignitic Coals.*

	Water.	Volatile matter.	Fixed carbon.	Ash.	Units of heat in 1 lb. of coal.	Specific gravity.	Color of ash.
Vermejo Cañon, New Mexico.....	3.27	23.73	59.72	13.28	5418	1.36	Brownish gray.
Cañon City, Col.....	5.40	36.40	54.70	3.50	...	1.29	Yellow.
Colorado Springs, Col.....	12.90	39.10	46.00	2.00	...	1.27	Fawn.
Golden City, Col.....	13.67	34.75	47.58	4.00	...	1.35	
Murphy, Ralston, Col.....	11.70	29.07	55.31	3.92	4870	1.39	Ochre yellow.
Erie Mine, Col.....	14.80	34.50	47.30	3.40	...	1.27	Orange.
Carbon, Wy. Ter.....	11.60	27.68	51.67	6.17	...	1.37	Light gray.
Hallville, Wy. Ter.....	12.12	29.75	54.37	3.76	...	1.32	Gray.
Point of Rocks, Wy. Ter.....	8.54	30.60	52.34	8.52	5181	...	White.
Van Dyk's, Wy. Ter.....	8.12	36.65	53.23	2.00	...	1.27	Light gray.
Rock Springs, Wy. Ter.....	6.25	31.75	53.45	9.55	...	1.23	White.
Evanston, Wy. Ter.....	8.07	43.06	47.34	9.60	5632	1.34	Gray.
Coalville, Utah.....	10.66	38.23	48.00	3.11	...	1.32	
Wasatch, Utah.....	8.38	47.06	49.68	2.26	6154	1.31	Nearly white.
Weber River, Utah.....	9.45	26.21	58.32	3.64			
Mount Diablo, Cal.....	14.69	33.89	46.84	4.68			
Coos Bay, Oregon.....	20.09	32.59	41.98	5.34			
Bellingham Bay, Wash. Ter.....	8.39	33.26	45.69	12.66			
Nanaimo, Vancouver's Island.....	2.98	33.16	46.31	18.55			
Bozeman, Montana.....	7.00	34.50	50.50	8.00			

Ultimate analyses give the true value of coal as a heat-producer. The "volatile matter" in proximate analyses includes some combined water that tends to diminish the heat. The nitrogen also is an impurity. The following table of analyses is from Prof. Rossiter W. Raymond:

	Uncombined water.	Carbon.		Hydrogen.		Oxygen.	Nitrogen.	Ash.	Sulphur.	Combined water.	Calorific power.
		Probably fixed.	Probably combined with hydrogen.	Probably combined with carbon.	Combined with oxygen to form water.						
Cañon City, Col.....	5.18	50.36	17.22	5.74	1.68	13.42	...	5.77	0.63	15.10	7330
Carbon Sta., Wy. Ter...	11.56	59.41	5.58	1.86	1.90	15.20	1.74	1.68	1.07	17.10	5738
Carbon Sta., Wy. Ter...	8.06	59.63	9.51	3.17	1.19	9.54	1.25	6.62	1.03	10.73	6578
Weber Cañon, Utah.....	9.41	57.64	7.20	2.40	1.94	15.52	1.29	3.00	1.60	17.46	5912
Echo Cañon, Utah.....	9.17	62.25	7.59	2.53	1.37	10.99	1.93	3.40	0.77	12.36	6400
Coos Bay, Oregon.....	13.28	54.29	1.95	0.65	2.73	21.82	0.42	4.05	0.81	24.55	4565
Mt. Diablo, Cal.....	8.94	50.36	9.36	3.12	1.96	15.69	1.01	5.64	3.92	17.65	5757

and bituminous coal. The percentage of ash is low for lignites, varying from 2 to 6 per cent., while the sulphur seldom reaches 1 per cent. The volatile products driven off at a dull red heat vary from 25 to

37 per cent., and the amount of fixed carbon is from 45 to 60 per cent. They are superior to European lignites, but differ from the true coals, and hence are termed "lignitic coal." *Hayden's Report of the U. S. Geological Survey of Colorado for 1873* gives tables of all reliable proximate analyses of these lignitic coals, and the preceding table is abstracted from them. (See Table XXVII.)

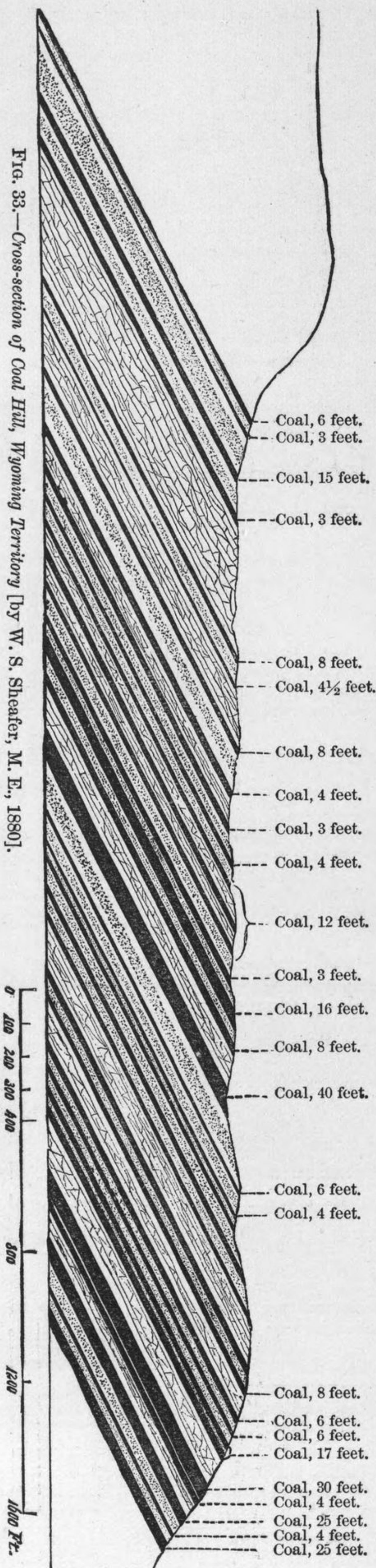
As the heat-producing power of the coal is dependent on a chemical union of the atmospheric oxygen with the carbon and hydrogen in the coal, thus forming carbonic acid and water, the amounts of these products represent the amount of heat which has been produced as the result of their formation; while the ash and moisture present diminish the percentage of combustible ingredients and the heat-producing power of the whole, the moisture being a further disadvantage, as it requires a considerable amount of heat to expel it.

These coals are found in a series of sandstone and fire-clay, probably of Lower Tertiary age. The fossils contained are chiefly leaves of deciduous trees. No ferns or fossil plants, like those common to the true coal-measures, are found in this formation. The coal-beds are often of great size, reaching a thickness of 27 feet on Bear River, Utah. They are remarkably free from impurities and without slate partings. Iron pyrites may be detected in small flakes and thin disks. All the coals tend to crumble after having been exposed to the weather, and this tendency to crumble is the cause of great waste at the mines. With rare exceptions, when submitted to the coking process they retain their form or crumble into a dry powder. As a fuel for locomotives and for domestic purposes the coal answers well. It kindles and burns freely, making a bright fire, with a yellow blaze and comparatively little smoke. The presence of iron pyrites in coals so easy to crumble as these, suggests the possibility of spontaneous combustion.

WYOMING LIGNITIC COAL.—The largest single deposit of coal yet discovered on the American continent is the Twin Creek coal in the Green River coal-basin, in South-western Wyoming, where the writer's explorations show 250 feet of coal in a thickness of about 3000 feet of measures. (See fig. 33.) The number of beds is not known, but twenty-two of workable thickness have been developed, and there are traces of nearly or quite as many more, most of which are supposed to be workable. On the line of the Utah and Wyoming Railroad, about 100 miles east of Corinne and 20 west of Ogden, two series of coal-deposits have been traced, which Dr. Hayden and Clarence King ascribe to the Cretaceous period—a notable exception to Dr. Hayden's theory that the Rocky Mountain lignites belong to the Tertiary formation. The first is in the Lower Fox Hill group, and the second in the Laramie group. South of where Ham's Fork of Green River cuts through Oyster Ridge two beds of coal have been opened; the upper is 10 feet thick, and contains 18 inches of fire-clay, 6 of hard sandstone, 72 of coal, 6 of soft fire-clay, and 18 of coal; or 7 feet 8 inches of coal in a 10-foot bed. The second bed is about 40 feet below this, and consists of 10 feet of coal, 6 inches of sandy clay, 1 foot 8 inches of dark slate and fire-clay, and 1 foot 8 inches of coal. The strike of these beds is nearly due north, and they dip westwardly 23 degrees. They are regular, and have been traced for several miles (fig. 34).

A second series of beds appears in Coal Ridge, a hill parallel to Oyster Ridge and about 4 miles west of it. They first appear through the overlying Tertiary deposit 6 or 8 miles south of Bell's Pass, and rise gradually to about 300 feet above the valley of the north branch of the Little Muddy River. Observations taken at thirty-four shaftings located about 3 miles south of Bell's Pass show that the coal-beds underlie strata of fire-clay or sandstone, or both, varying in thickness from 3 to 100 feet, and averaging about 37 feet through the series. The beds themselves vary from 3 to 40 feet, averaging 11 feet throughout the series. The coal gen-

FIG. 33.—Cross-section of Coal Hill, Wyoming Territory [by W. S. Sheaffer, M. E., 1880].



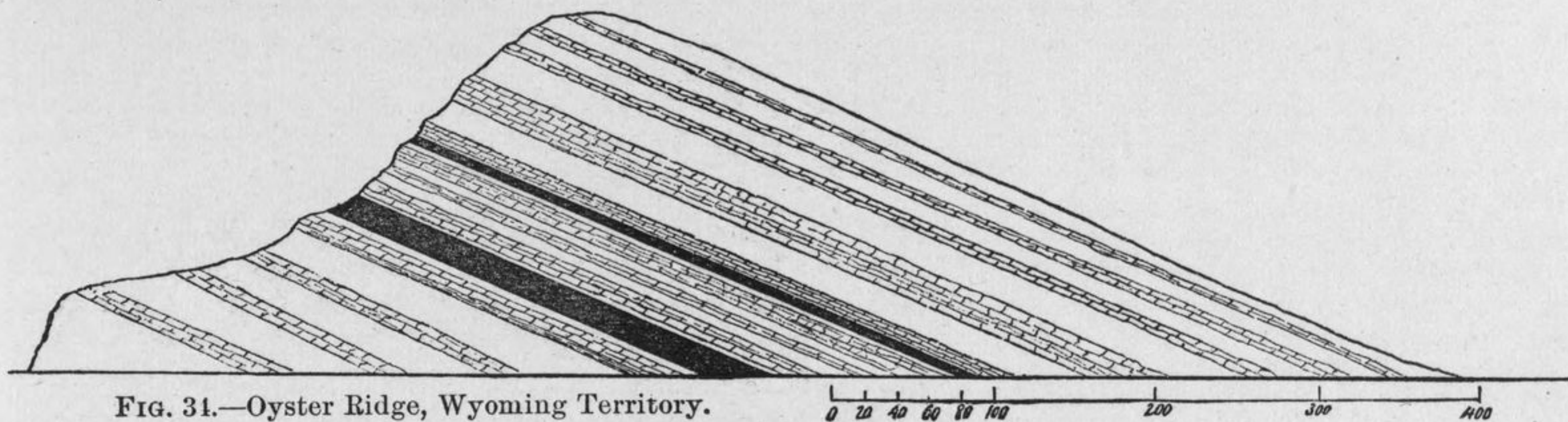


FIG. 31.—Oyster Ridge, Wyoming Territory.

erally is of good quality, and but four or five of the whole series of beds must be regarded as certain to prove unprofitable in working, although in several instances coal has been reached without a thorough proof of the thickness of the deposit. In four shaftings the superincumbent strata are 300 feet in depth; in one, 200 feet.

Several other beds, overlying the last of this series, were seen in other parts of this field, but not developed. The distances between the beds in the above section (see fig. 33) were estimated or taken from barometrical measurements, and are only approximate, as indeed the whole statement necessarily must be. It gives, however, an idea of the richness of this magnificent field. The beds have been traced for a distance of at least 10 miles in a north-and-south direction.

The following are results of analyses of coals from Twin Creek. They are numbered according to their place in the series mentioned above:

	No. 1.	No. 3.	No. 5.
Moisture	17.305	13.882	16.909
Volatile matter.....	36.177	38.807	36.948
Fixed carbon.....	44.147	42.713	43.979
Ash	2.371	4.598	2.164
	100.000	100.000	100.000
Color of ash	White.	Gray.	Yellowish.
	No. 18, Mouzilly.	No. 21.	No. 32.
Moisture	14.710	14.725	15.696
Volatile matter	35.410	38.891	35.257
Fixed carbon.....	48.094	45.410	45.149
Ash	1.765	2.974	3.898
	100.000	100.000	100.000
Color of ash.....	Yellow.	Red.	Red.

TABLE XXVIII.—Analyses of Lignitic Coals in Wyoming and Montana.

	I.	II.	III.	IV.	V.
Moisture.....	17.31	13.88	14.71	4.72	7.00
Volatile matter.....	36.18	38.81	35.41	39.49	34.50
Fixed carbon.....	44.15	42.71	48.09	50.80	50.50
Ash.....	2.37	4.60	1.79	4.99	8.00
Color of ash.....	White.	Gray.	Yellow.		

- No. I. No. 1 vein, Twin Creek, Wyoming.
- " II. No. 3 " " " "
- " III. No. 18 " " " "
- " IV. Ham's Fork, Wyoming.
- " V. Bozeman, Montana.

COLORADO LIGNITIC COAL.—At Golden City, 15 miles west from Denver, coal was first discovered in several small and vertical beds near together in the steep bank of Clear Creek, a half mile below where it passes out from the mountain. An extension of one of the beds toward the south was opened at the summit of the ridge. The bed was 10 to 14 feet thick, but irregular, sometimes pinching to a few inches, and then expanding to 8 or 10 feet. The average thickness is 5 feet. Two large coal-beds are opened at Ralston Creek, 5 miles north of Golden City. They lie in a vertical position, 25 feet apart. The upper or western bed has 9 feet of good coal, and the lower bed 14 feet. Marshall's mines are in the valley of South Boulder Creek, 22 miles from Denver. There are four coal-beds. The coal is brilliant.

Lignitic coal has been found on both the east and west sides of the Platte River, but the only mines of importance are near the eastern foot of the Blue Hill range of mountains. The formation is a series of sand-

stones, ranging north and south, and along its western margin is uptilted in a vertical position, sometimes dipping toward the metamorphic rocks that make up the steep mountain-slope. Away from the mountains the inclination is eastward and very gentle. The formation follows the mountain-range for an unlimited extent.

In Hayden's *Report* will be found sections showing the series of beds at these mines.

These coals analyze as follows (two samples):

Water, in a state of combination, or its elements, as in dry wood.....	12.00	20.00
Volatile matter, expelled at red heat, forming inflammable gases and vapors	26.00	19.30
Fixed carbon	59.20	58.70
Ash, consisting chiefly of oxide of iron, alumina, and a little silica.....	2.80	2.00
	100.00	100.00

Other openings in Colorado are the Wilson, Brigg, and Baker mines on Coal Creek. The coal-belt extends north into Wyoming Territory, but is not found east of the Black Hills. At Carbon, on the Union Pacific Railroad, in the Laramie Valley, 140 miles west of Cheyenne, the bed is 7 feet thick. (See Table XXIX.) The coal is good, but has much impurity. At Hallville, 142 miles farther west, are several coal-beds. The main bed is about 6 feet thick. The next coal-mine is at Van Dyke, 30 miles west. The coal here is 4½ feet thick, and remarkably clean. This and the next coal, at Rock Springs, have the best reputation among Rocky Mountain lignitic coals. The latter mines are 2 miles west of Van Dyke; the bed is 9 feet thick. At Evanston, 126 miles west of Rock Springs, the beds are 26 feet thick, and dip 15°. Iron pyrites are abundant; the coal clinkers to a great extent. These mines supply the Union Pacific and Central Pacific Railroads with fuel. At Coalville, in Utah, these beds are still found. (See Table XXVII. for analyses.)

TABLE XXIX.—The Coal-mines of the Union Pacific Railroad.

According to Poor's *Manual* the coal-lands owned by the Union Pacific Railroad Company extend along the line of the road from Carbon to Echo, a distance of 335 miles, and embrace an area greater than the entire anthracite region of Pennsylvania. Previous to 1875 the mines were worked by contractors, but since that time the company has operated them on its own account. The results of working the principal localities for the last six years are shown in the following table:

Year.	Carbon.		Rock Springs.		Almy.		Total.	
	Tons Mined.	Cost per Ton.	Tons Mined.	Cost per Ton.	Tons Mined.	Cost per Ton.	Tons Mined.	Cost per Ton.
1875	61,750	\$2.05	104,667	\$1.84	41,805	\$1.73	208,222	\$1.88
1876	69,062	1.58	134,953	1.37½	60,756	1.32½	264,771	1.41½
1877	74,343	1.24½	146,494	1.10½	54,643	1.05	275,480	1.13½
1878	62,418	1.20	154,281	0.99	59,096	1.00½	275,795	1.04½
1879	75,325	1.19	193,251	0.98½	71,576	1.16½	340,152	1.06½
1880	100,434	1.35½	244,460	1.24½	100,235	1.07½	445,129	1.23
Total production	443,332	....	978,106	....	388,111	....	1,809,549	....
Av. cost per ton.	....	\$1.42	....	\$1.25½	....	\$1.22½	....	\$1.29½

At Cañon City, Col., there is an independent coal field. The coal-openings are 6 miles below the town, on the Arkansas River. The strata lie, for the most part, in a horizontal position, except along the north and west sides. Here the pitch is steep, but flattens and forms a basin, the centre being 3 miles east of the base of Greenhorn Range, a spur of the Rocky Mountains. The basin is 10 miles long and 5 miles wide, containing in all 34 sq. miles of coal-bearing rocks. There are at least nine seams

of lignitic coal, varying in thickness from 6 inches to 8 feet. The two seams cropping farthest south are 6 and 7 feet thick, and but 50 feet apart. The lowest seam is the Cañon City coal, 51 inches thick, 'black, compact, uniform in color, separating in large cubical blocks.' Towards the north these seams grow thinner and are farther apart.

Lignitic coal is found and mined in the vicinity of Trinidad, Las Animas county. The coal-seam is 9 to 10 feet thick, and its product looks like bituminous coal. It yields an excellent coke, and at present is used extensively in the iron-works of Colorado.

At the town of Walsenberg, Huerfano county, 50 miles south of Pueblo, there is a seam $8\frac{1}{2}$ feet thick, the coal being of a dull lustre, resembling splint coal, and approaching, to a certain degree, the qualities of the Trinidad coal.

TABLE XXX.—*Lignites of Southern Colorado and New Mexico.*

	I.	II.	III.	IV.	V.	VI.	VII.
Moisture.....	7.665	3.650	1.150	1.540	14.5	3.27	2.90
Volatile matter...	37.210	35.447	30.200	6.350		23.73	3.18
Fixed carbon.....	49.535	49.403	58.040	74.850	61.0	59.72	88.91
Ash.....	5.590	11.580	10.610	17.260	24.5	13.28	5.21
Sulphur.....	0.819	0.651	0.595	0.655			

- No. I. Cañon City., Col., lower seam.
 " II. Walsenberg, Col.
 " III. Trinidad, Col., coal.
 " IV. Trinidad, Col., coke.
 " V. Arizona, Deer Creek.
 " VI. Vermejo Pass, New Mexico.
 " VII. Placer Anthracite, New Mexico.

Large and valuable beds of *bituminous* lignite are found on the Animas River, forty miles south of Silverton, in the vicinity of Durango, where, as a consequence, extensive machine-shops, smelters, and coke-ovens have been established.

A recent writer (April, 1882) says of the Colorado coals: "The mines in the north, in Boulder and Jefferson counties, became known soon after the development of the State began, and these still supply a considerable portion of the coal used. But as development continued the fact became manifest that the better portion of the coal-deposit was in the southern half of the State. Cañon City coal, for instance, commands several dollars a ton more in Denver than any other soft coal mined in Colorado—a pre-eminence that it will hold only relatively now that the exceptionally fine, free-burning bituminous [lignitic] of the Gunnison is fairly brought into the market by the opening of the Gunnison extension of the Denver and Rio Grande Railway. In the extreme south, too, close upon the New Mexican line, is found the famous coking coal of El Moro, which, again, is excelled by the coking coal of Crested Butte; and the Cucharas mines, also in the south, yield a good quality of bituminous. From these several mines the output last year amounted to 350,000 tons, and the estimated output of the present year is 400,000 tons."

The report of the Colorado Coal and Iron Company for 1881 shows the following beds worked by it: In the Cañon coal-field two beds are worked, 4 and 5 feet; the product was 125,902 tons; its value at mines was \$258,417. In the Cucharas coal-field three beds are worked, 4, 7, and 6 feet; the product was 71,272 tons; its value was \$135,624. In the El Moro coal-field there was worked a horizontal bed, 10 to 12 feet thick, of good gas, blacksmith, coking, and domestic coal; the product was 150,585 tons; its value was \$146,941. In the Crested Butte coal-field were worked four seams, 4, 5, 6, and 10 feet thick; the 5-foot and 4-foot beds produce good coke. A railroad has recently reached this field. The estimated production in 1882 is 70,000 tons. The company's present plant consists of 250 beehive coke-ovens. In 1881 they sold 47,186 tons of El Moro coke for \$247,300, making a net profit of \$2.31 per ton. Two steam crushing and washing establishments are used to prepare the coal for coking.

NEW MEXICO.—New Mexico contains lignitic coals

in all their grades of anthracite, bituminous, and true lignites. The anthracite, so far as known, is found only in the Placer Mountains, on the eastern border of the Rio Grande Valley, 30 or 40 miles S. S. W. of Santa Fé; the bituminous, at various points in cañons in the Cretaceous plains, where, by erosion, the strata have been cut through to the coal-measures; and the pure lignites in the Tertiary beds of the northern part of the Territory. The outcroppings of coal on the north-west side of the Placer Mountains are of great interest. They were first exposed in the centre of the little branches that run into the Gallisteo Creek. The coal is in the natural condition. The following section of the strata was taken, ascending: (1) Laminated clay, with thin seams of sand, passing up into carbonaceous clay as a floor for the coal. (2) Coal, very compact. The cleavage lines are, in a few instances, filled with clay, 5 to 6 feet. (3) Drab clay, indurated, 15 to 20 feet. (4) Ferruginous sandstone, passing up into light grayish sandstone, 30 to 50 feet. At another locality there is a bed of coal which has been changed into anthracite by an enormous dyke.

A cross-section shows—(1) clay slate; (2) $2\frac{1}{2}$ to 3 feet of anthracite; (3) 14 to 18 inches of clay; (4) 14 inches to 2 feet of anthracite; (5) clay shale, passing up into alternate layers of sandstone and clay, 10 feet; (6) dark sandstone.

The dip of all the beds is 14° east. They are overlaid by a thick bed of columnar basalt. The dyke that covers the coal-bed trends about north and south, or a little east of south.

Three groups of Tertiary beds, of different ages, have been traced in the valley of the Rio Grande. They are—(1) The coal-strata, with abundant impressions of deciduous leaves, lying above well-marked Cretaceous beds. (2) The Gallisteo sand group, which plainly overlies the coal-strata, but inclines equally with and conforms to them. (3) The Santa Fé marls, which are of much later date than either of the other two, and rest conformably upon the Gallisteo group, and never incline more than 9° or 10° .

In the Raton Mountains, in New Mexico, the coal approaches anthracite in quality, although somewhat impure and high in ash. Dr. Leconte reports the bed as having a thickness of 4 feet. At Vermejo Cañon there are two beds of poor coal, 10 and 15 feet, and two beds of 5 feet. In Raton Pass are found several beds from 3 to 8 feet thick. In Blackmore Cañon and Bremer Cañon the bed is seen, but the thickness varies. Twenty-eight miles south-west of Albuquerque lignite beds, 5 feet thick, are exposed. At Cimarron the bed is reported to be 14 feet thick. The coals in this region are used in the various railroads now traversing this section of the country.

The following summary of the latest coal-discoveries in New Mexico was made by John Robertson, M. E., in Jan., 1882: "As you enter this Territory from the north by way of the Atchison, Topeka, and Santa Fé Railroad, the first point where coal is found is at and in the neighborhood of Raton. Here large bodies of coal of a bituminous character are opening out, and the town of Raton has become the centre of the coal interests of the northern part of the Territory. The railroad company is the principal owner, and it has commenced a vigorous development of its property, both for its own use and for public consumption; and the existence of coal at this point has led it to establish large machine-shops, etc., for its business. Coming south, we reach Las Vegas, where vigorous explorations are now carried on, which so far have developed the existence of bituminous coal-seams of from 12 to 24 inches, which underlie nearly the whole district. Boring is still pushed forward, and hopes are entertained of striking a coal of sufficient thickness to pay for working. Seventy miles farther south coal is found in the mountains forming the Pecos range. These seams have never been explored beyond the point of proving their existence and their thickness, which runs from 30

to 36 inches. Twenty miles farther south there are the extensive coal-fields of Los Cerillos, many thousand acres in extent, and consisting of both bituminous and anthracite. The anthracite veins vary from 18 to 40 inches; the bituminous average about 3 feet. Still proceeding south to Albuquerque, and then taking the line of the Atlantic and Pacific Railroad, inexhaustible fields of the finest cannel and bituminous coals have been discovered. One vein is 5 feet 6 inches in thickness of cannel coal, of which there are over 1000 acres in one body only 2 miles from the road. Continuing down the main line, we reach San Antonio, in Socorro county, where at San Pedro, 7 miles east, there are several hundred acres of bituminous coal of good quality. This field is owned and operated by the railroad company. At various other points in the Territory similar beds have been discovered, which, from their distance from existing railroads, are not at present considered valuable.

"All the points above mentioned are from one to seven miles from railroads, and are destined to prove of value. Coking establishments are building or projected at several of these points; and as we have extensive mines of gold, silver, copper, lead, and iron, a bright future seems to be before this Territory. With few exceptions, the coal-fields are on Government land."

ARIZONA.—The great lignitic fields of the West seem to continue into the south-eastern corner of Arizona, but the discoveries here are quite recent, and have not been proved to a very great extent. Coal has been found in the Saddle Mountains, 6 miles east of the San Pedro River and 4 miles south of the Gila, on the line of 33° north latitude. There is quite a number of beds, which lie almost flat, few appearing on the surface. At Casa Granda, 25 miles south of the Southern Pacific Railroad, outcroppings of coal are numerous.

The Deer Creek coal-fields occupy the eastern half of an elliptical basin 30 miles long by 3 to 5 miles broad, lying nearly east and west, and divided centrally by the Gila River. The location is an abrupt synclinal valley, the rocks being eruptive and forming some characteristic dykes. The first discovery of coal was near the head of Deer Creek, where the valley is intersected by two dykes. The dip of the beds is 35° south. The main bed is 6 to 8 feet thick, and there are several smaller ones. The coal seems to be a semi-bituminous. The analysis is given below (No. I.). Eight miles below this is another outcrop; the dip is 35° north, and the coal a typical lignite (No. II.). The area of the whole region is about 30 square miles, in which an unknown portion of the coal-fields and beds has been broken up by the action of eruptive rocks. Where least disturbed the coal is a true lignite, but portions are changed to bituminous coal, coking well, and even to anthracite.

	No. I.	No. II.
Volatile combustible matter and water.....	14.5	47.6
Fixed carbon	61.0	44.0
Ash.....	24.5	8.4
	100.0	100.0

UTAH.—The Green River coal-basin extends into Utah, west of the Wahsatch Mountains, to the Sierra Nevada range, including the plains of the Great Salt Lake. The coal-series is first seen in East Cañon Creek, a tributary of the Weber, and then continues along the Weber. The formations of the region are in three broad folds, having their rise at the base of the Wahsatch Mountains, and are parallel with a course of N. 26° E. The middle fold contains most of the coal. Coalville is in this basin. Clarence King in his report (*Geological Exploration of the 40th Parallel*) says: "Our knowledge of the formation is now so well advanced that it can be said with perfect safety that the series contains a practically inexhaustible supply of coal. Beds from 7 to 25 feet in thickness are discovered at intervals over 500 miles, and from their ordinarily gentle dips may be mined with unusual ease. The principal mines are at Coalville. Chalk Creek, which enters the Weber River

at this place, exposes the coal for 18 miles, and along its tributaries are the coal-mines. The bed has an average width of 11 to 14 feet at the Sprague mine. The coal itself is of a black, brilliant surface, with the same tendency to rectangular cleavage which is characteristic of all the Western lignites." (See Table XXVII. for analyses.)

NEVADA.—Near Pancake Mountain, 20 miles east of Eureka, in Nevada, a bed of coal from 5 to 6 feet thick has been opened. It runs north and south, and dips 40° west. The coal is much broken and displaced, and in some places seems to have been burned to ashes. It has been found to coke well and to make gas, but is used chiefly for local consumption.

CALIFORNIA.—The Mount Diablo coal-field is the only one in California that can be profitably mined. The measures are considerably disturbed, the dips varying from 12° to 33°. The coal-beds of this field are subject to great variation in thickness, the Clarke bed ranging from 20 inches to 4½ feet; the Little bed, 1 foot thick; the Black Diamond, from 6 to 20 feet thick. These beds lie parallel, with their measures dipping to the north. The coal is of rather inferior quality, lying close to the surface and requiring considerable timbering in mining—notably so in the Black Diamond bed. Fire-damp is met with in all the mines. In the preparation of the coal no machinery is needed for fracturing it, the coal being brittle in its nature and needing but slight force to reduce it to the sizes required. The yield is about 25 per cent. of the amount in the ground. Coal has also been found at Coral Hollow. The northern portion of Los Angeles county, 13 miles east of Anaheim, furnishes ten or twelve impure seams. In the western part of Fresno county the coal-measures dip from 80° to 85°. Beds of good coal 14 to 15 feet thick, overlaid by shales, have been found in Mendocino county. The rocks here are greatly disturbed, the locality being in the heart of the Coast Range, where mining would be very expensive. Shasta county has a coal-bearing strata, while in Amador county there are coals from 6 to 15 feet in thickness, all lignitic in their nature. In Placer and Solano counties the coals are small, poor, and irregular.

OREGON.—The Coos Bay coal-field in Oregon, lying 100 miles north of California and 40 miles north of Cape Blanco, consists of several hundred square miles of territory, extending from the mouth of the Umpqua River on the north to points beyond the Coquille River on the south, and stretching back from the coast 15 or 20 miles inland. The surface is generally hilly, divided by narrow and crooked inlets, each of which has a bar in front of it, with channels constantly varying. The depth of water in these channels varies from 9 to 14 feet according to the seasons, making it very difficult for large vessels to enter. The sea is very rough in winter, and ships experience hard work in entering and leaving Coos Bay. The profitable coal-mines are all in township 26 south, range 13 west. The Eastport mine works a bed 4 to 5 feet thick, running north and south, with an average dip of 8° west. The bed is divided by 6 inches of clay slate. The coal from the gentle pitch of 8° flattens out as the bottom of the mine is approached.

The Newport mine is in the same region, working the same bed as the Eastport. There are few faults or disturbances in the present mines.

WASHINGTON TERRITORY.—The Bellingham Bay coal-bed in Washington Territory is 14 feet thick, with a dip N. 57° W. The coals are interstratified with slate and "bone" or slaty coal. Only half of the bed is mined, the lower half being dirty and of no value.

The coal-bed upon which the Renton mine is located lies in sections 17, 20, and 29, township 23 north, range 5 east, Willamette meridian. There are two beds now being worked: the upper one is 17 feet thick, interstratified with "bone," and yielding 10 feet of good coal. The lower one is 13 feet thick, yielding 8 feet of good coal. The measures strike south 10° west, and dip 15° east. These two beds are separated by 80

feet of sandstone. The coal is hauled two miles by rail to Black River, thence on barges or by rail to Seattle.

The Seattle mine is 10 miles south-east of Seattle. The land in this neighborhood was first explored in 1868, and the first coal mined in 1871. The coal-field is on the east shore of Lake Washington, and contains six distinct beds—the upper one 5 feet thick, in soft sandstone; the lower bed, 8 feet thick, of good coal. The middle beds are poor.

All the coal shipped from these mines goes to San Francisco. There were sent in 1881—from the Renton mine, 12,708 tons; from Seattle, 134,710 tons; total, 147,418 tons. It is estimated that the amount used locally and supplied to steamships in the bay brought up the total output to 160,000 tons.

The Bellingham Bay coal has an extensive reputation as the best on the Pacific coast, and its use is growing very rapidly, the exports from Seattle having grown from 4918 tons in 1871 to 147,418 in 1881; the total shipments for the eleven years included being 876,558 tons. The field is being rapidly developed by railroads, and new mines are being opened.

TABLE XXXI.—Analyses of Coals of the Pacific Coast.

	Moist- ure.	Fixed car- bon.	Vol. mat- ter.	Ash.	Sul- phur.
Mt. Diablo, Cal.....	14.69	46.84	33.89	4.58	
Coos Bay, Oregon.....	20.09	41.98	32.59	5.34	
Bellingham Bay, Wash. Ter.....	8.39	45.59	33.26	12.66	
Seattle, Wash. Ter.....	11.66	45.98	35.49	6.44	0.43
Nanaimo, Vancouver's Island...	2.98	46.31	32.16	18.55	
Cook's Inlet, Alaska.....	1.25	49.89	39.87	7.82	1.20

TABLE XXXII.—Production of Bituminous Coal and Lignite West of the 100th Meridian.

Name of State.	Number of counties.	Number of establish- ments.	Total product census years, tons (2000 lbs.).	Value of total prod- uct.	Value of materials used census year.	Wages paid to all classes.	Total employes.	Number of steam-en- gines.	Horse-power of en- gines.	Value of plant.	Value of real estate.	Total capital employed and invested.	Acres of coal land.
Total.....	20	46	1,477,736	\$3,272,470	\$189,431	\$1,828,401	3,441	42	1,447	\$1,251,342	\$6,858,300	\$8,479,573	33,001
California	3	6	236,950	663,013	44,013	321,950	751	8	295	535,500	596,000	1,239,431	2,960
Colorado.....	8	25	462,747	1,041,350	114,576	714,714	1,434	20	749	328,600	5,448,100	5,939,250	23,592
Montana Territory.....	1	1	224	800	...	400	3	...	...	5,100	7,200	12,550	
Oregon.....	1	3	43,205	97,810	8,567	68,017	76	1	60	115,023	105,000	226,523	2,649
Washington Territory..	3	5	145,015	389,046	21,203	143,754	168	4	115	87,721	232,000	335,421	2,600
Wyoming Territory.....	4	6	589,595	1,080,451	1,072	579,566	1,009	9	228	179,398	470,000	726,398	1,200

UNITED STATES GOVERNMENT COAL-LANDS.—The officials of the General Land Office at Washington made a compilation from their surveys, from which they estimated that the total number of acres of coal-lands now owned by the United States (in 1881) was as follows:

	Acres.	Acres.
Washington Territory:		
Area.....	829,440	
Sold.....	3,350—	826,090
Oregon:		
Area.....	414,720	
Sold.....	185—	414,535
California:		
Area.....	247,820	
Sold.....	1,800—	246,020
Colorado:		
Area.....	1,128,225	
Sold.....	600—	1,127,625
Utah:		
Area.....	2,764,800	
Sold.....	2,180—	2,762,620
New Mexico:		
Area.....	10,800	
Sold.....	720—	10,080
Wyoming: at least.....		42,000
Dakota: at least.....		50,000
Montana: at least.....		50,000
Arizona: no coal yet discovered.		
Nevada: no coal yet discovered.		
Nebraska: the coal-bearing rocks cover an area of 3600 square miles, but on account of the smallness of the beds—none exceeding 1 foot—the coal is of no commercial value.		
Indian Territory: the coal-bearing rocks cover an area of 13,600 square miles.		
Arkansas: the coal-bearing rocks cover an area of 12,000 square miles.		
		5,528,970

The laws regulating the sale of lands of the United States containing coal provide “that any person above the age of twenty-one years, who is a citizen of the United States, or who has declared his intention to become such, or any association of persons severally qualified as above, shall, upon application to the register of the proper land-office, have the right to enter, by legal subdivision, any quantity of vacant coal-lands of the United States, not otherwise appropriated or reserved by competent authority, not exceeding 160 acres to

such individual person, or 320 acres to such association, upon payment to the receiver of not less than ten dollars per acre for such lands where the same shall be situated more than fifteen miles from any completed railroad, and not less than twenty dollars per acre for such lands as shall be within fifteen miles of such road.”

Any person in actual possession of land, and who has opened mines, shall have preference of right of entry. Any association of more than four persons who have expended \$5000 on coal-workings can enter not exceeding 640 acres. The act allows only one entry by the same person or association of persons. Payment for lands must be made within one year after the filing of the entry.

ALASKA.—Good bituminous coal has been found at Port Gardner, Hood Bay, Admiralty Island, in Alaska, and also at Hamilton Harbor, on the east side of Kake Strait. A 6-inch seam is reported as found in hard rock, with a southerly dip of 35°, at Kuin Island, Kuprianoff Island, and Port Camden. At Cape Beaufort, on the Arctic coast, a small seam of true Carboniferous coal is found.

Most of the coal in Alaska is Tertiary, and inferior to the Carboniferous coals. The deposit at Cook's Inlet is the most promising. North of Cape Starichkoff the coal is found in two parallel layers, variously reported from 18 inches to 7 feet in thickness, and from 36 to 60 feet below the top of the bank. To the north a third layer appears.

The U. S. revenue cutter Corwin in 1882 found beds of coal on the coast of Alaska, within the Arctic Circle. Numerous beds were exposed on the face of a bluff about 150 feet high. They pitched at an angle of 45°, and varied in width from 3 to 20 feet. They could be traced for miles on the “tundra,” or grassy plain, which ended in the bluff. The coal is described as a semi-anthracite, which burned well and made little smoke, but left a large percentage of ash. It is probably a good variety of lignite.

CANNEL COAL.

Near Greensburg, in Beaver co., *Pennsylvania*, is a bed of cannel coal about 8 feet thick, resting on about 3 feet of ordinary bituminous coal. This cannel is light,

compact, ignites with great facility, and burns with a strong bright flame.

The famous Stockton bed at Cannelton, Fayette co., West Virginia, contains 3½ feet of excellent cannel coal and 22 inches of splint coal.

Cannel coal is also found in Kentucky, Ohio, Illinois, Missouri, Indiana, and, we believe, in Tennessee. It is not commended for any purpose of iron making and manufacture, but is suitable for steam-engines.

Kentucky.—At Hawesville, on the left bank of the Ohio, 120 miles below Louisville, is a coal-bed 4 feet thick. The upper eighteen inches of this bed consist of cannel coal; the remainder is common bituminous coal. Its analysis, by Dr. Jackson, shows—carbon, 48·40; bitumen, 48·80; ashes, 2·80. The price of this coal at New Orleans is from sixty-two and a half cents to one dollar per barrel of two and a half bushels. It is in request there for the use of the towboat companies. Hawesville is about 258 miles above the mouth of the Ohio. The coal-seam is nearly horizontal, appearing on both sides of the river, in a position remarkably favorable for loading into vessels lying in the Ohio. It is a compact, largely conchoidal coal, producing a bright flame—does not cement or adhere together in burning, but, on the contrary, falls into a profuse white ash, much larger in amount, practically, than the analysis indicates. It is specifically lighter than common bituminous coal, yet heavier than the cannel coal of Lancashire and Yorkshire, as is shown by the following statement:

Kentucky or Hawesvillecannel, specific gravity..	1·250
Jackson county cannel coal, Ohio.....	1·410
Lancashire cannel.....	1·199
Ingleton cannel, Yorkshire...	1·195

Indiana.—The Cannelton coal of Indiana is found in that part of the coal-field which is intersected by the Ohio River, about 120 miles below Louisville by water, but scarcely more than half that distance in a straight line. The seam varies from 3 to 4 feet in thickness, and occasionally expands to nearly 5 feet. It is mined at an elevation of 70 feet above the Ohio River. The coal can be furnished at a low price. It burns freely, yields a pleasant flame, and affords a light sufficiently strong to read by. Prof. Johnson observes that the fracture is often conchoidal, and the lustre dull, like that of Scotch cannel coal. The mean result of two specimens gave

Fixed carbon.....	59·40
Moisture and other volatile matter.....	34·90
Earthy matter.....	5·70
	100·00

Iowa.—A bed of pure cannel coal 5 feet thick has been discovered in Red Rock township, in Warrior co., Iowa, 30 miles from Des Moines. Samples tried by a gas company are pronounced equal to West Virginia cannel.

Missouri.—A very fair cannel coal is found at several points in Callaway co., Mo., north of the Missouri River and on each side of it, 120 miles above St. Louis. Extraordinary statements have been made of the immense thickness of the Calloway county bed of cannel coal. At one point it is said to be 24 feet, and at another 46 feet, in thickness. In Cole county, a few miles from Côte-sans-Dessein, it is affirmed that a shaft has been sunk 32 feet into the coal without getting through the stratum; probably an oblique section of the seam. It is well adapted for steam, gas, and iron manufacture.

Texas.—At a point on the Rio Grande River 27 miles above Laredo, in Texas, a bed of cannel coal has been developed by a tunnel or drift, and is used to supply the Rio Grande and Pecos Railroad. At the outcrop the bed is 3 feet thick, but at 650 feet from the surface it has a thickness of 4 feet. It is said to be a pure cannel, and very hard. The strike of the bed is north-west and south-east, and its dip 6 inches per 100 feet. There is said to be a great deal of coal in the vicinity of Laredo, though much of it has been consumed in the ground by spontaneous combustion. The country has not been explored sufficiently to procure specific data.

GAS COAL.

The varieties of coal best suited for the manufacture of gas are the bituminous coals, especially the caking and cannel varieties. Some asphaltic materials, like albertite, can be used as enriching materials, but never alone. They produce large quantities of gas, but their cost limits the quantity used. Cannel coal yields the richest gas, and is much used in England, but caking coal is the material in most general use. The advantage of this variety is in its abundance and consequent cheapness, and in the fact of its furnishing coke of value. Gas from caking coal is inferior in illuminating power. The percentage of sulphur in gas coal is a matter of considerable importance. Half of the sulphur remains in the coke, while the other half goes into the gas, and must be removed by purification, thus increasing the cost of the process. Nova Scotia coals contain 3 to 5 per cent. of sulphur; Red Bank, Pa., 0·89; Westmoreland, Pa., 1·50; Murphy's Run, W. Va., 1·88 to 3·06; Orrell, Eng., 1·75 to 2·34. The last column in the accompanying table shows the number of feet of gas purified by one bushel of lime, which is a tolerable indication of the amount of sulphur that goes into the gas:

TABLE XXXIII.—Analyses of Gas Coals.

	Volatile matter.	Fixed carbon.	Ash.	Gas per ton of 2240 lbs., in cu. ft.	Candle- power of gas.	Coke per ton of 2240 lbs.		Gas. in cu. ft. purified by 1 bu. lime.
<i>Caking Coals:</i>								
New Castle, England.....	32·70	65·55	1·75	10,057	10·11	1536	49	3500
Glance Bay, Cape Breton.....	...	...	...	9,560	12·50	1484	38	1945
Lingan, " ".....	35·20	60·80	4·00	9,520	12·92	1450	42	2200
Block House, " ".....	40·80	57·70	1·50	10,217	17·32	1460	40	2304
Pittsburg, Pa.....	36·76	51·93	7·07					
Westmoreland, Pa.....	36·00	58·00	6·00	10,642	16·62	1544	40	6429
Sterling, Ohio.....	37·50	56·90	5·60	10,528	18·81	1480	36	3993
Despard, West Va.....	40·00	53·30	6·70	10,765	20·41	1540	36	2494
<i>Cannel Coals:</i>								
Kirklees Hall, England.....	40·30	56·40	3·30	10,012	21·47	1410	36	2000
Darlington, Pa.....	43·00	40·00	17·00	9,800	34·98	1320	32	2806
Peytona, West Va.....	46·00	41·00	13·00	13,200	42·79	1380	32	4510
<i>Enriching materials:</i>								
Boghead mineral, Scotland.....	51·60	15·70	32·70	13,619	26·45	1378	35	3400
Grahamite, West Va.....	53·50	44·50	2·00	15,000	28·70	1056	44	
Albertite, New Brunswick.....	57·70	41·90	0·40	14,784	49·55	806	16·8	
Wollongongite, Australia.....	82·50	6·50	11·00	13,716	131·00	424	...	5686

NOVA SCOTIA.—The Cumberland coal-field is the largest Carboniferous tract in Nova Scotia. It extends along the whole line of coast, and as far inland as the base of the range of mountains stretching along the northern coast of the Bay of Fundy. It displays one of the finest natural sections of coal-forma-

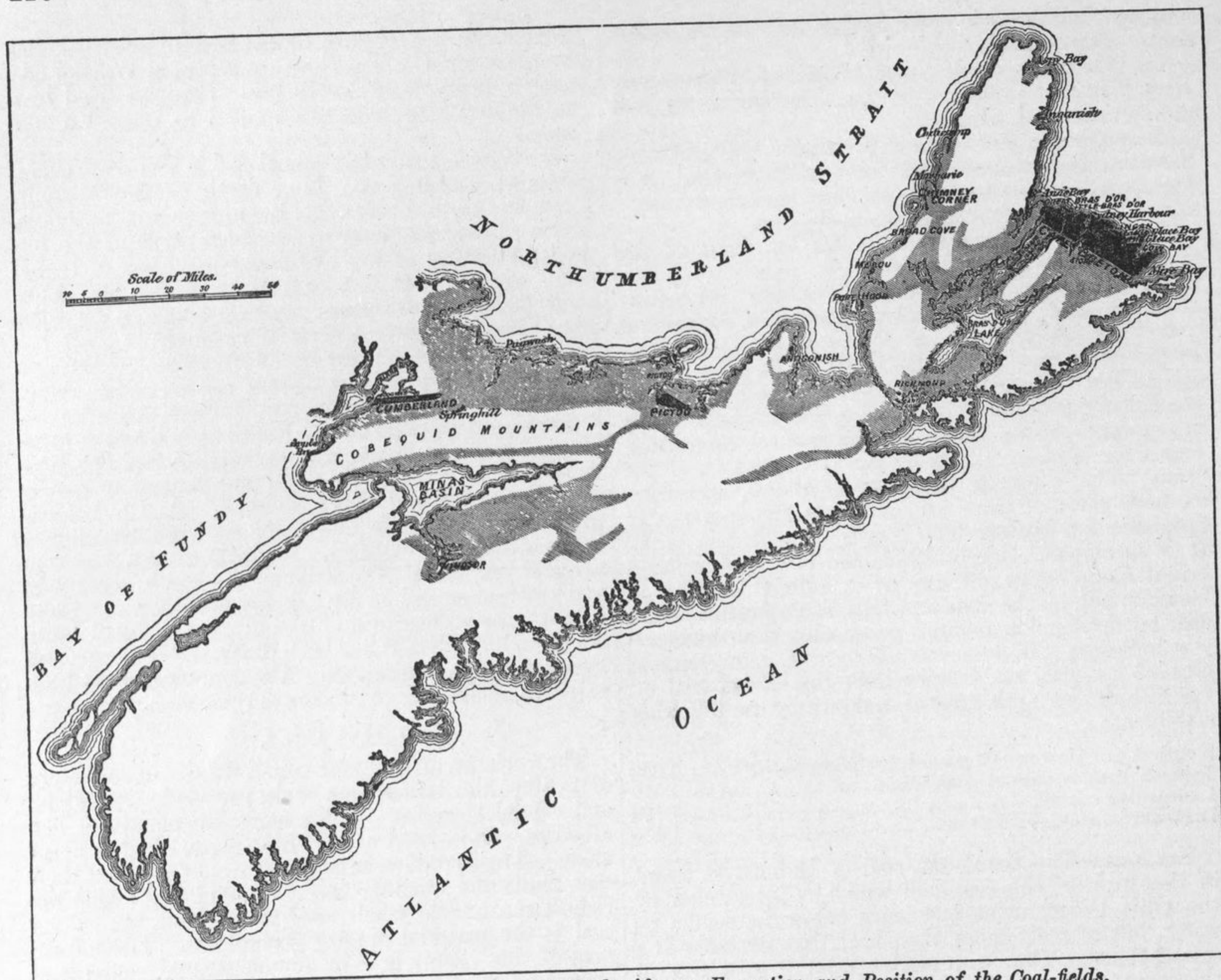


FIG. 35.—Map of Nova Scotia, showing the Carboniferous Formation and Position of the Coal-fields.
[From Report of John Rutherford, M. E., Inspector of Mines in 1871.]

tion to be found in the world, considered merely as a section for illustration. The whole series has a thickness of 14,570 feet, with seventy-six seams of coal, thirty of which are 1 inch or less in thickness, and few of them more than 1 foot. The beds rise at an angle of 19° . The principal coal in this field is the Joggins main seam, consisting of two beds, $3\frac{1}{2}$ and $1\frac{1}{2}$ feet thick. At Spring Hill there are six or seven workable seams, with a total thickness of 42 feet of coal. The economic importance of this field is not great.

Section from Cranberry Head to Stubbard's Point.

	Ft.	In.	Ft.	In.
Sandstone and shale.....	16	6		
Coal.....			0	1
Under-clay and shales.....	5	0		
Coal, Cranberry Head, top seam.....			3	8
Measures.....	15	$8\frac{1}{2}$		
Coal, Cranberry Head, bottom seam.....			1	0
Measures.....	245	8		
Coal and shale.....			1	1
Measures.....	17	3		
Coal, Lloyd's Cove.....			5	0
Measures.....	250	3		
Coal and shale.....			1	4
Measures.....	106	11		
Coal and shale.....			2	1
Measures.....	2	5		
Coal.....			0	4
Measures.....	21	3		
Coal.....			0	3
Measures.....	163	8		
Coal.....			0	4
Measures.....	178	$9\frac{1}{2}$		
Coal, main seam.....			6	0
Measures.....	43	1		
Coal.....			0	9
Measures.....	12	1		
Coal.....			0	4
Carried forward.....	1078	7	22	3

Brought forward.....	1078	7	22	3
Measures.....	130	11		
Coal and shale.....			0	11
Measures.....	76	9		
Coal.....			0	4
Measures.....	46	0		
Coal and shale.....			0	8
Measures.....	26	10		
Coal.....			1	3
Measures.....	120	4		
Coal, Indian Cove Seam.....			4	8
Measures.....	61	9		
Coal.....			0	11
Measures.....	21	11		
Coal.....			1	4
Measures.....	20	10		
Coal.....			0	7
Under-clay.....	8	11		
Coal.....			0	2
Under-clay and shale.....	12	6		
Coal.....			0	2
Measures.....	74	9		
Coal and shale.....			0	10
Under-clay.....	1	0		
Coal.....			0	$0\frac{1}{2}$
Under-clay and soft blue clay.....	0	10		
Coal and shale (Stony seam).....			3	2
Clay and shales.....	1	11		
Coal and shales.....			1	0
Sandstone and shale.....	65	2		
Coal.....			1	0
Under-clay and shale.....	2	9		
Coal.....			0	1
Sandstone.....	69	7		
	1821	4	39	$4\frac{1}{2}$

The coal-field of *Colchester* and *Hants* is separated from the former-described field by the Cobequid chain of hills. The coal-seams appear to be all under 18 inches in thickness.

The coal-field of *Pictou* contains two thick beds of

coal, the upper 37 feet (largely worked at the Albion mines), accompanied by three other workable beds, having an aggregate thickness of nearly as much more, separated by 157 feet of strata. The last three beds are divided by partings of inferior coal and ironstone. The beds incline at an angle of 20°; only 12 feet of the upper part of the seam are now worked. The coal is high in ash. (See fig. 36.)

Pictou Field: Dip, 20° N. E.—Success Engine Pit.

		Ft.	In.	Ft.	In.
Measures.....		73	0		
Coarse coal.....				0	2
Good ".....				5	0
Ironstone.....		0	6		
Good coal.....				14	4
Ironstone.....		0	4		
Coarse coal.....				7	7
Ironstone.....		0	4		
Coarse coal.....				3	1
Ironstone.....		0	4		
Coarse coal.....				2	11
Ironstone.....		0	5		
Coarse coal.....				4	11
Ironstone and shales.....		157	7		
Bad coal.....				0	2
Good ".....				3	10
Ironstone.....		1	2½		
Coal.....				3	7½
Slaty coal.....				0	9½
Good ".....				4	2
Coarse ".....				1	0½
Good ".....				3	8
Inferior coal.....				6	3
		233	8½	61	6½

Forster Pit.

		Ft.	In.	Ft.	In.
Measures.....		450	0		
Coarse coal.....				4	0
Black shale.....		1	0		
Good coal.....				10	0
Fire-clay.....		3	0		
Good coal.....				23	0
		454	0	37	0

Richmond and Cape Breton Coal-field.—According to M. R. Brown, the productive measures here cover an area of 250 square miles, with a thickness of 10,000 feet of strata. North-west of Sydney Harbor there are four beds, containing 20 feet of coal in a thickness of 1500 feet. The respective thicknesses are 3 feet 8 inches, 5 feet, 6 feet 9 inches, and 4 feet 8 inches. There are good coal-seams at Lingan and Bridgeport; one contains 9 feet of coal—a fine coke and good gas coal. Prof. Lesley's description of the fields of Nova Scotia says the coal-beds on Great and Little Glace, Cow, and Miré Bays are of handsome size and highest quality. The beds north of Sydney Harbor are more limited in area, thinner and poorer in quality, and are reached at great depths.

No. 3 Pit, Glace Bay Colliery.

		Ft.	In.	Ft.	In.
Measures.....		61	0		
Coal.....				1	0
Measures.....		56	3		
Coal, coarse.....	Stub seam.....			2	0
Coal, good.....				8	6
		117	3	11	6

Engine Pit, Caledonia Colliery.

		Ft.	In.	Ft.	In.
Measures.....		36	9		
Coal.....				1	2
Measures.....		19	7		
Coal, Black Pit seam.....				4	9
Measures.....		65	7		
Coal.....				4	8
Measures.....		28	7		
Coal.....				0	2½
Black shale.....		0	10		
Coal.....				0	1½
Black shale.....		0	9		
Coal.....				0	1
Measures.....		13	10		
Coal, Phelan seam.....				8	3
Dark-gray sandstone.....		4	1		
		170	0	19	3

GLACE BAY DISTRICT, NOVA SCOTIA.

Section No. 4, Cow Bay District, Cape Breton, showing probable position and connection of seams.

Section No. 1, Pictou District.

Section No. 2, Pictou District.

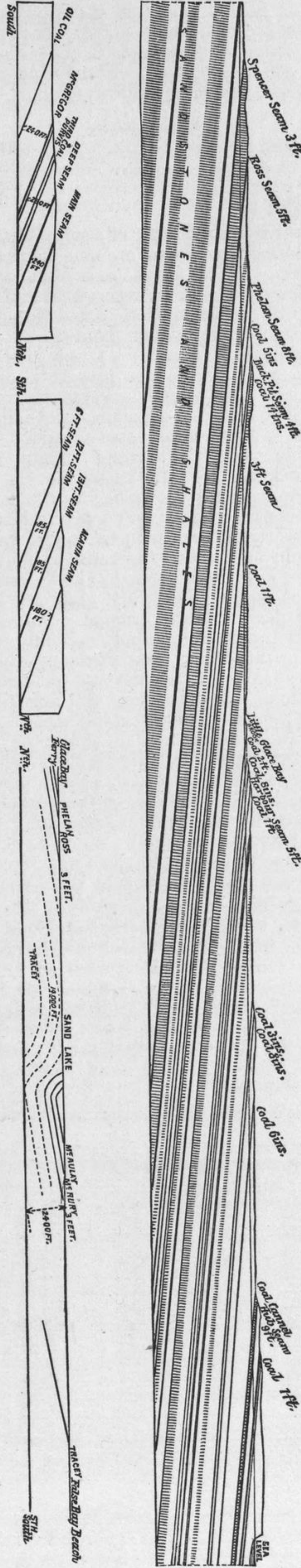


FIG. 36.—Glace Bay District, Nova Scotia.

The Pictou field is small and yields poor fuel. The mines exhibit great thickness, but this seems to be local. The entire contents of the beds in the largest basin is only about 300,000,000 tons. The Pictou coal is full of ash, and the North Sydney of sulphur.

Average Analysis.

Volatile matter.....	33.481
Fixed carbon.....	61.873
Ash.....	4.223
Sulphur.....	2.39

The coals of Nova Scotia are of a soft bituminous Carboniferous formation. There are nine districts, but the Pictou and Cape Breton are the most important. A letter from Henry S. Poole, an experienced civil and mining engineer, of Stellarton, N. S., dated March 23, 1882, gives very precise information about the extent of the Nova Scotia fields. He says: "I now give you every square mile, according to our present knowledge, in which any seam approaching workable thickness within a depth of 4000 feet, and a distance of 4 miles from a mining point or shore, is supposed to exist.

"Beginning with Cumberland county, seams of workable thickness are only known on the northern and eastern outcrops of the basin; to the south their probable representatives are only a few inches in thickness. The workable seams dip at angles from 19° to 45°, and would even reach the assumed limit of 4000 feet. Leases have been given by the Government to cover only 66 square miles, and they are known to cover a good deal of barren ground. The control of forty selected square miles would certainly cut off all competition in this county. In Pictou county Government leases cover 29 square miles, and no seam of value lies outside them. In other parts and isolated spots in Nova Scotia proper—as, for example, near Antigonish—the explorations made have only shown the seams exposed to be thin, stony, or highly faulted and inclined, and therefore, so far as at present known, unworkable. When we move to Cape Breton all the workable seams are found near the coast, dipping seaward. Those in Inverness and Richmond counties would be included in 22 square miles. In Victoria and Cape Breton counties, which is the principal coal-field, the extreme limits would be included in a block of uniform size 35 miles long by 8 wide, which would cover not only the known coal under the land, but also the available area under water; and to mine coal under such an area would necessitate operations conducted under the foreshore being made with extreme caution, to secure approaches to the more distant submarine field. From these figures you will see that after selecting 400 square miles, I don't know where to find in Nova Scotia one square mile of workable coal."

TABLE XXXIV.—Nova Scotia Coal Exported to the United States.

Years.	Tons.	Duty.	Years.	Tons.	Duty.
1850	98,173	24 ad.	1866	404,252	\$1.25
1851	116,274	"	1867	338,492	"
1852	87,542	"	1868	228,132	"
1853	120,764	"	1869	257,485	"
1854	139,125	Free.	1870	168,180	"
1855	103,222	"	1871	165,431	"
1856	126,152	"	1872	154,092	.75
1857	123,335	"	1873	264,760	"
1858	186,743	"	1874	138,335	"
1859	122,720	"	1875	89,746	"
1860	149,289	"	1876	71,634	"
1861	204,457	"	1877	118,216	"
1862	192,612	"	1878	88,495	"
1863	282,775	"	1879	51,641	"
1864	347,594	"	1880	123,423	"
1865	465,194	"			

NOTE.—The quantities given for the years 1850 to 1872 are on the authority of the Board of Trade of Philadelphia, and are probably under-estimated.

There has been a great increase recently in the output of Nova Scotia coal. In 1879 the yield was 688,624 tons. In that year a duty of 50 cents a ton on importations of anthracite and 60 cents a ton on bituminous coal

was imposed, and the quantity mined was increased to 954,659 tons in 1880, and to 1,035,014 tons in 1881, while the demand is still greater than the supply.

The total amount of coal exported from Canada during the fiscal year 1880–81 was 420,055 tons, and the total amount imported 1,159,115 tons, of which 572,092 tons was anthracite and 587,023 tons bituminous.

TABLE XXXV.—Coal Product of Nova Scotia during the Year ending Dec. 31, 1880 [from Department Report].

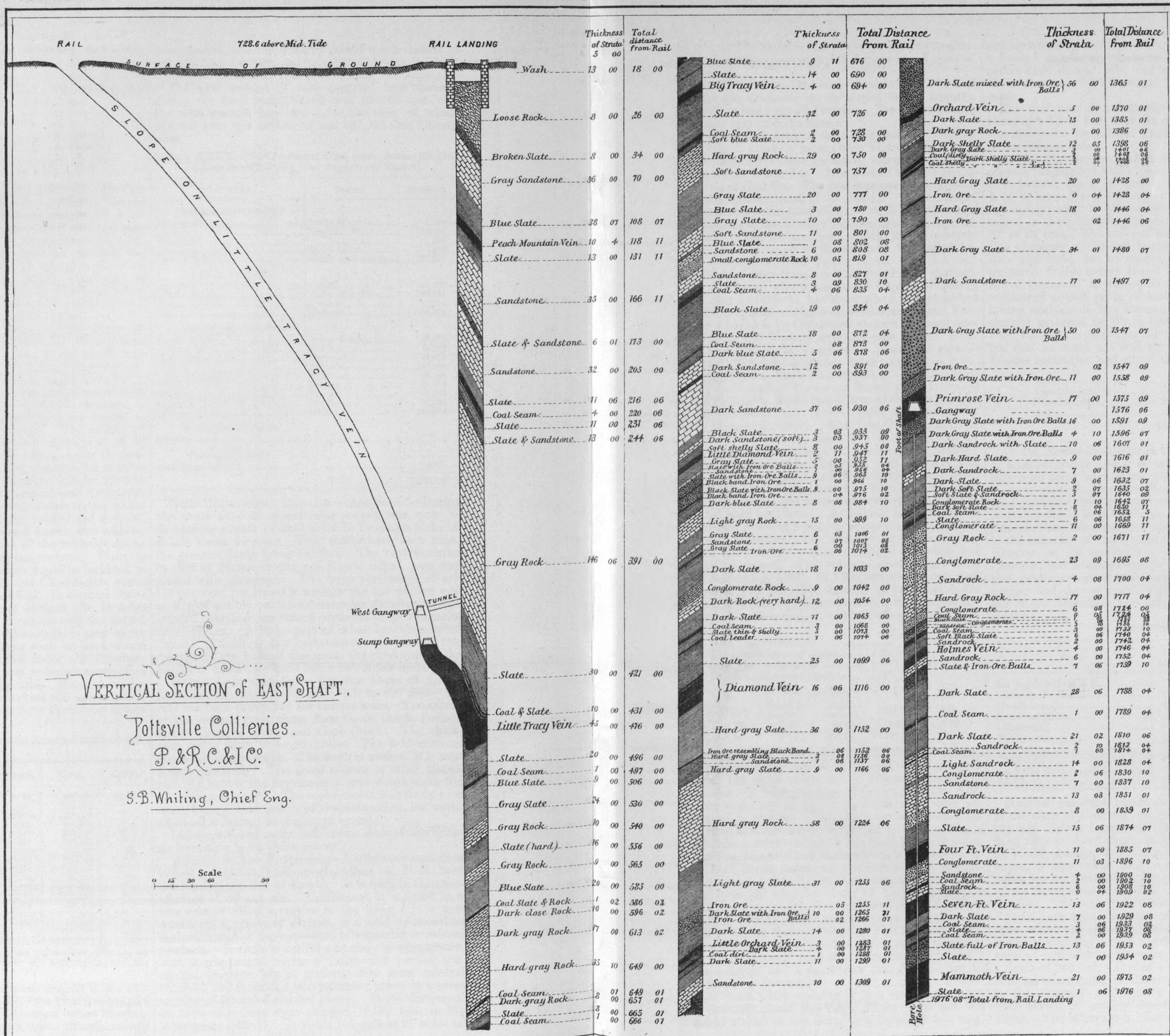
Collieries.	Seams.	Product.
CUMBERLAND COUNTY.		
Chignecto.....	North Seam.....	1,093
Joggins.....	Joggins' Main.....	13,350
Minudie.....	.....	303
Scotia.....	North Seam.....	432
Spring Hill.....	Black and South...	127,907
PICTOU COUNTY.		
Acadia.....	Acadia.....	94,907
Albion Mines.....	Main and Deep.....	199,611
Intercolonial.....	Acadia.....	81,254
Vale.....	McBean.....	86,522
CAPE BRETON COUNTY.		
Block House.....	Block House.....	48,475
Caledonia.....	Phelan.....	18,589
Glace Bay.....	Harbour.....	24,371
Gowrie.....	McAulay.....	46,990
International.....	Harbour.....	63,131
Lingan.....	Lingan.....	31,758
Ontario.....	Phelan.....	8,695
Reserve.....	Phelan.....	37,621
Sydney Mines.....	Main.....	143,254
INVERNESS COUNTY.		
Broad Cove.....	.....	5
VICTORIA COUNTY.		
New Campbellton.....	.....	4,925
Total.....		1,033,193

NEW BRUNSWICK, CANADA.—Anthracite.—During the years 1874–78 considerable money was spent in developing a seam of anthracite in Devonian rocks of Belais Basin, Lepreau. Four shafts have been sunk, the greatest depth being 140 feet. The coal is similar to that of Massachusetts and Rhode Island, poor and glazed with plumbago. The large percentage of ash (36 per cent.) is strongly against the use of this coal as a combustible, while its irregular distribution and impure character are strong obstacles to its successful development. A large part of what has been called "coal" is nothing but carbonaceous shale, and this constitutes the bulk of the seam, the thickness of the harder or anthracite band being only a few inches.

Grand Lake Coal-field.—On the shore of Grand Lake borings have been made 170 to 400 feet. No coal has been shown but the surface seam. The extent of the seam is great along New Castle Creek, Salmon River, Salmon Creek, and Coal Creek. The thickness varies from 10 to 20 inches. The field contains about 100 square miles. The seam is worked, it is supposed, profitably. The seam is seen in other places, and if it covers the intermediate area would make the extent much larger. The coal-formation extends over much more ground (nearly 6000 square miles), but workable coal is limited to the above extent.

Lignite is found in the soft brown shale of the Triassic formation in St. John county.

Albertite in New Brunswick.—A substance analogous to coal is found at Hillsborough, Albert co., N. B., near the head of the Bay of Fundy. It is used in the manufacture of oil and gas. Unlike coal, it is found in a true vein or filling a crevice in the rocks. It is now considered a variety of asphalt, or a solid hydrocarbon derived from the decomposition of vegetable or animal products. It has a beautiful and singular appearance, with a resplendent resinous lustre and perfect conchoidal fracture. It is perfectly free from mineral charcoal, and is divided into prismatic pieces by a great number of smooth divisional planes. It was discovered in 1849, and there were shipped 19,267 tons in the three years 1869–71. It yields 100 gallons of crude oil



per ton, or 14,500 cubic feet of gas of superior quality. A late consular report says this deposit shows signs of exhaustion.

PRINCE EDWARD ISLAND.—There is no known coal of workable thickness yet developed in this country. The surface rocks are all Permian. The Carboniferous formation may underlie them.

VANCOUVER'S ISLAND.—At Nanaimo, in Vancouver's Island, about 70 miles above Victoria, there is a coal-deposit of the same geological age as that at Bellingham Bay, Wash. Ter. It is worked by the Vancouver's Island Coal Co. The coal-measures extend over the whole eastern coast of the island. On the island and on the opposite coast of America there are extensive deposits of the Tertiary and Cretaceous ages, bearing beds of lignite and coal, which are extensively worked for the supply of the steamers navigating between Victoria and the Fraser River. Of this coal that obtained from Nanaimo is admitted to be the best.

Dr. J. Hector, who accompanied Capt. J. Palliser's expedition in 1857-60, has determined the geological age of the lignites of North-western America and Vancouver's Island to be Cretaceous, though others of inferior quality and Tertiary age also exist. Prof. Newberry's analysis of the Vancouver's Island coal gives—carbon, 51.81; volatile matter, 44.30; and ashes, 3.89.

QUEEN CHARLOTTE'S ISLANDS COAL.—Mr. Richardson, of the Canadian Geological Survey in 1872, reports on the Skidegate Inlet a bed of true anthracite in rocks of the Cretaceous age; which report was affirmed by Prof. Dawson in 1878. The Cowgitz coal-mine is opened on the outcrop, about one mile from Anchor Cove. The Queen Charlotte Coal-mining Company (limited) was formed in Victoria in 1865. A large sum of money was expended, and the enterprise abandoned in 1872 after building a tramway, wharf, etc. The coal, when first struck by a tunnel, showed from 2 to 3 feet thick of good anthracite. At a short distance farther it increased to about 6 feet, in which were two beds of pure coal, averaging 3 feet, and 1 foot 3 inches of shaly midrib. Where the work was stopped the seam had gradually narrowed. This outcrop, called King's Vein, was discovered in 1867. In 1869, 800 tons of coal were shipped to Victoria. The quantity of inflammable gas exuding from shales is so great as to necessitate safety-lamps. The following is a cross-section of the coal-beds:

Coal, good anthracite.....	6 inches.
Black argillaceous shale.....	4 feet 6 "
Coal, good anthracite.....	2 " 5 "
Black argillaceous shales.....	11 " 0 "

Analysis.

	Water.	Volatile matter.	Fixed carbon.	Sulphur.	Ash.
I.....	1.60	5.02	83.09	1.53	8.76
II.....	1.89	4.77	85.76	0.89	6.69

MEXICO.—The anthracite coal-deposits of Mexico are situated in the district of Hermosillo and state of Sonora, 120 miles south-east of Hermosillo and 130 miles easterly from the city of Guaymas. The coal-bearing rocks are of the Triassic formation, and are embraced in a series of rugged mountains which extend from San Antonio de la Chueba to Onaras, and in width from a north-and-south line through the junction of the San Migeleta and Tecorepa roads to and east of the Yaqui River, embracing the towns of La Barranca, Los Bronces, San Xavier, Loda Campa, etc. These rocks form an irregular chain of high and rugged mountains greatly disturbed and broken, then eroded into deep ravines. The rocks have an irregular easterly dip varying from 25° to 50°. The coal-beds have been opened at three localities—one 3 miles northerly from La Barranca; another at Los Bronces, about 7 miles easterly; and a third near San Antonio, north-east from La Barranca.

The Santa Clara opening is in a small ravine 300 feet vertically above the Yaqui River. The coal-bed is cut by a shaft 40 feet deep, by a tunnel 60 feet long,

and by a drift 80 feet above the other openings. It is a limited deposit, as efforts to trace it outside of the ravine have shown. The bed is 9 feet thick, dipping 25° to the east. It is covered by only 5 feet of loose earth.

The coal near San Antonio is opened by a shaft, showing a 4-foot bed, near the summit of the hill 800 feet above the level of the Yaqui River, and seems to be an isolated basin.

In the Los Bronces Cañon seven beds of coal are opened, ranging from 2 to 7 feet thick, as follows: No. 1, 18 inches; No. 2, 30 inches; No. 3, 36 inches; No. 4, 80 inches; No. 5, 81 inches; No. 6, 4 inches; No. 7, 9 inches; total, 31 feet 9 inches. These beds are contained in about 2500 feet of arenaceous rocks, dipping 20° to 25° east. The strike of the measures is N. 60° E. The character of the coal is generally good, free from slate and bone, but of such a very thinly-laminated, fractured, friable nature that it makes a large percentage of fine coal. It cannot be coked, and is generally considered a good grade of anthracite coal. The following analyses of Los Bronces coal were made from samples gathered by W. S. Sheaffer, E. M., of Pottsville, Pa., who reports that the beds contain good coal, but that he could not find any large quantity. It is Triassic anthracite, and not of the true coal-measures:

Moisture	8.45	8.09
Volatile matter.....	6.05	6.108
Fixed carbon.....	80.85	80.159
Ash	4.65	5.643
	100.00	100.000

In the *Santa Rosa* district there are vertical seams of semi-anthracite; 30 or 40 miles to the eastward of this point occur bituminous coals. Lignites are found in many places in Northern Mexico, the veins being of good workable thickness and excellent quality. They contain sulphur in considerable quantities. Near San Antonio there are some true brown coals. In a report to the secretary of the interior of Mexico, by Santiago Ramirez, on the coal-fields of the Matamoros, Izucar, Chranita, and Acatlan districts, in the state of Puebla, that gentleman gives some analyses of coal which are curious and do not speak well for the greater number of the deposits. The following is a summary of them:

TABLE XXXVI.

Mine.	Fixed carbon.	Volatile matter.	Ash.
La Espectativa.....	8.00	1.00	91.00
Corazon de Maria.....	43.00	16.40	40.60
Guadalupe.....	40.78	15.25	43.97
San Francisco.....	42.25	13.63	44.12
Limontla.....	81.00	2.00	17.00
Tecomatlan.....	66.00	19.00	15.00
Olomatlan.....	50.00	9.00	41.00
Chiltepin.....	62.00	31.00	7.00
La Peña de Ayuquila.....	76.00	14.00	10.00
La Llave.....	60.70	21.50	17.80

Another coal-field, hundreds of miles in extent, lies in the state of Coahuila, on the Rio Grande, extending into Nuevo Leon and Tamaulipas. It has not been fully explored as yet, and the following account, by W. H. Adams, M. E., superintendent of the Cedral mines, is the fullest that can be obtained. These mines are on the western line of the field, at the base of the Santa Rosa Mountains, 110 miles from the Rio Grande. The region is volcanic. Mr. Adams says: "From their nearness to the coal-measures, the mountains, which are protruded into the plains at this particular point, offer a great novelty in producing vertical veins of coal nearly anthracitic in character, opened to a depth of 240 feet. Coal of a more bituminous nature is found outcropping on the rivers 30, 40, and 60 miles to the eastward, and lignites in many places over a wide extent of country drained by the Rio Grande River. The inference is, that the heat which changed

the metamorphic rocks drove off the bitumen, and that the nearer one approaches the mountain-line the better is the product."

The formation is Triassic. It abounds in salt, and salt water is found above and below the coal. "Surface-openings at several points along the Salinas River, above ordinary water-level, show veins of coal of good workable thickness and of excellent quality. The amount of sulphur contained in the coal is considerable and finely disseminated, but not so great as to require a washing operation. The coal cokes easily, producing about 60 per cent. of good coke." No analyses are given. Fifty coke-ovens were built and extensive workings carried on at the Cedral mines in the spring of 1882.

A report by Prof. Heilscher, on the Piedras Negras district, says that a coal-region there forms a high, dry plain for ten miles along the Rio Grande River, extending about six miles from the river on the American side and an unknown distance on the Mexican side. A bed of coal crosses the river. Near Eagle Pass there is a gray, finely-laminated clay overlaid by 4 feet of coal of poor quality. About seven miles north of the Omos River a good seam of bituminous coal 5 feet thick crops out. It has a dip of about 15° to the south-east.

HONDURAS.—Dr. W. G. K. Fitzgaertner reports coal very abundant on the Atlantic coast, near the river Uloa. The quality is semi-bituminous, and the deposits are considered quite valuable. No statistics are given.

COAL IN SOUTH AMERICA.

UNITED STATES OF COLOMBIA.—Coal-beds have been discovered in the province of Veragua, west of the province of Panama. Brown coal exists in great abundance and in ample quantity for the supply of the country around. This same coal-formation is found on the Isthmus of Panama and the island of Muerto. Abundant evidences of the existence of coal were met with, and outcrops of small beds were discovered upon the beach, dipping due west, at the foot of a small cliff 20 feet high. In one place steamers can approach within 100 yards of the shaft. The presence of coal has been ascertained also in other parts of the province of Panama. The coal found on the island of Muerto is said to burn freely, leaving a white residuum. Capt. Peacock considers its practical value, as compared with English coal, in the proportion of 13 to 18, and says it bears a strong resemblance to the Talcahuano coal in Chili, and probably might, when mined from a greater depth than that penetrated by his trial-shaft, be sufficiently available for steam purposes. Mr. Wheelwright is of opinion that a coal-area of undetermined dimensions stretches entirely across the Isthmus of Panama.

The island of *Santa Clara* also furnishes coal of good quality.

Coal occurs abundantly on the south side of the city of *Santa Fé de Bogotá*, and even within the limits of the city itself. The fuel is reputed to burn extremely well and to give out a great heat. It evidently belongs to the Cretaceous period, and probably is of the age of the Gault of England. It compares favorably with the coals of the Upper Missouri Valley (U. S.).

Coal has been found in the province of *Choco* at an elevation of 7680 feet, which is about the same elevation as the coal of New Mexico, of Upper California, and of Eastern Oregon, in the northern continent.

BRAZIL.—The province of *Rio Grande do Sul*, at the southern extremity of the empire of Brazil, is now known to be exceedingly rich in mineral fuel. According to the observations of Mr. N. Plant, there are three distinct coal-basins contained within the limits of lat. 30° and 32° S., long. 51° and 54° W., which are separated from each other by rolling hills of granite and schist, with trachytic and basaltic rocks. The largest of these basins occupies the valleys of the Jaguarão and Candiota, and the strata, consisting of sandstone at the top and shale, coal, and limestone below, dip southward at an angle of 10° to 15°.

The following section is given by Mr. Plant, as exposed in the escarpment of the Sierra Partida in this basin:

(1.) Ferruginous sandstone.....	25 feet.
(2.) Coaly shale.....	9 "
(3.) Sandy shale.....	5 "
(4.) Coal.....	3 "
(5.) White shale, with plants.....	5 "
(6.) Coal.....	11 "
(7.) Parting of blue clay.....	2 "
(8.) Coal.....	17 "
(9.) Shale, with fossils.....	9 "
(10.) Coal.....	25 "
(11.) Shales, with ironstones and ferns, resting on sandstone.	

The second basin lies in the valley of the São Sepe. Two distinct beds of coal, one 7 feet, the other 14 feet thick, appear in this locality, underlying sandstone apparently the same as that which overlies the coal of the Candiota Valley. The third basin is near the town of São Jeronymo, on the banks of the Jacuahy, lat. 30°, long. 51° 30'. At a depth of 19 yards is a bed of bituminous coal 6 feet thick, below which are others interstratified with shales and ironstone.

Carboniferous deposits also occur in the province of Santa Catharina. About 45 miles N. W. of the seaport of Laguna the basin is intersected by the river Tubaro and its tributaries. In this basin five seams, from 18 inches to 10 feet, have been met with, underlying a sandstone formation.

URUGUAY.—The coal-bearing formations of the republic of Uruguay are similar to those above described. Along the head-waters of the Rio Negro beds of shale and coal are overlaid by a thick deposit of sandstone.

ARGENTINE REPUBLIC.—Along the Cordillera, in the Argentine Republic, bituminous shale and indications of coal are affirmed to be abundant, and it is also said that there are extensive beds of coal in the extreme south-west angle of the country. The formations here, like those of Patagonia, are of the Tertiary age.

CHILI.—An exploration of the coal-beds that exist so abundantly in Chili and the other republics of South America has been made by some of the most scientific engineers, miners, and geologists of that continent, and the account given by them is most satisfactory. The coast between Valparaiso and Talcahuano was hastily examined, and evidence obtained as to the presence of a vast, continuous stratum of coal. At Talcahuano seams of coal were visible in the broken cliffs. The coal has been simply taken from the surface, and no subterranean mining has been attempted. The work was carried farther by Capt. Peacock and Mr. Wheelwright. On examining the eastern and northern sides of the bay, extensive coal-strata appeared, and demonstrated the existence of coal-beds along that entire section of the Chilean coast. About 40 tons of coal were mined and sent to Valparaiso for trial. An experiment made on this coal during the exploring excursion of the steamer Peru showed a comparative consumption of 13 tons of English coal to 16 tons of the South American. It made no clinkers; the residuum lay lightly upon the bars, without adhering in the slightest degree. On her second voyage the Peru steamed 1500 miles with this fuel, which gave entire satisfaction in its use. About 5000 tons were mined at an expense of \$3.65 per ton. Mr. Wheelwright says he mined several thousand tons which were of excellent quality, and adds: "The whole southern coast is nothing but a mine of coal." Mr. W. R. Johnson says of it: "In external appearance it is nearly related to many of the richest bituminous coals of America and Europe;" and in his analysis he shows it to contain 67.62 per cent. of carbon. At Talcahuano a seam 4½ feet thick was proved. In the tide-way of Penco a bed is worked about 200 yards from the beach. It has been penetrated to a vertical depth of 10 feet without passing through the coal. The most important district in Chili is that lying between Concepcion and Valdivia, which contains the two largest collieries of the country—those of Coronel Puchoco and Lota, from which the best coal is derived. According to the re-

port of Mr. Bollaert, the Lota coal is largely used in steam-navigation along the Chilian coast, as also in copper-smelting, iron-foundries, and for domestic purposes. The Lota coal-field is estimated to contain 40,000,000 tons, and the Coronel double that quantity. A detailed section is given by Mr. W. Mundle of the coal-series at Coronel throughout a depth of 587 feet, which shows a series of sandstones and shales, with nine seams of coal or lignite, some of which are workable. The eighth seam from the top, nearly 5 feet in thickness, is described as a "very good, hard, and clean coal;" it is, however, inferior in quality to the true Carboniferous coals of Great Britain and America.

The following are the analyses of these coals:

	Talcahuano (Admiralty).	Lota.	Lota (first seam).
Ash.....	6.92	5.68	2.05
Carbon.....	70.71	78.30	83.70
Hydrogen.....	6.44	5.30	1.02
Oxygen.....		8.37	
Sulphur.....	15.93	1.06	13.23
Nitrogen.....		1.29	
	100.00	100.00	100.00

Mr. Bollaert states that coal similar to that of Chili has been found along the Straits of Magellan, and indications of it observed 30 miles south of Valparaiso.

PATAGONIA.—Patagonia exhibits a great southern Tertiary formation, forming extensive groups on both sides of the chain of the Andes. These appear to be the prolongation of the series which is so largely displayed in Chili. A vast belt of Tertiary deposits, which contain brown coal and lignites, occupies the larger portion of the countries bordering upon the Pacific Ocean from N. lat. 10° to at least as low down as S. lat. 50°. The supposition is, that the whole length of the Tertiary range is scarcely short of that of the entire continent, or at least 2500 miles, in the greater part of which lignites abound. Bituminous coal has recently been discovered on the east shore of Skyring Water, South Patagonia. A consular report says that it is of fair merchantable quality, much superior to that which is taken out at Sandy Point in the Straits of Magellan. The specimens, however, are only from the outcrop, and the coal is expected to improve as the digging progresses. The coal lies in two seams, each about 7 feet in thickness, with a dip of 40° to the west.

COAL IN THE EASTERN HEMISPHERE.

GREAT BRITAIN.—Mr. Richard Meade, assistant keeper of mining records for Great Britain, issued in 1882 a complete and exhaustive work on the coal and iron resources of the British Isles. Its statistics embody the latest information respecting that important field.

Mr. Meade estimates the total area of the coal-fields of the United Kingdom at 7876 square miles, divided as follows:

England:	Coal-Fields.	Area in sq. miles.
Durham and Northumberland.....		796
Yorkshire, Derbyshire, and Nottinghamshire..		800
Cumberland.....		25
Lancashire and Cheshire.....		220
Leicestershire.....		15
Warwickshire.....		30
Shropshire.....		28
North Staffordshire.....		75
South Staffordshire.....		93—2082
North Wales:		
Anglesea, Denbighshire, and Flintshire.....		90
South Wales:		
Monmouthshire.....		104
Glamorganshire.....		518
Brecknockshire.....		74
Carmarthenshire.....		228
Pembrokeshire.....		76
Gloucestershire (Forest of Dean).....		34
Somersetshire (Bristol).....		150—1184
Scotland.....		1720
Ireland.....		2800
Total.....		7876

These fields contained in 1880 an estimated amount of 145,288,613,038 tons of available coal, a quantity

TABLE XXXVII.—Detailed Statement of British Coal-Fields, 1880 [Report of the Royal Commission].

No.	Name of Coal-Field.	Amt. of coal in stat. tons to depths not exceeding 4000 ft. after necessary deductions.	Amount of coal remaining and available for future use from the year 1880.
ENGLAND AND WALES.		Tons.	Tons.
1	South Wales.....	32,456,208,913	32,302,046,783
2	Forest of Dean.....	265,000,000	257,623,705
3	Bristol.....	4,218,970,762	4,207,076,209
4	Warwickshire.....	458,652,714	450,179,258
5	South Staffordshire.....	1,906,119,768	1,789,674,293
6	Colebrookdale & Forest Wyre..		
7	Clee Hills.....	836,799,734	826,799,734
8	Leicestershire.....		
9	North Wales.....	2,005,000,000	1,986,229,493
10	Anglesea.....	5,000,000	
11	North Staffordshire.....	3,825,488,105	3,784,377,741
12	{ Lancashire and } Cheshire.....	5,546,000,000	{ 5,270,686,699 192,104,295
13	Midland.....	18,172,071,433	17,928,908,710
14	Black Burton.....	70,904,011	70,904,011
15	Durham and Northumberland	10,036,660,236	9,734,261,887
16	Cumberland.....	405,203,792	391,123,499
SCOTLAND.			
17	Edinburgh.....	2,153,703,360	9,669,172,642
18	Lanarkshire.....	2,044,090,216	
19	Fife.....	1,098,402,895	
20	Ayrshire.....	1,785,397,089	
21	East Lothian.....	86,849,880	
22	Frith of Forth.....	1,800,000,000	
23	Dumfriesshire.....	358,173,995	
24	West Lothian.....	127,621,800	
25	Perthshire.....	109,895,040	
26	Stirlingshire.....	106,475,436	
27	Clackmannanshire.....	87,563,494	
28	Dumbartonshire.....	48,618,320	
29	Renfrewshire.....	25,881,285	
30	Argyleshire.....	7,223,120	
31	Sutherlandshire.....	3,500,000	
32	Roxburghshire.....	70,000	
IRELAND.			
33	Ballycastle (Antrim co.).....	16,000,000	154,384,079
34	Tyrone.....	6,300,000	
35	Leinster (Queens co.).....	77,580,000	
36	Tipperary.....	25,000,000	
37	Munster (Clare co.).....	20,000,000	
38	Connaught.....	10,800,000	
Total.....		90,207,285,398	89,015,553,038

The details of coal remaining unwrought, as estimated by Prof. Ramsey, and contained under the second head under Permian and other overlying formations, amounting to 56,273,000,000 tons, is as follows:

Districts.	Under.	Square miles.	Tons.
Warwickshire.....	Permian.	73	2,165,000,000
Warwickshire, south of Kingsbury.....	New Red.	5	150,000,000
Warwickshire, north of Atherstone.....	" "	6	179,000,000
Leicestershire, Moira Dist..	Permian.	15	1,000,000,000
" Coleorton "	New Red.	{ 25 to 28 }	{ 790,000,000 }
District between the Warwickshire and South Staffordshire coal-fields	Permian and New Red.	116	3,400,000,000
District between the South Staffordshire and Shropshire coal-fields..	" "	195	5,800,000,000
Between the South Staffordshire and Colebrookdale coal-fields to the Cheadle and North Staffordshire coal-fields	" "	200	4,580,000,000
East of the Denbighshire coal-field.....	" "	50	2,489,000,000
West and south-west border of the North Staffordshire coal-field.....	" "	50	1,500,000,000
Cheshire, west of the Keridge.....	" "	9	62,000,000
Cheshire, between Woodford Fault and Denton	" "	36	1,790,000,000
Lancashire, east and west of Manchester....	" "	30	350,000,000
Lancashire, west of Eccles and Stretford to Prescott, Runcorn, and Hale-on-the-Mersey....	" "	130	3,883,000,000
The Irwell, the Mersey, and country to the N....	" "	216	3,000,000,000
Yorkshire, Derbyshire, and Nottinghamshire..	" "	900	23,082,000,000
Vale of Eden.....	" "	40	1,593,000,000
Ingleton and Burton.....	" "	3	33,000,000
Severn Valley.....	New Red Marl.	45	400,000,000
Scotland.....	Permian.	No estimate.	
Ireland, Tyrone.....	New Red Marl.	4	27,000,000
Total of concealed coal-fields..		...	56,273,000,000

With these available resources, and an annual output of nearly 147,000,000 tons, supplies are ensured for 920 years hence.

sufficient to last nine hundred years at the present rate of production. All this coal is less than 4000 feet from the surface, that being the depth at which it is thought mining must stop. It is distributed as follows:

	Tons.
England and Wales.....	79,192,056,317
Scotland.....	9,669,172,642
Ireland.....	154,384,079
Total known coal-fields.....	89,015,613,038
Concealed coal-fields (overlaid by Permian and other formations). }	56,273,000,000
Total coal available in 1880.....	145,288,613,038

It is not the purpose of this article to describe fully the numerous and extensive coal-fields of Great Britain; but the following cross-sections of the fields are of much value in the comparisons that can be drawn between the fields of the United States and those of foreign countries. The principal difference that is noticed is the great thickness of strata in the English fields, while the veins are not as thick as in the United States. Table XXXVIII. shows the output of the collieries of each coal-field in the years given.

Table XXXIX. shows the relative value of the different varieties of British coals in the several fields. Care should be taken, in comparing it with tables of analyses of American coals, to note that this table shows ultimate analyses, while, as a general rule, the other tables give proximate or commercial analyses.

In Table XL. is shown not only the thickness of the veins in the North Staffordshire coal-field, but the amount of coal to the acre and the profit per acre from the working of each vein. The statistics of coal-mining in Great Britain are reliable, as the Government has control of all the records and they are

published under its authority. This is a decided advantage over the system of collecting statistics and information in the United States, where the figures vary almost in proportion to the number of authorities.

TABLE XXXVIII.

Coal-Fields.	No. of Collieries in 1880.	1860.	1870.	1880.
ENGLAND.				
Northumberland, North and South Durham.....	380	18,244,708	27,613,539	34,513,508
Cumberland.....	29	1,171,052	1,408,235	1,680,841
Westmoreland.....	3	...	...	1,950
Cheshire.....	28	750,500	929,150	681,000
Lancashire, North, East, and West.....	361	11,350,000	13,810,600	19,120,294
Yorkshire, North Riding	505	9,284,000	10,606,604	{ 5,270 17,468,536
Derbyshire.....	235	4,940,000	{ 5,102,265 2,115,372	{ 7,903,834 4,432,393
Nottinghamshire.....	42		647,540	1,101,386
Warwickshire.....	32	545,000	599,450	1,063,382
Leicestershire.....	26	730,000	...	...
Staffordshire, North and South, and Worcester-shire.....	598	7,648,300	13,230,062	13,734,800
Shropshire.....	61	850,500	1,343,300	905,000
Gloucestershire, Somersetshire.....	139	5,503,400	1,955,910	1,952,732
Monmouthshire.....	103	...	4,364,342	5,039,549
WALES, NORTH.				
Flintshire, Denbighshire...	107	1,750,500	2,329,030	2,429,315
WALES, SOUTH.				
Glamorganshire, Brecknockshire, Pembroke-shire, and Carmarthen-shire.....	344	6,254,813	9,299,770	16,126,031
SCOTLAND.				
Eastern District, Western District.....	651	10,900,500	14,934,553	18,274,886
Ireland.....	50	119,425	141,470	133,702
Total of the United King..	3694	184,042,698	110,431,192	146,968,409

Mined in 1880 — 18,660½ tons per sq. m.
Average, 37,879 tons per colliery.

TABLE XXXIX.—Analyses of British Coals.

Name of Coal-Field.	Steam Coals.						Household Coals.						Coking and Manufacturing Coals.						Gas Coals.					
	Carbon.	Hydrogen.	Nitrogen.	Sulphur.	Oxygen.	Ash.	Carbon.	Hydrogen.	Nitrogen.	Sulphur.	Oxygen.	Ash.	Carbon.	Hydrogen.	Nitrogen.	Sulphur.	Oxygen.	Ash.	Carbon.	Hydrogen.	Nitrogen.	Sulphur.	Oxygen.	Ash.
Great Northern.....	80.69	5.36	7.27	1.57	1.24	4.23	82.97	5.92	1.40	.90	7.47	1.33	84.92	4.53	0.96	0.65	6.66	2.28	84.80	4.11	1.28	1.01	6.24	1.93
Yorkshire.....	80.05	4.93	1.24	1.06	8.99	3.73	80.46	5.08	1.67	1.65	6.80	3.30	81.93	4.85	1.27	0.91	8.58	2.46	80.46	5.08	1.67	1.65	6.80	3.30
Cumberland (cannel coal)...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lancashire.....	75.53	4.82	2.05	3.04	7.98	6.58	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cheshire.....	...	...	...	...	...	...	...	...	...	...	...	...	85.84	0.52	1.38	0.86	...	11.40	...	...	...	...	...	...
Derbyshire.....	...	...	...	...	...	...	77.49	4.86	1.64	1.30	12.41	2.30	79.85	4.84	1.23	0.72	10.96	2.40	...	...	...	...	...	...
Nottinghamshire.....	...	...	...	...	...	...	...	...	...	...	...	...	79.19	5.12	1.19	1.00	10.56	2.94	...	...	...	...	...	...
Leicestershire.....	74.97	4.83	0.88	1.45	11.88	5.99	...	...	...	...	...	...	...	...	...	...	...	1.65	...	...	...	...	...	...
North Staffordshire.....	...	...	...	...	...	...	61.79	37.35	...	0.06	...	0.80	63.50	34.85	...	0.00	...	1.65	...	...	...	...	...	...
South Staffordshire and Worcestershire.....	...	...	...	...	...	...	...	...	...	...	...	...	74.41	4.63	...	0.70	16.09	2.82	...	...	...	...	...	...
North Wales.....	78.00	5.31	0.56	2.30	8.82	5.05	...	...	...	...	...	...	...	...	...	...	...	10.00	...	...	...	...	...	...
South Wales.....	82.90	4.92	1.02	1.16	...	4.95	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gloucestershire.....	80.71	5.42	0.73	1.27	7.06	4.80	78.81	5.30	1.75	2.06	9.05	3.02	73.52	5.69	2.04	2.27	0.48	10.00	59.10	...	...	1.04	...	5.93
Bristol.....	...	...	...	...	...	...	63.55	...	...	1.62	...	4.27	...	...	...	...	...	...	...	...	...	...	...	...
Devonshire (lignites).....	...	...	...	...	...	...	66.31	5.62	0.56	2.36	22.86	2.26	...	...	...	...	...	...	...	...	...	...	...	...
Scotland (Clyde basin).....	...	...	...	...	...	...	55.8	5.4	34.0	2.00	...	2.8	53.22	...	...	.25	...	2.74	...	...	...	...	...	...
Midlothian.....	76.94	5.20	trace	0.38	14.37	3.11	...	...	...	...	...	...	81.36	6.28	1.53	1.57	6.37	2.89	...	...	...	...	...	...
Fife-shire.....	76.09	5.22	1.41	1.53	5.05	10.70	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ayrshire.....	79.82	5.82	.94	.86	11.31	1.25	88.08	6.50	1.55	1.38	8.05	2.44	...	...	...	...	...	...	...	...	...	...	...	...
IRELAND.																								
Northern Group.....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tyrone.....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Slievadagh.....	80.03	2.20	0.23	6.76	10.80	...	...	...	...	...	...	...	...	...	...	...	...	...	81.04	4.91	...	...	6.64	7.4
																			37.86	...	...	...	1.80	8.00

East Lothian Coal-field.

	Ft. In.
Coal, Great Seam.....	7 0
Strata.....	50 0
Splint coal.....	4 0
Strata.....from 7 ft. to	18 0
Parrot coal.....	1 8
Strata.....from 7 ft. to	34 0
Three-foot coal.....	2 6
Strata.....	9 0
Four-foot coal.....from 3 ft. 8 in. to	4 11
Strata.....	118 0
Five-foot coal.....	4 0
Strata, with blackband ironstone.....	130 0
Panwood coal.....	1 6
Strata.....	72 0
Splint and rough coals (16 ft. apart.).....	4 0
Strata.....	100 0
Haughliel coals (sometimes "Parrot Coal"), 16 in. to	1 6
Strata.....	35 0
Total thickness of coal and strata.....	597 1
Total thickness of coal.....	31 1
Actual thickness of coal-beds, from 16 in. to 7 ft.	

Denbighshire Coal-field.

	Yds. Ft. I.
Top sulphurous coal.....	0 4 0
Strata.....	70 0 10
Bottom sulphurous coal.....	0 4 6
Strata.....	10 0 7
Smiths' coal.....	0 2 2
Strata.....	12 1 1
Drowsall coal (good quality).....	0 3 0
Strata.....	9 0 8
Powell coal.....	0 3 3
Strata.....	9 1 3
Two-yard coal.....	0 6 0
Strata.....	11 0 0
Crank coal.....	0 2 8
Strata, with Brassey ironstone.....	10 2 6
Brassey coal.....	0 5 0
Strata, with black-band ironstone, 18 in.....	10 0 11
Main coal, with a parting of clay, 18 in.....	0 7 6
Total thickness of strata and coal.....	156 0 11
Total thickness of coal.....	38 1
Actual size of coal-beds, from 2 ft. 2 in. to 7 ft. 6 in.	

¹ Includes 4,000,000 tons wasted on fire-heaps.

Yorkshire Coal-field, Barnsley District.

	Ft.	In.
Magnesian limestone.....	75	0
Lower Permian sandstone.....	54	0
Red rock of Rotherham.....	...	...
Strata	0 to 100	0
Pontefract rock.....	100	0
Strata.....	70	0
Ackworth rock.....	54	0
Strata.....	510	0
1. Shafton coal.....	5	0
Strata.....	393	0
2. Muck coal.....	3	10
Strata.....	219	0
3. Woodmoor coal	3	0
Strata, with Half-yard coal.....	45	0
4. Winter coal.....	4	0
Strata.....	...	...
5. Beamshaw coal.....	3	0
Strata, with Kent coal.....	1	0
Mapple coal (inferior quality).....	4	6
Strata.....	216	0
6. Barnsley coal.....	9	3
Strata.....	198	0
7. Swallow Wood coal.....	3	0
Strata.....	234	0
8. Joan coal.....	2	0
Strata.....	60	0
9. Flockton Top coal.....	3	3
Strata.....	120	0
10. Parkgate coal.....	5	0
Strata.....	78	0
11. Thorncliffe thin coal.....	2	6
Strata.....	123	0
12. Four-foot coal (variable).....	2	6
Strata.....	108	0
13. Silkstone coal.....	5	0
Strata.....	195	0
14. Whin Moor or Low Moor coal.....	2	6
Strata.....	About 150	0
Flagstone.....	36	0
Strata, principally shales.....	495	0
15. Halifax coal (with Pecten papyraceus in roof and a floor of ganister).....	1	9
Strata (shales and flags).....	81	0
16. Halifax soft coal.....	1	6
Millstone Grit.....	150	0
Total thickness of strata and coal.....	3926	7
Total thickness of coal.....	61	7
Total number of beds, 16.		
Average size of beds.....	3	10

In the subjoined table appears the thickness of the several seams, the produce of coal and slack per acre, and the profit per acre, from Smith's *Mines Guide*, 1836:

TABLE XL.—North Staffordshire Coal-field.

Coal-Seams.	Thickness.	Produce per acre.		Profit per acre.
		Coal.	Slack.	
	Yds. Ft. In.	Tons.	Tons.	£ s.
Peacock coal.....	1 2 0	4,840	806	100 16
Spencroft.....	1 2 0	4,840	806	100 16
Great Row.....	2 0 0	5,808	968	169 8
Cannel.....	2 0 0	5,808	968	169 8
Little Row.....	2 1 0	6,637	1106	304 3
Rusty Mine.....	3 0 0	8,712	1452	399 6
Chalky Mine.....	1 0 0	2,904	484	24 4
Single Four-foot.....	1 2 0	4,840	806	80 13
Single Five-foot.....	1 2 0	4,840	806	221 0
Ragman.....	1 0 6	2,904	484	105 1
One yard to seven feet.....	2 2 6	8,228	1371	754 14
Hains.....	1 2 0	4,840	806	100 16
Ten-foot.....	3 0 0	8,712	1452	980 2
Top Two Row.....	0 2 0	1,936	322	
Bowley Alley.....	1 2 0	4,840	806	
Seven-foot Nabbs.....	1 2 6	5,280	880	726 0
Eight-foot Nabbs.....	1 1 6	4,356	726	598 19
Gray coal.....	3 0 0	8,712	1452	
102 ft. coal in 18 coal-beds ¹ ..	34 1 0	99,037		

The above method of leasing coal by the acre rather than a rental per ton ensures better results to the landowner and closer working by the operator, and of course a greater yield per acre. On this account it deserves commendation.

During three years ending 1880 average prices of coal and slack in North Staffordshire were—

	8s. 4d. in 1880,	7s. 8d. in 1879,	and 9s. 3d. in 1878.
Highest,	12 6	11 8	12 6
Lowest,	6 6	6 0	8 4

Cost of getting coal varied with depth of seam from 2s. 6d. to 4s. 6d.

¹ Average, 5 ft. 8 in.

TABLE XLI.—Nottinghamshire Coal-field.

Description of Strata.	Thick-ness.		Depth.	
	Ft.	In.	Ft.	In.
1. Limestone magnesian.....	5	4		
2. Light blue and brown stone in beds..	6	3	11	7
3. Blue stone.....	8	5	20	0
4. Dark-pink bind.....	3	8	23	8
5. Dark-gray stone.....	0	4	24	0
6. Red stone with pebbles.....	1	0	25	0
7. Clunch (usually tough clay or shale)	1	9	26	9
8. Bind.....	19	0	45	9
9. Ironstone.....	0	3	46	0
10. Soft clunch.....	5	0	51	0
11. Black shale or bind.....	2	7	53	7
12. Clunch.....	6	8	60	3
13. Bind, with bands of ironstone.....	40	4	100	7
14. Chillery coal.....	0	7½	101	2½
15. Light and dark clunch	6	0	107	2½
16. Bind.....	20	9	127	11½
17. Ironstone	0	2½	128	2
18. Bind.....	14	7	142	9
19. Soft coal.....	1	1½	143	10½
20. Shale, bind, and clunch.....	20	2	164	0½
21. Soft coal.....	2	4½	166	5
22. Clunch and bind, with bat and shale	18	10	185	3
23. Soft coal.....	1	0	186	3
24. Clunch and bind.....	1	0	187	3
25. Soft coal.....	1	7½	188	10½
26. Clunch and stone.....	9	5	198	3½
27. Bind, clunch, and stone, with a } little coal and ironstone..... }	81	8½	280	0
28. Coal.....	3	6½	283	6½
29. Dark clunch, with bat and ironstone	20	8	304	2½
30. Coal.....	0	7	304	9½
31. Shaly bind.....	10	1	314	10½
32. Soft coal.....	2	4	317	2½
33. Shale and bind.....	36	2	353	4½
34. Soft coal.....	3	4	356	8½
35. Dark clunch, with impressions.....	3	11	360	7½
36. Soft coal.....	1	3	361	10½
37. Clunch and bind	45	3	407	1½
38. Coal.....	1	5	408	6½
39. Black shale and bind.....	29	7	438	1½
40. Soft coal	2	5	440	6½
41. Shale, clunch, etc.....	68	7	509	1½
42. Coal.....	3	9	512	10½
43. Shale and bind and a few small } beds of ironstone..... }	82	3	595	1½
44. Coal (hard).....	2	2½	597	4
45. Clunch, bind, and shale.....	50	0	647	4
46. Main coal.....	8	2	655	6
15 coal beds, av. size 2 ft. 4½ in.				
Total thickness of coal and strata...	655	6		
Total thickness of coal.....	35	9		
Actual size of beds, from 7½ inches to 8 ft. 2 in.				

Shropshire Coal-field.

1. Chance Pennystone coal } found only at north end of			
2. Fungus coal, } coal-field.			
3. Gur coal,			
4. Top coal.....	From 4	0 to 4	6
5. Half-yard coal.....			1 6
6. Double coal.....	"	5	0 " 6 0
7. Yard "	"	2	6 " 3 0
8. Big Flint coal.....	"	3	0 " 4 6
9. Stinking coal.....	"	3	0 " 4 0
10. Clunch coal.....	"	2	0 " 2 0
11. Two-foot and best (with parting).....	"	0	0 " 3 4
12. Randle and Clod coal.....	"	4	0 " 5 0
13. Little Flint coal.....	"	1	6 " 2 3
10 beds, average thickness 3 ft.; total, 30 ft.			

Antrim Coal-field.

	Ft.	In.
Top or first coal (splint seam)	3	0
Sandstones and shales	30	0
Second coal (Hawksnest seam).....	3	0
Strata, with black-band ironstone.....	240	0
Third coal (main seam).....	4	0
Strata, with black-band ironstone.....	60	0
Limestone	8	0
Strata, shales and sandstones.....	240	0
Lower (black-band ironstone by boring).....	1	0
Total thickness of strata.....	589	0
Total thickness of coal.....	10	0
Actual thickness of coal-beds, 3 to 4 ft.		

<i>Derbyshire Coal-field.</i>		Ft.	In.
Sandstones and shales.....		350	0
1.	Coal.....	2	10
	Strata.....	107	0
2.	Coal.....	2	1
	Strata.....	220	0
3.	Barnsley Top hard coal.....5 ft. 10 in. to	7	0
	Strata, Brown Rake and Black Rake iron-		
	stones.....	470	0
4.	Soft coal (generally two seams with partings)...	6	0
	Strata.....	120	0
5.	Lower hard coal.....3 ft. 0 in. to	4	0
	Strata.....	200	0
6.	Furnace coal.....2 ft. 6 in. to	4	0
	Strata with nodular ironstone.....	140	0
7.	Silkstone Clod or black shale coal...5 ft. 0 in. to	7	0
	Strata... ..	385	0
8.	Kilburn coal.....4 ft. 0 in. to	5	0
	Strata with honey-crop ironstone.....	200	0
	Wingfield flagstones.....	350	0
	Black shales.....	300	0
	Flagstones and shales.....	200	0
9.	Coal, with a floor of ganister... ..	1	0
	Flagstones and shales.....	125	0
10.	Ganister coal (with a floor of ganister).....	2	0
	Flagstones and shales... ..	600	0
	Millstone grit.....	...	...
Total thickness of coal and strata.....		3807	11
Total thickness of coal.....		40	1
Total number of beds, 10.			
Average thickness of beds.....		4	0

TABLE XLII.—Great Britain: Iron Furnaces and Coal Consumption.

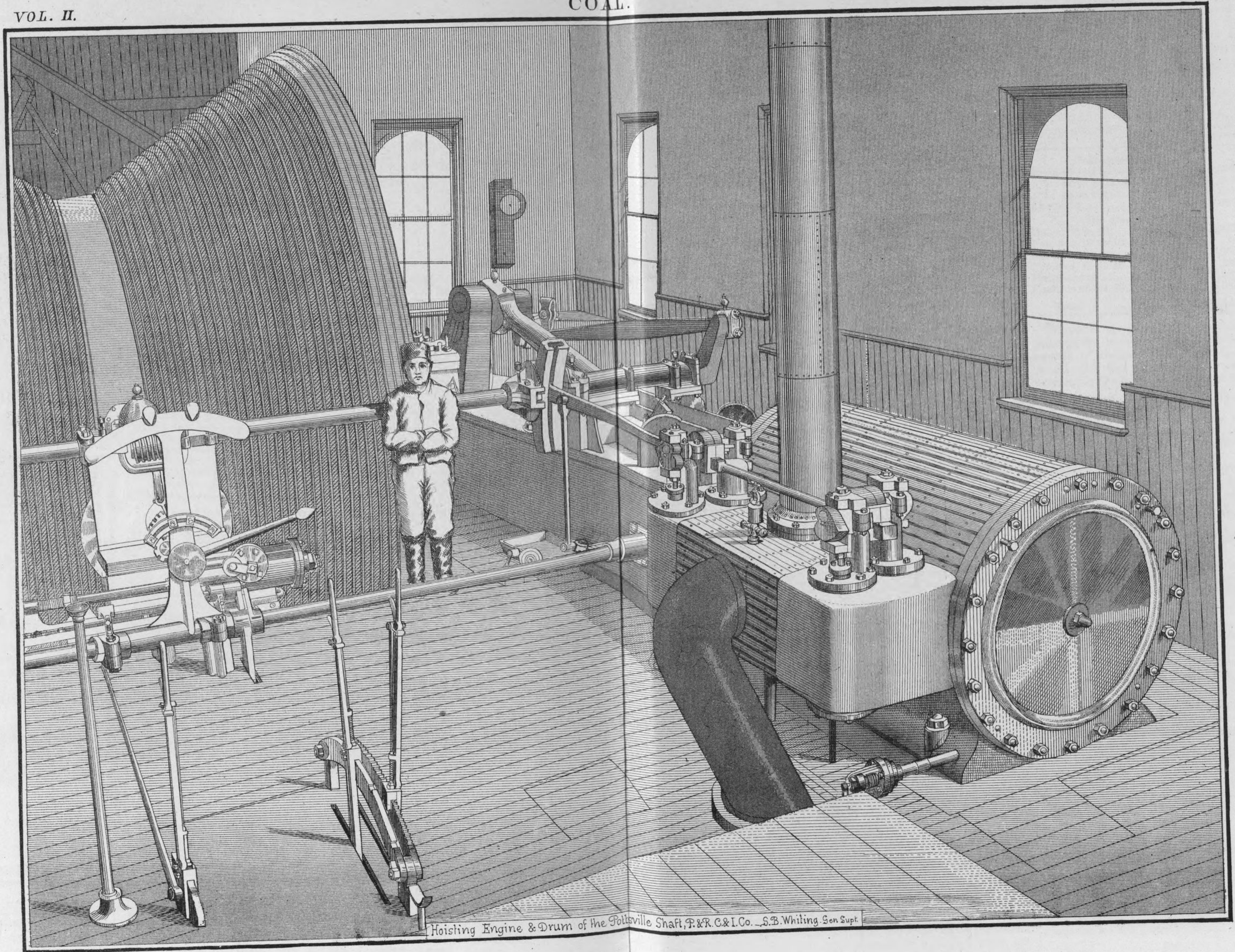
Districts.	Furnaces.		Pig Iron made, tons.	Coal used, tons.	Average.	
	Built.	In blast.			Per furnace.	Coal used, cwt.
ENGLAND.						
Northumberland.....	10	4	44,807	101,347	11,202	45
Durham.....	54	49½	799,573	1,848,100	16,071	40
Yorkshire, North Riding.	78	76	1,156,431	2,643,997	15,216	46
“ West “	40	30	151,511	493,976	5,050	65
Derbyshire.....	47	39	296,468	865,350	7,601	58
Lancashire.....	44	36	529,271	1,108,192	14,702	42
Cumberland.....	48	33½	456,877	1,079,118	13,638	47
Shropshire.....	29	21	135,149	407,876	6,435	60
Staffordshire, North.....	36	29	241,166	710,856	8,316	59
“ South.....	142	99	673,397	1,968,580	6,801	58
Northamptonshire.....	16	10	58,480	169,592	5,848	58
Lincolnshire.....	13	9	52,076	142,236	5,786	55
Gloucestershire.....	10	6	44,409	134,019	3,841	60
Wiltshire.....	7	5	48,944	131,293	8,157	53
Somersetshire.....	1	1				
Total, England.....	575	448½	4,688,199	11,804,532	10,406	51
NORTH WALES.						
Denbighshire.....	9	5	42,773	135,180	8,554	63
Flintshire.....	4	3	24,690	52,098	8,230	42
Total, North Wales.....	13	8	67,463	187,278	8,433	55
SOUTH WALES.						
Anthracite furnaces.....	13	8	32,282	81,837	4,102	50
Bituminous Coal-Districts.						
Glamorganshire.....	73	51	424,384	1,047,245	8,321	49
Monmouthshire.....	62	42	360,583	867,640	8,085	48
Total, South Wales.....	148	101	817,789	1,996,722	8,012	50
Scotland.....	156	126	993,000	2,730,000	7,881	55
Total, Great Britain.....	892	683½	6,566,451	16,718,532	9,512	50½

North Staffordshire Coal-field.		Ft.	In.
Peacock coal.....		6	6
Strata.....		20	0
Spencroft coal.....		3	9
Strata.....		121	0
Great Row coal.....		8	0
Strata.....		71	0
Cannel Row coal.....		5	0
Strata.....		54	0
Wood Mine coal.....		2	0
Strata.....		29	0
Deep Mine coal.....		2	8
Strata.....		361	0
Winghay coal.....		4	6
Strata.....		377	0
Ash or Rowhurst coal.....		8	0
Strata.....		121	0
Burnwood coal.....		5	0
Strata.....		68	0
Golden Twist.....		3	6
Strata.....		486	0
Mossfield coal.....		4	7
Strata.....		30	0
Coal.....		3	0
Strata.....		270	0
Birches coal.....		4	6
Strata.....		300	0
Ten-foot coal.....		6	0
Strata.....		102	0
Bowley Alley coal.....		4	6
Strata.....		81	0
Holly Lane coal.....		5	10
Strata.....		84	0
Sparrow Batts coal.....		4	9
Strata.....		222	0
Flats coal.....		3	0
Strata.....		108	0
Frog's Row coal.....		4	6
Strata.....		30	0
Cockhead coal.....		4	6
Strata.....		420	0
Bullhurst coal.....		4	0
Strata.....		60	0
Winpenny coal.....		3	0
Total thickness of coal and strata.....		3516	1
Total thickness of coal		101	1
22 coal beds, averaging 4 ft. 7 in. each.			

<i>Leinster Coal-field.</i>		Ft.	In.
Uppermost beds, about.....		12	0
Peacock coal.....		1	10
Strata		45	0
Stony coal.....		3	0
Strata		21	0
Double seam.....		5	0
Strata and shales.....		120	0
Three-foot or Old Colliery coal.....		3	0
Strata		180	0
Five-foot coal.....		3	6
Strata		300	0
Upper and Lower Towlerton coals.....	1 ft. 6 in. to	2	0
Flag series, about.....		650	0
Black shale series.....		500	0
Upper Carboniferous limestone.....		...	...
Total thickness of strata and coal.....		1846	4
Total thickness of coal.....		30	4

TABLE XLIII.—Coal Statistics of Ireland.

Year.	Collieries.								Total Coal raised.	Average per Man.	Persons Employed.		
	Connaught.		Ulster.		Leinster.		Munster.				Under Ground.	Above Ground.	Total.
	Colls.	Tons.	Colls.	Tons.	Colls.	Tons.	Colls.	Tons.					
1873	376	11,021	391	18,105	777	61,425	406	45,180	135,731	79	1209	741	1,950
1874	111	5,108	321	17,810	828	73,302	391	43,993	139,213	84	1120	531	1,651
1875	84	4,772	261	15,869	866	66,876	333	40,684	128,207	83	1069	475	1,544
1876	99	5,203	183	15,335	798	72,025	285	32,632	125,195	90	946	419	1,365
1877	78	6,477	180	15,398	713	88,095	277	30,211	140,181	112	883	365	1,248
1878	75	6,456	217	12,407	663	74,474	267	28,714	122,051	100	841	381	1,222
1879	88	9,600	165	17,066	624	77,061	238	25,276	129,003	115	819	296	1,115
1880	87	8,506	175	21,203	589	75,490	220	28,503	133,702	124	777	294	1,071
Totals..	998	57,143	1893	133,193	5858	588,748	2417	275,193	1,053,283	787	7664	3502	11,166



Hoisting Engine & Drum of the Poltsville Shaft, P. & R. C. & I. Co. S. B. Whiting, Gen. Supt.

Coal-Series of Northumberland and Durham, Newcastle District [by Prof. Hull, F. R. S.].

		Ft. In.	
		Ft.	In.
Upper Series.	Closing Hill seam.....	1	8
	Strata.....	450	0
	Hebburn Fell seam.....	2	8
	Strata.....	250	0
	Five-quarter seam.....	4	0
	Strata.....	260	0
	Three-quarter (Black Close) seam.....	2	0
	Strata.....	50 to 180	0
	1. High Main coal.....	6	0
	Strata.....	33 to 150	0
	2. Metal coal.....	1	6
	Strata.....	33	0
	3. Stone coal.....	1	6
	Strata.....	60 to 100	0
	4. Yard coal (variable).....	2	10
	Strata.....	60 to 100	0
	5. Bensham coal.....	2 ft. 5 in. to 5	0
	Strata.....	78	0
	6. Five-quarter coal.....	3	0
	Strata.....	48	0
	7. Low Main or Hutton coal.....	6	0
	Strata.....	30 to 100	0
	8. Crow coal (inconstant).....	2	10
	Strata.....	24	0
	9. Five-quarter coal.....	3	8
	Strata.....	30	0
	10. Ruler coal.....	1	10
	Strata.....	96	0
	11. Townley or Harvey coal.....	3	1
	Strata.....	42	0
	12. Jetty coal.....	2	2
	Strata.....	42	0
	13. Stone coal.....	2	5
	Strata.....	18	0
	14. Five-quarter coal.....	3	0
	Strata.....	30	0
	15. Three-quarter coal.....	2	6
	Strata.....	54	0
	16. Brockwell coal.....	2	11
Total thickness of coal and strata.....		2145	7
Total thickness of coal.....		60	7
20 beds, averaging 3 ft. each.			
Regular size of beds, from 1 ft. 6 in. to 6 ft.			

Population employed in Coal-mining in the United Kingdom.—All the early returns on this subject were careful estimates made by the inspectors, each in his own district. Since 1872, when the Coal-mines Regulation Act came into operation, very complete returns have been published in the annual reports of H. M. inspectors of mines, in which the numbers engaged under and above ground are separately distinguished, together with the quantity of coal raised. These appear in the annexed table, to which is added the average production per man in each year:

TABLE XLIV.

Year.	Persons Employed.		Total.	Coal Raised.	Average per Man.
	Under Ground.	Above Ground.			
				Tons.	Tons.
1873	407,808	106,341	514,149	128,680,131	250
1874	428,611	110,218	538,829	126,590,108	235
1875	427,017	108,828	535,845	133,306,485	245
1876	409,229	105,303	514,532	134,125,166	266
1877	395,025	99,366	494,391	134,179,968	278
1878	382,979	92,350	475,329	132,612,063	279
1879	385,179	91,631	476,810	132,720,393	280
1880	391,381	93,552	484,933	146,969,409	303
1881	399,387	96,090	495,477	154,184,300	311

These figures indicate the increased efficiency of the coal-miner in recent years. In 1873, the year of the "coal famine," the average output per man was 250 tons per annum. A less number of persons was then employed than in the succeeding year, when the average fell to 235 tons per man, the diminished production being due to the larger amount of unskilled labor employed. Since 1874, however, the efficiency of the coal-miner has gone on increasing, till in 1879 the average amounted to 280 tons, and in 1880 to 303 tons, per man per annum.

Of the population employed in coal-mining the annexed abstract will show the numbers and respective ages of all engaged under and above ground in the collieries of the United Kingdom in the year 1873, when the last return appeared, and for the years 1879 and 1880; the last-named year showing an increase of 8123 persons employed in excess of the previous year, and an increase of 23 tons per man:

TABLE XLV.

Ages.	1873. Persons Employed.	1879. Persons Employed.	1880. Persons Employed.
<i>Under ground.</i>			
From 10 to 12.....	1,202	446	428
" 12 to 13.....	11,309	4,881	4,868
" 13 to 16.....	45,931	35,993	36,162
Above 16.....	349,366	343,859	349,923
<i>Above ground.</i>			
Males, 10 to 13.....	2,070	671	552
Females, 10 to 13.....	31	9	10
Males, 13 to 16.....	6,957	6,572	7,037
Females, 13 to 16.....	790	502	354
Males above 16.....	91,110	79,546	81,323
Females above 16.....	5,383	4,331	4,276
Total.....	514,149	476,810	484,933

To realize the great importance of coal in the world's progress we have but to quote from the very complete records of Robert Hunt, F. R. S., keeper of mining records for the year 1880, the result of one year's working in the kingdom of Great Britain and Ireland:

Value of the product of gold and silver.....	£2,717
" " " " iron ore.....	6,585,806
" " " " tin, copper, lead, zinc..	1,778,723
" " " " clay, salt, ochre, gyp- sum, nickel, pyrites..	3,331,879
	£11,699,125
Value of the coal-product for the year, or 84·3 per cent. of the whole.....	£62,395,414
In all.....	£74,094,639

Well may Prof. Tyndall say the seat of England's greatness is in her coal-mines. The weight of this gross product is nearly 171,000,000 tons, and of this the great bulk is coal.

Of this vast product, England, from her 17 counties and 2720 collieries, mined....	109,749,367 tons.
Wales, from her 7 counties and 451 collier- ies, mined.....	18,660,550 "
Scotland, from her 7 counties and 651 col- lieries, mined.....	18,274,886 "
Ireland, from her 5 counties and 50 col- lieries, mined.....	133,719 "
	146,818,622 tons.

The amount exported to all the world—not including that sent to Ireland—was 17,703,787 tons; declared value, £8,372,933. It went principally to France, Germany, Italy, Russia, India, and Egypt (see Table XLVI.); the amount landed on the Atlantic coast of this country being 83,652 tons, and on the Pacific, 84,135 = 167,787 tons—only one-sixth of a million out of 146 millions. This simple fact shows that the coal-areas of the United States make us practically independent. Of the 130 million tons of coal not exported, Great Britain consumed in her 892 furnaces (but 683 of which were in blast) 16,718,532 tons to make 6,566,451 tons of pig iron. (See Table XLII.) Great Britain thus shipped but one-tenth of her product, and consumed nine-tenths to supply home industry and keep her people at work. There were brought by rail, canal, and sea to the London district alone, in 1880, 9,915,489 tons.

The relative importance of the coal and iron outputs of Great Britain is seen by a comparison of their statistics for the years 1880 and 1881:

Years.	Coal, tons.	Iron ore, tons.	Persons employed.
1881.....	154,184,300	11,858,766	495,477
1880.....	146,818,622	11,664,726	484,933
Increase.....	7,365,678	194,040	10,544

And another comparative statement will show how the coal-production has kept pace with the population :

	Population.	Tons.
1800, G. Britain and Ireland,	16,000,000	10,080,300
1850, " " (1854)	28,000,000	64,661,401
1875, " "	33,060,000	131,867,105
1881, " "	35,246,000	154,184,300

TABLE XLVI.—Coal Exported from Great Britain to Other Countries in 1880 [from Gov. Report].

Countries.	Tons.
Argentine Republic.....	75,286
China and Hong-Kong.	84,979
Belgium.....	277,656
Central American States.....	697
Brazil	137,649
Chili.....	170,52
Denmark.....	857,615
Channel Islands.....	81,435
France.....	3,566,717
Falkland Islands.....	575
Foreign West Indies.....	290,392
West Coast of Africa.....	124,474
Muscat and Bourbon.....	6,567
Mauritius and Madagascar.....	20,439
Greece and Roumania.....	138,742
Germany.....	2,202,303
Sweden	827,183
Holland	487,772
Norway.....	433,021
Pacific Islands.....	2,263
Austrian Territory.....	56,769
Russia—North and South.....	1,406,583
Gibraltar.....	309,265
Malta.....	387,763
United States of America.....	167,787
Nova Scotia, New Brunswick, etc.....	178,825
British India and Straits Settlements.....	884,084
Philippine Islands, India, and Siam.....	38,366
British West Indies.....	186,176
Java.....	140,914
Ceylon	117,921
Dutch Possessions.....	27,535
British Possessions in Africa.....	177,938
Tripoli, Tunis, etc.....	3,364
British Australia.....	7,208
Italy.....	1,453,622
Japan	8,069
Ecuador.....	437
Mexico.....	27,863
Peru	41,100
Uruguay	137,649
Azores.....	333,168
Bolivia.....	12,588
Spain	708,837
Egypt	649,327
Aden.....	109,589
Algeria.....	46,182
Turkey	284,350
Venezuela.....	790
United States of Colombia.....	13,426
	17,703,787
Cinders and patent fuel.....	828,790
Total.....	18,532,577
Total value.....	£8,372,933

	Tons.
Iron ore imported in 1880.....	2,634,401
Coal used in pig-iron manufacture in 1880.....	16,982,629
Ore produced in Great Britain in 1880.....	18,026,410
Total value.....	£2,792,717

Coal under London.—A ridge of Palæozoic rocks has been found underlying the city of London, having been reached at Tottenham Courtyard at a depth of 1066 feet. Authorities quoted in *Nature* declare that there is a reasonable probability of finding “a hard, dense anthracite” in these rocks, in which case the city can be supplied with the best variety of fuel at a very moderate cost.

RUSSIA.—At the Centennial Exhibition at Philadelphia in 1876 the mining department of Russia exhibited a series of anthracite coals from the government of Ekaterinoslav, which is situated just north of the Sea of Azof. This series (see Table XLVII.) was taken from the following localities :

- I. Anthracite from the estate of Mr. Bulazel.
 - II. Anthracite from the left bank of the river Cundrutchja ; bed, 2 feet 4 inches.
 - III. Anthracite from the ravine Shirokaja, on the river Krinka, near the village of Charziskaja ; bed, 4 feet 1 inch thick.
 - IV. Anthracite from the ravine Philipowa, near the village of Tchisjakowa ; bed, 4 feet 1 inch thick.
 - V. Anthracite from the ravine Perivi Iar, on the river Olchowaja, near the village of Olawa ; bed, 4 feet 1 inch thick.
 - VI. Anthracite from the ravine Pogorelaja, on the river Sowostjanka ; bed, 2 feet 1 inch thick.
 - VII. Anthracite from the ravine Wodjanaja, on the river Chrustatnaja.
 - VIII. Anthracite near the village of Malokrepinskoi ; bed, 3 feet 6 inches.
 - IX. Anthracite from the ravine Librinaja, near the village of Rowence ; bed, 4 feet 1 inch thick.
- A much larger suite of coals, from the most southern province of Russia (the government of Taurida), was exhibited, the analyses of which show that the greater portion of them are semi-bituminous. As is seen from the analyses, they are all very low in sulphur and ash, appear to be of a good quality, and are well adapted for iron-smelting :

	I.	II.	III.	IV.
Volatile matter...	12·64	37·95	16·50	29·00
Fixed carbon.....	86·04	61·21	82·63	61·92
Ash	1·32	0·84	0·87	1·08
	100·00	100·00	100·00	100·00
Sulphur	0·80	0·35	0·24	0·36

The official reports of the Russian department of mines show the following output of coal in that country for the years named :

	Pounds.	Net tons.
1874	78,813,137	1,423,245
1875	104,348,067	1,884,313
1876	111,302,028	2,009,941
1877	110,120,054	1,988,547
1878	154,024,302	2,781,363
1879	178,238,013	3,218,661

The great increase of the output is owing to the increased productiveness of the mines of the Don basin, of Poland, and of the Moscow basin. In ten years the yield of coal has almost quadrupled in Poland, but this production is not sufficient for the local demand, which must be met by the Silesian coal. A projected railway from Dombrovad to Ivangorod will, it is thought, greatly increase the coal-yield.

The narrative of the *Voyage of the Vega*, in 1879, by Prof. Nordenskjöld, refers to the discoveries on Bear Island and the coast of Spitzbergen of considerable strata of coal and phosphatic minerals, which are likely to be of great economic importance to neighboring countries. Also in Northern Siberia, about 70° N. lat., near where the river Dudinka flows into the river Yeniesei, in the Noril Mountains, there are very thick coal-seams. This must prove of vast importance for steam-navigation on the great rivers of Northern Russia and Siberia, the Obi and Yeniesei, which are navigable for 1000 miles or more in the interior of Siberia, and even into China.

Coal of poor quality has also been found on the

TABLE XLVII.—Analyses of Russian Coals, Series I. to IX.

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.
Volatile matter.....		8·12	5·84	7·67	7·96	5·73	7·76	6·61	5·42
Fixed carbon.....		86·68	91·91	88·89	89·22	91·73	90·13	88·93	90·39
Ash		5·20	2·25	3·44	2·92	3·53	2·11	4·46	4·19
		100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00
Sulphur			2·89	1·297	2·52	1·50	1·06	0·984	1·09

Lena River at Schiganth, on the Arctic Circle, north of Yakutsk.

COAL-FIELDS OF TURKEY.—At about 150 miles from the mouth of the Bosphorus, on the Asiatic coast of the Black Sea, there is a coal-basin of considerable extent and richness, which, when properly worked, will exercise a large influence on the future prosperity and civilization of the Ottoman empire. This coal-field is known as the Heraclea basin, and is near the Heraclea Pontica of the ancients. The first report on it was made in 1854 by two French engineers, but it was not complete, as they were not furnished with the means of making a thorough exploration. Since then much more complete surveys have been made, which show that the coal-beds extend over an area of about 450 square miles, and are estimated to contain 60,000,000 tons. During the Crimean War, the British Government obtained permission from the Porte to work these mines to supply the Allied squadrons operating against Sebastopol and their numerous steam-transports, and the works undertaken in the mountains south of Zongal Dag, 60 miles east of Heraclea, furnished nearly all the coal consumed during the siege. After the conclusion of peace it was no longer to the interest of the English to continue working these mines, whose development would have created a serious competition with their own coals, which now find so large an outlet in the East. After 1856 the working of the mines was left to the Ottoman Government, and it has been conducted ever since in the careless manner that characterizes every work of public utility in Turkey which is under the supervision of the Government.

The best quality of coal is obtained at Kooslor, in the district of Heraclea, where it is found in seams varying from 3 to 18 feet in thickness. The mines are the property of the Government, and in 1880 were estimated to have yielded about 33,000 tons, all of which were used by the vessels of the imperial navy and the Government factories. The cost of this coal, delivered at Constantinople, is now about \$4.08 per ton, but with proper mining and means of transport it could easily be obtained for much less. Other beds are found throughout this district, but none of them are yet mined; the only other mine being that of Sokia, where about 5000 tons of lignite are extracted annually. On the other hand, Turkey is compelled to import largely from abroad.

The following table shows the import of English coals into Constantinople during the past six years:

In 1875.....	129,625 tons.
" 1876.....	213,249 "
" 1877.....	145,253 "
" 1878.....	260,766 "
" 1879.....	198,523 "
" 1880.....	207,579 "
Total.....	1,204,935 tons.

The freight on the above averaged about \$3.72 per ton.

COAL IN AFRICA.—Northern Africa has but little coal that has been discovered beyond doubt. Some eminent geologists, commissioned by the French Government, report the presence of coal in Algeria, in the more remote parts of the colony. In a paper read Oct. 25, 1882, by M. Pinard, before the French Academy of Sciences, an account is given of bituminous coal-deposits near Bou Saada. He claimed that it fully equalled the coals of France and England in illuminating power, and furnished a coke ranging from 62 to 66 per cent. of the weight of the coal itself. At Smeudon, in the province of Constantine, lignite has been found in the Tertiary beds, but they have not exhibited satisfactory results. At Coleah similar lignites are found.

Egypt.—Several beds of coal have been found in the oasis of Ghenne in Egypt, on the Arabic side of the Thebaïd. It resembles the Scotch coal. In Nubia coal is reported to have been discovered.

Tropical Africa.—Sir W. C. Harris, in his *Highlands of Ethiopia*, says that coal-beds extend along the whole of the eastern frontier of Shoa. Coal is also reported to

be found in the more remote parts of Abyssinia. Dr. Livingstone, in his *Expeditions to the Zambesi*, says coal-deposits occur on the banks of the Zambesi River. Some seams exist in the island of Madagascar. At Quilimané, in the Portuguese settlement of Mozambique, some valuable coal-seams are reported to have been discovered.

Southern Africa contains the only valuable and productive coal-mines of the continent. In the Stormberg, on the north-east margin, north of Queenstown, occur two sets of coal-bearing beds: one is probably of old Carboniferous age; the other belongs to the upper part of the great Karoo series. There is an exposure of some underlying coal-bearing (anthracitic) strata, distinct from the Karoo beds, at Buffel's Kloof, in a spur of the Camdebo Mountains, between Graaf Reinet and Beaufort West. Again, outcrops are seen at Brandewyn's Gap, by the Leeuwe River, on a spur of the Nieuweldt, 36 miles north-west of Beaufort West and 100 miles west of Buffel's Kloof.

At Buffel's Kloof the diggings show that one or more rather thick seams of coal (anthracite) in underlying inclined beds have been broken and crushed by fault.

In Natal the coal is of better quality than the Stormberg. In the Biggarsberg there is a seam of coal 8 feet thick. In the Transvaal, equally thick seams of superior coal are known in the High Veldt. A few outcrops are known in the Orange Free State. Mr. Stone, F. G. S., in his report on the Sand River district, says the coal underlying that portion of the country would amount to 145,800,000 tons. In the new coal-field discovered in the Vaal River Valley the minimum quantity would be some 350,000,000 tons, making a total of 495,800,000 tons.

The *Port Elizabeth Telegraph*, published at the Cape of Good Hope, says that Mr. Frederick W. North, C. E., who has for some time been engaged in exploring the coal-measures of South Africa, has lately thoroughly inspected all the best-known and most promising coal-mines of Natal, and carefully tested the coal on the Natal railroads. "Though not equal to the article imported from England, he finds it well suited for railroad purposes, and much superior to Indian coal, which he had an opportunity of using for comparison. He says, as the result of his observations, that 13½ cwt. of good English coal will do the same amount of work as 17 cwt. of Natal coal; but, estimating the cost of English coal at Durban at £3 per ton, and the cost of Natal coal at the mines at 12s. 6d. per ton, a very great saving will be effected by using the latter. The principal mines are at Dundee, New Castle, and Sunday River. A capital mine could be opened within fifteen miles of Ladysmith." Preparations are being made to open up these coal-deposits and place them in communication with both the coast and the diamond-fields by rail.

In 1880, Great Britain shipped coal to points in Africa as follows:

	Coals, tons.	Cinders, tons.	Pat. Fuel, tons.	Value, £
Egypt.....	649,327	298	2,246	316,066
Tripoli and Tunis...	3,308	...	...	1,482
Algeria.....	46,182	3	39,213	39,259
Morocco.....	51	...	230	132
Western coast.....	124,474	...	2,386	63,669
British possessions } in South Africa. }	168,289	479	6	86,785
Eastern coast.....	9,649	...	1,565	6,595
Total.....	1,001,280	778	45,646	513,988

Pres. Benson, of the Republic of Liberia, in his message of 1863 (page 78), mentions a rich quality of coal at Half Cape Mount. Also a rich quality of iron ore in the vicinity of Careysburg.

NEW ZEALAND.—The first mention of coal in this colony was made in 1839, when imperfectly formed coal was found. In 1849 coal was found on the banks of the Tangarakaw, in the province of Wellington. Coal was also discovered at Motupipi in 1840. In 1858 the first systematic efforts to develop the coal-mines were made in the Drury district, 24 miles from Auckland.

In 1863 coal was discovered on the Waikato River, 90 miles from its mouth. The seams vary from 18 to 55 feet in thickness. The coal is a brown coal of Tertiary age, and the seams are overlaid by beds of limestone. Brown coal is also found near the Malvern Hills, 30 miles from Christchurch, and a vast area extends under the Canterbury plains. It is also found near the Molyneux River, where the seams are from 6 to 20 feet thick. At one place a section is exposed 3 miles in length and 56 feet thick. An estimate places the amount of accessible coal in this district at 100,000,000 tons. Some mines are successfully worked. Within 6 miles of Dunedin is an important basin called the Green Island and Saddle Hill. Two of the seams are, respectively, 7 and 9 feet thick, and successfully worked. There is an area of 10 square miles near Green Island containing a seam 18 feet thick. Only 6 feet are worked, however, as the roof is soft and timber is not plentiful for support; so two-thirds of the coal is lost. Another great area of brown coal is found on the western seaboard of Otago, east of the Kakamii Mountains. At Kartangata there is a field of 40 square miles. The seams here are 27 feet thick, and the coal is good, having a hard, splintery fracture and laminated structure.

The *black* or *pitch coal* covers large areas in the districts of Auckland, Nelson, Canterbury, and Otago. The coal belongs to the Mesozoic age. A pure seam is opened 70 miles north of Auckland, and another seam on the Kawakawa River. The diamond drill has been used in the developments, and shows the existence of several other beds. The Bay of Islands Coal Company has the largest mines. The coal is hoisted, and then hauled to, and loaded into, steamships, and shipped to San Francisco and other points. An analysis of the coal is given below.

Coal is also mined at the Kamo colliery, 25 miles distant. It is thought that these seams are the same, and that others exist near them, showing one vast bed between Kamo and Kawakawa. The seams at present worked are 11 feet thick. The color of the coal is black, lustre resinous, fracture and cleavage irregular and granular.

Analyses.		
	Bay of Islands.	Kamo.
Fixed carbon.....	57.20	56.0
Volatile matter.....	36.00	39.75
Moisture	4.60	2.44
Ash	2.20	0.61
Sulphur	...	1.20
	100.00	100.00

The coal-mines of the South Island exceed those of the North Island in number, but are generally smaller. The seams are thick, but have not been worked to their greatest extent. The production of coal at all the mines, and the importation of all coal to New Zealand, are given:

	Raised in colony.	Imported.
1878	162,218 tons.	174,148 tons.
1879	231,218 "	158,076 "
1880	299,923 "	123,298 "

The cost of coal is \$2.44 at New Castle; freight to San Francisco is \$3.32; price in San Francisco is \$6.75.

The coal-fields of the Mokau district have been examined by Dr. Hector, who reports that the coal-formation there is of considerable extent, the outcrops having a width of two miles and stretching from Kawhia Harbor toward the upper part of the Wanganui River. The beds appearing on the Mokau River are from 2 to 6 feet in thickness, and the coal is excellent for steam purposes. Limestone also abounds in this district, and a deposit of brown hæmatite iron ore 50 feet thick has been traced for a distance of two miles.

NOTES FROM FOREIGN COAL-FIELDS.—The following fresh items of interest concerning other European coal-fields and their product are principally taken from the United States consular reports:

India.—The consumption of coal by railways, manufacturing, and steamers amounts to 1,500,000 tons, of

which 600,000 tons are brought from Europe and Australia, and the rest mined in the country.

France.—*Production of Coal in France, 1880–81.*

	Tons.	
Production, 1880—	19,361,564	1881, 19,909,057
Pas de Calais, " "	4,844,323	" 5,320,616
Nord, " "	3,701,589	" 3,668,733

TABLE XLVIII.—*Imports and Exports of Coal and Coke.*

	Coal.		Coke.	
	Imports.	Exports.	Imports.	Exports.
1879.....	7,662,385	513,938	760,529	20,589
1880.....	8,451,129	546,455	943,416	40,905
1881.....	8,106,761	724,885	1,110,974	24,514

For the year 1880 the consumption of coal in France was distributed as follows, according to *La Houille*:

Railroads.....	2,499,000, or	9.6 per cent.
Ocean steamers.....	450,000 "	1.8 "
River steamers.....	112,000 "	0.4 "
Mines	1,112,000 "	4.4 "
Other industries.....	3,819,000 "	15.1 "
Iron and steel works.....	4,546,000 "	17.9 "
Other metallurgical works.....	141,000 "	0.6 "
Salt-works.....	115,000 "	0.5 "
Domestic fuel.....	12,606,000 "	49.7 "

Sweden and Norway.—The output of coal in Norway and Sweden in 1881 was very nearly 97,684 tons. This coal is all mined in the extreme south of Sweden, chiefly at Höganäs and vicinity; it is very hard, and requires a very strong draught; it has not, as yet, been successfully employed for smelting purposes, its chief use, at present, being for locomotives and factory-engines; it sells in the market at about the price of Scotch coal, being usually about 2s. less than Newcastle coal. The output in 1881 is by far the largest ever reported, though this coal has been mined since 1797. Two seams have been worked, one at a depth varying, according to a regular dip, from 30 to 60 metres (33½ to 66½ yards), and 15 to 44 centimetres (6 to 17 inches) thick, and the other 24 metres (nearly 79 feet) lower, 1.42 metres (4 feet 8 inches) thick. Swedish engineers acknowledge that they are not thoroughly acquainted with the extent of this coal-formation, though numerous bore-holes have been put down and shafts sunk. The measures contain coal of inferior quality, as well as fire-clay.

Germany.—The information contained in Tables XLIX., L., LII., and LIII., obtained from official reports of the Government, is of importance on account of the high rank of Germany among the coal-producing countries.

Breslau.—The official report concerning the coal and metal industries of Upper Silesia for the year 1880 gives some interesting statistics. It appears that women and children are still employed in large numbers in the mines and smelting-works of that district. The 88 coal-mines of the district produced in that year 10,010,721 tons of coal, and gave employment to 32,517 persons, of whom 2580 were of the female sex. The mines likewise found work for 962 horses, and for 462 steam-engines of 36,356 horse-power. The 32,517 laborers were paid, in all, \$4,075,761, or \$125 per head.

The following table gives the number of persons employed in the mines in Upper Silesia, their age, sex, and aggregate wages:

TABLE XLIX.

Sixteen years and upward.		Under sixteen years.		Wages.
Males.	Females.	Males.	Females.	
29,865	2,567	78	13	\$4,065,671

Coal and Lignite in Prussia.—Of the countries in Europe, Prussia is next to England in its coal-production, and ranks third among the coal-producing countries in the world. During the year 1881, 43,780,545 tons of coal were raised, in addition to 10,412,153 tons of lignite. There were, altogether, 386 coal-mines and 446 lignite-mines; the former employing a total of 162,179, and the latter 19,959 workmen.

TABLE L.—*Production of Mines in the German Empire and Luxembourg during 1881.*
BITUMINOUS COAL.

States, subdivided into Mining Districts.	Mines reporting for 1881.			
	Production in 1881.		Production in 1880.	
	Tons, 1000 kilos, 2214 lbs.	Value, Marks.	Tons, 2214 lbs.	Value, Marks.
I. Prussia—Breslau district.....	13,110,848	58,877,591	12,656,764	57,186,762
Halle "	29,657	273,157	35,114	313,328
Dortmund "	23,644,755	108,243,307	22,495,204	102,953,856
Bonn "	6,608,623	46,863,021	6,627,534	47,551,451
Klausthal "	386,662	2,716,885	358,328	2,611,669
Total Prussia.....	43,780,545	216,973,961	42,172,944	210,617,066
II. Bavaria—Munich district.....	290,496	2,606,962	320,520	2,858,930
Bayreuth "	53,851	416,914	52,601	391,988
Zweibrücken "	175,475	1,417,776	183,135	1,528,932
Total Bavaria.....	519,822	4,441,652	556,256	4,779,850
III. Saxony ¹	3,717,368	25,904,061	3,621,048	25,399,641
IV. Baden.....	9,390	90,985	10,805	106,537
V. Saxe-Meiningen	819	7,189	2,802	23,671
VI. Saxe-Coburg-Gotha	108	2,223	152	3,119
VII. Schaumburg-Lippe.....	108,865	965,555	100,169	918,555
VIII. Alsace-Lorraine	560,867	4,106,698	508,086	3,808,729
Total German Empire.....	48,697,784	252,492,324	46,972,262	245,657,178

BROWN COAL.

States, subdivided into Mining Districts.	Mines reporting in 1881.				Not reporting in 1881.	
	Production, 1881.		Production, 1880.		Production, 1880.	
	Tons.	Value, Marks.	Tons.	Value, Marks.	Tons.	Value, Marks.
I. Prussia—Breslau district.....	462,983	1,599,692	446,526	1,575,189	4,219	9,040
Halle "	9,574,507	28,296,892	9,127,570	27,397,444		
Bonn "	223,076	697,866	159,582	552,182		
Klausthal "	149,180	647,681	136,191	631,911		
Total Prussia.....	10,409,746	31,242,131	9,869,869	30,156,726	4,219	9,040
II. Bavaria—Munich district.....	1,884	11,004	2,409	14,312	141	940
Regensburg "	15,256	52,694	13,543	51,978		
Bayreuth "	...	...	...	...		
Zweibrücken "	1,000	3,500	1,250	4,250		
Total Bavaria.....	18,140	67,198	17,202	70,540	141	940
III. Saxony.....	592,895	1,735,421	586,090	1,858,092	4,029	10,246
IV. Hesse.....	30,738	238,153	45,351	326,600		
V. Mecklenburg-Schwerin	12,341	46,050	11,900	59,500		
VI. Saxe-Weimar.....	257	1,683	431	2,834		
VII. Braunschweig	273,683	891,694	234,854	793,443		
VIII. Saxe-Altenburg.....	682,864	1,776,704	657,549	1,169,087		
IX. Anhalt	766,137	2,350,456	659,911	2,083,580		
X. Schwarzburg-Rudolstadt.....	47,050	161,315	41,824	143,397		
XI. Reuss (younger line).....	5,070	10,135	7,015	16,530		
XII. Alsace-Lorraine.....	3,206	10,831	3,284	9,458		
Alsace.....	...	...	...	...		
Total German Empire.....	12,842,127	38,531,771	12,135,280	36,689,787	8,389	20,226

¹ Collieries producing 1304 tons, valued at 7738 marks, in 1880, not reporting in 1881.

TABLE LI.—*Analyses of Foreign Coals [from Kerl's Metallurgy].*

Name of Coal and Country.	Fixed car- bon.	Hydro- gen.	Nitro- gen.	Sul- phur.	Oxy- gen.	Ash.	Name of Coal and Country.	Fixed car- bon.	Vol. matter.	Nitro- gen.	Sul- phur.	Oxy- gen.	Ash.
BORNEO.							SPAIN.						
Labuan.....	64.52	4.74	0.80	1.45	20.75	7.74	Coals of Asturias:	66.00	31.80	...	...	...	2.20
Three-feet seam.....	54.30	5.03	0.98	1.14	24.22	14.32	One-yard coal.....	67.90	30.90	...	...	...	2.10
Eleven-feet seam.....	70.31	5.41	0.67	1.17	19.19	3.23	Three-yard coal.....	35.00	53.00	...	...	...	12.00
VAN DIEMEN'S LAND.							Mine of Clausel.....	53.00	40.00	...	...	...	7.00
Fingal.....	57.21	3.58	1.20	1.32	7.80	29.09	Mean of five other mines	...	...	...	...	...	...
Tasman's Peninsula.....	65.54	3.36	1.91	1.03	1.75	26.41	BELGIUM.						
Whale's Head.....	65.86	3.18	1.12	1.14	7.20	21.50	Near Mons.....	65.30	33.00	...	...	...	1.70
Adventure Bay.....	80.22	3.05	1.36	1.90	4.80	8.67	Liège.....	78.30	17.80	...	...	...	3.90
Sydney.....	82.39	5.32	1.23	0.70	8.32	2.04	Bonnier.....	91.38	8.00	...	...	...	6.12
Formosa.....	78.26	5.70	0.64	0.49	10.95	3.96	ASIA.						
Vancouver's Island.....	66.93	5.32	1.02	2.20	8.70	15.83	Assam.....	60.70	38.50	...	...	...	0.80
Conception Bay.....	70.55	5.76	0.95	1.98	13.24	7.52	Birmese coast.....	33.00	66.40	...	...	...	0.60
Trinidad.....	65.20	4.25	1.33	0.69	21.69	6.84	Turkey in Asia.....	62.40	31.80	...	...	...	5.80
Dresden.....	80.40	4.60	0.11	...	14.60	...	Syria.....	14.00	72.60	...	...	...	13.40
France.....	85.00	4.88	...	...	4.53	7.00	".....	24.40	68.00	...	...	...	7.60
							ITALY.						
							Principality of Monaco.	49.20	29.90	...	...	...	20.90
							EUROPEAN CONTINENT.						
Nova Scotia, Pictou.....	60.73	26.76	...	...	...	12.51	Mean analysis of	79.15	7.37	...	...	...	13.25
Cape Breton, Sydney.....	67.57	26.93	...	...	...	5.50	twelve varieties of						
Isle of Cuba.....	34.97	63.00	...	...	...	2.03	of anthracite.						

TABLE LII.—Statement showing the Quantities and Values of the Product of German Mines in the Years 1871 to 1880.

Year.	Pit Coal.		Brown Coal.	
1871	646,212 cwt.	\$51,968	186,621 cwt.	\$6239
1872	732,740	70,607	198,396	7020
1873	800,630	96,068	214,563	8242
1874	790,209	92,150	236,269	9337
1875	823,600	70,701	228,089	8779
1876	845,996	62,755	244,112	9149
1877	825,651	51,639	235,406	8552
1878	870,975	49,484	240,462	8111
1879	924,565	48,957	451,790	8356
1880	1,034,047	58,567	267,264	8754

TABLE LIII.—Prices of Pit Coal (Average in 1880 and 1879) in Several German Cities.

Cities.	Marks per 1000 kg. (= 22 cwt.).	
	1880.	1879.
Berlin.....	7.04-4.52	3.80-4.04
Breslau.....	1.42-2.38	1.42-2.33
Dantzig.....	3.09-3.33	2.85-3.09
Dortmund.....	1.42-1.90	1.19-1.90
Düsseldorf.....	1.42-1.90	1.19-1.42
Essen.....	1.42-1.66	0.95-1.19
Hamburg.....	3.33-3.80	3.57-3.80

TABLE LIV.—Statement showing the Domestic Exports of Coal from the several Custom Districts of the United States for the years ended June 30, 1880 and 1881. [Specially furnished by the U. S. Census Bureau.]

Customs Districts.	Year ended June 30, 1881.				Year ended June 30, 1880.			
	Anthracite.		Bituminous.		Anthracite.		Bituminous.	
	Tons.	Dollars.	Tons.	Dollars.	Tons.	Dollars.	Tons.	Dollars.
Alexandria, Va.....	7	44	90	360				
Baltimore, Md.....	...	...	29,079	114,365	22	114	44,888	152,058
Boston and Charlestown, Mass.....	4,244	23,071	...	...	1,260	6,748	309	1,503
Bristol and Warren, R. I.....	71	500						
Buffalo Creek, N. Y.....	5,293	24,559	266	692	6,504	19,459	406	661
Champlain, N. Y.....	81,146	361,285	...	...	47,926	159,065		
Cuyahoga, Ohio.....	...	...	69,710	222,683	...	...	103,190	267,831
Delaware, Del.....	...	...	30	120	...	...	100	350
Detroit, Mich.....	27,158	167,923	...	...	22,366	110,807	50	250
Duluth, Minn.....	...	...	...	...	...	...	2	11
Dunkirk, N. Y.....	...	...	...	...	4	20		
Erie, Pa.....	...	...	5,103	15,283	6	24	6,473	18,395
Fairfield, Conn.....	...	...	...	...	55	182		
Genesee, N. Y.....	28,081	130,549	199	828	20,673	65,517	406	1,360
Georgetown, D. C.....	...	...	800	2,800	...	...	6,285	20,039
Huron, Mich.....	...	...	15,931	79,135	...	...	3,091	14,102
Machias, Me.....	122	537	...	...	3	12		
Miami, Ohio.....	...	...	7,032	23,311	...	...	11,819	34,546
Minnesota, Minn.....	...	...	2,424	22,647	712	4,505	68	334
Mobile, Ala.....	...	...	...	...	...	...	40	180
Newark, N. J.....	1,159	5,109	...	...	1,739	4,993		
New Bedford, Mass.....	79	400	...	...	1	4		
New Haven, Conn.....	40	190	...	...	15	50	55	319
New Orleans, La.....	...	...	2	16	...	...	25	126
New York, N. Y.....	66,271	278,999	1,403	11,266	52,437	175,618	1,041	4,555
Norfolk and Portsmouth, Va.....	470	2,435	2,182	11,002	...	...	3,431	16,255
Oswegatchie, N. Y.....	7,494	24,683	...	...	200	982		
Oswego, N. Y.....	211,785	956,033	...	...	219,781	749,873		
Passamaquoddy, Me.....	472	2,700	...	...	363	1,550		
Pensacola, Fla.....	...	...	...	...	...	...	159	596
Perth Amboy, N. J.....	6,692	27,001	9,604	53,746	3,129	9,998	2,502	12,889
Philadelphia, Pa.....	21,368	84,123	37,812	144,465	14,597	49,469	33,604	118,927
Portland and Falmouth, Me.....	4	26	...	...	17	78		
Providence, R. I.....	50	275						
Puget Sound, Wash.....	...	...	694	2,112				
Richmond, Va.....	...	...	837	6,696	...	...	2,173	17,994
San Diego, Cal.....	...	...	1	10				
Sandusky, Ohio.....	...	...	7,275	21,901	...	...	1,982	5,948
San Francisco, Cal.....	32	561	422	5,047	91	1,110	505	5,815
Superior, Mich.....	...	...	...	...	10	54	30	135
Teche, La.....	...	...	25	145				
Vermont, Vt.....	170	925	117	902	715	2,669		
Total.....	462,208	2,091,928	191,038	739,532	392,626	1,362,901	222,634	695,179

The relative values and quantities of the exports from and the imports to the United States of anthracite and bituminous coal are shown in Table LVI. In comparison with these are given the exports and imports of iron ore and manufactures of iron. In coal the total value of exports is but little less than the value of imports, while in iron and iron ore the excess of imports over exports is very great. This table shows very plainly the distribution according to the various countries. The United States obtains its principal imports of coal from England (gas coal) and Nova Scotia, which supplies some of the extreme Eastern points, while British Columbia and Australia furnish their coal to San Francisco and the extreme Western ports. The statement of domestic exports, shown in Table LIV., exhibits the fact that the principal part of the coal exported from the United States goes to Canada through various ports.

TABLE LV.—Value of Imports for Consumption in the United States.

Coal, value.	Duties.	Per cent.	Iron, value.	Duties.	Per cent.
\$2,073,954.78	\$516,006.95	24.09	\$32,991,038.45	\$12,115,096.22	36.07

FIRE-CLAYS OF THE COAL-MEASURES.

Fire-clays may be looked upon as a special term for the gray clays of the coal-measures, interstratified with, and generally in close proximity to, the seams of coal, in beds varying from a few inches to many feet in thickness. They are locally known as "clunches" and "under-clays," and are supposed to represent the soil that produced the vegetation from which the coal was formed. The association of coal with the fire-clays of the

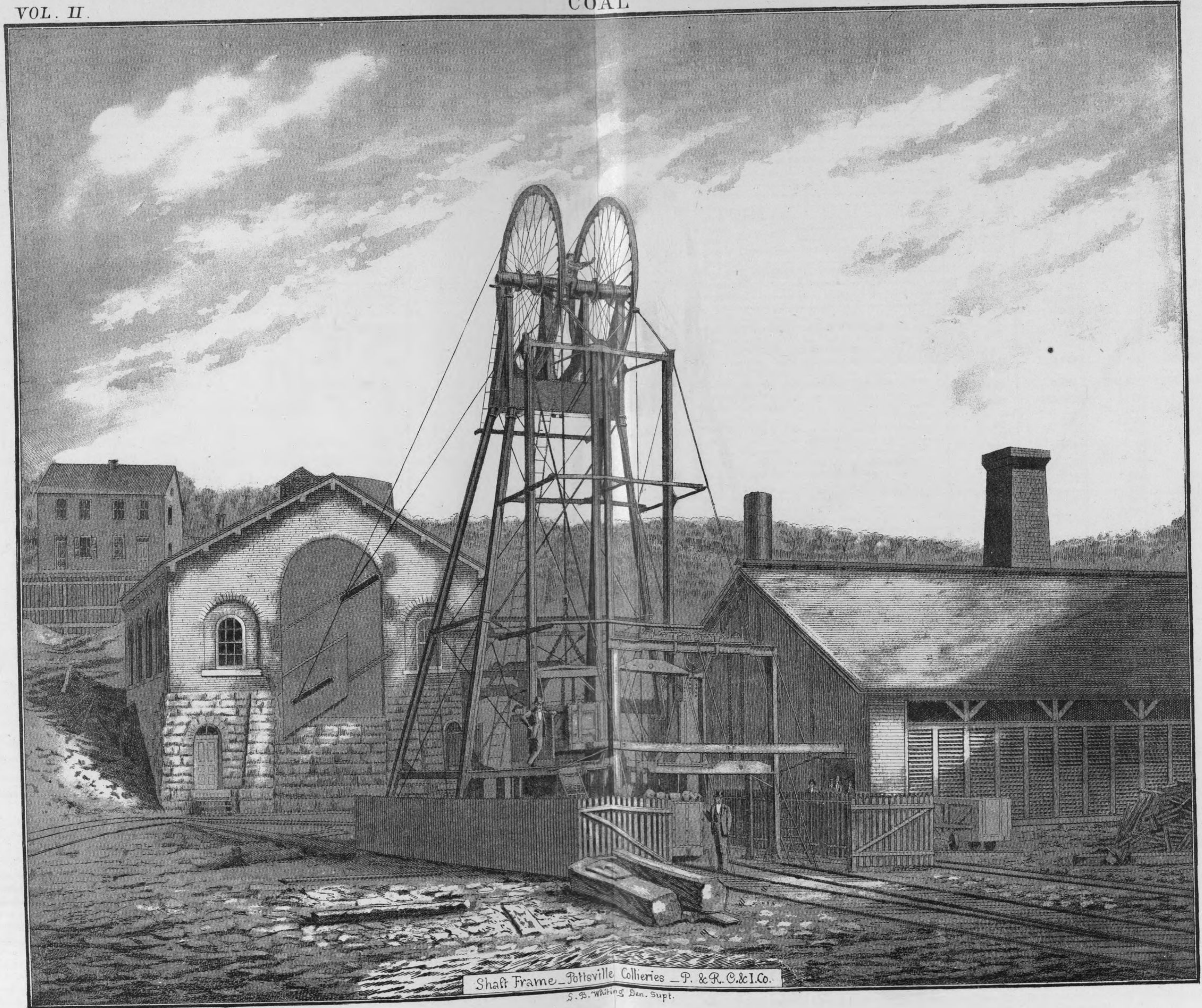


TABLE LVI.—Imports and Exports of Coal, Iron Ore, and Iron to and from the United States, 1880–1881.

Imports to the United States for the year ending June 30, 1881 [from Gov. Reports].			Exports from the United States to June 30, 1880 [from Gov. Reports].			
Country.	Bituminous Coal.		Anthracite Coal.		Bituminous Coal.	
	Tons.	Value.	Tons.	Value.	Tons.	Value.
Argentine Republic.....	8	\$33				
China and Hong-Kong.....			4,569	\$20,147		
Belgium.....	50	154				
Central American States.....			83	581	52	\$715
Brazil.....	109	411	1,654	7,609	250	1,024
Chili.....			2,127	10,891		
Denmark.....	30	124				
France.....	49	122	30	161	320	1,582
Dutch West Indies.....					500	1,925
French " ".....	30	91	1,404	5,577	625	2,400
Danish " ".....			3,847	15,649	5,397	20,038
French Possessions in Africa and adjacent } islands.....	9	20				
Miquelon, Langley, St. Pierre Islands..			198	940		
Germany.....	519	1,432			200	1,000
England.....	217,160	677,385	471	2,440	1,552	7,760
Scotland.....	30,092	84,416				
Ireland.....	50	128				
Russia on the Baltic and White Seas.....					110	660
Gibraltar.....	55	105				
New Foundland and Labrador.....			1,949	8,602		
Nova Scotia, New Brunswick, and Prince } Edward Island.....	131,647	250,429	48,861	198,278	1,297	8,756
Quebec, Ontario, Manitoba, and the North- } west Territory.....	983	5,249	362,477	1,670,847	108,057	387,382
British Columbia..	207,432	735,873	17	323	55	675
Uruguay.....			531	2,218		
British West Indies.....	56	200	1,268	8,602	491	1,804
British Guiana and Honduras.....	2	4	320	1,723	2	16
British Possessions in Africa.....	293	634				
Tripoli, Tunis, Morocco, and Ascension.....						
British Possessions in Australasia.....	88,464	251,288				
Italy.....	50	112	130	500		
Japan.....			280	1,133		
Mexico..	34	170	1,926	9,105	1,396	7,326
San Domingo.....			1,205	4,703		
Peru.....	20	82				
Hawaiian Islands.....			1,987	10,967	775	2,991
Azores, Madeira, Cape de Verd Islands, and } Portugal.....	12	26	17	95		
Porto Rico.....			166	830		
Spain.....	80	200				
Cuba.....	19	59	24,853	105,021	63,248	267,541
Hayti.....			232	1,158		
Turkey in Africa.....	100	205				
Venezuela.....			606	2,729	586	2,373
United States of Colombia.....	4	10	961	4,338	6,125	23,560
Total.....	677,357	\$2,008,962	462,169	\$2,095,167	191,038	\$739,528

IRON ORE.				
Countries.	Imports for year ending June 30, 1880.		Exports for year ending June 30, 1881.	
	Cwt.	Value.	Cwts.	Value.
England.....	115	\$1,183	720	\$9,000
Quebec, Ontario, Manitoba, and North-west } Territory.....	88,321	164,623	9,238	42,499
Total.....	88,436	\$165,806	9,958	\$51,499
IMPORTS OF IRON FROM ALL COUNTRIES:	Pounds.		Pounds.	
	Value.		Value.	
Pig iron.....	935,981,466	\$8,766,461	8,303,441	\$117,723
Railroad bars or rails of iron.....	273,979,293	3,824,720	2,164,648	48,246
" " " steel.....	403,159,482	6,507,048	146,168	6,076
Steel ingots, bars, sheets, and wire.....		6,218,453	346,333	37,634
Old rails and scrap iron.....	535,000,000	6,381,608		
Castings, bar, boiler, band, hoop, & scroll iron.				
Sheet iron, anchors, cables, and chains.....	135,956,422	3,582,436	10,028,874	13,958,571
Cutlery, saws, files, tools, and other manu- } factures of iron and steel.....		11,119,021		
Total.....	2,284,076,663	\$46,399,747	20,989,464	\$14,168,250

Carboniferous formation has localized the manufacture of fire-bricks, and by far the larger proportion are produced in the coal-measure districts. The fire-clays of the coal-measures vary as regards their refractory character, not only in the different coal-fields, but the individual strata in close alternation often present sudden

variations, refractory beds being interstratified with use- less strata largely charged with disseminated carbonate of iron. The gray color of the coal-measure clays is largely due to the presence of this mineral. The average contraction of the coal-measure fire-clay is a little over 2 per cent.

The importance of these clays in England may be realized from the fact that in 1880 they produced 3,062,544 tons, valued at £1,635,650. The product consists of fire-clays, potter's clay, china clay, and stone.

Prof. J. P. Lesley, State geologist of Pennsylvania, gives his theory of the formation of fire-clay as follows: "The thick and valuable deposit described and repeatedly alluded to in this report as underlying the Kittanning coal

is but one of a number of such in other parts of the Appalachian coal-fields, equally stimulating to the curiosity of the geologist. Since Sir W. E. Logan first published the fact that every true coal-bed has its under-clay, efforts have been made to explain its cause, but not with entire success. I make the following suggestion: A peat-bog, and still more truly a lake, invaded on all sides by sphagnum vegetation, must have a water-circulation set up by evaporation from the central surface and by percolation from the surrounding land. But this circulation must be feeble, capable of carrying only the finest mud. In the course of ages the amount of clay—all of it fine, and all of it of one kind—thus abstracted from the dry grounds and transferred to the peat-filling hollows, must be very large. The dry grounds are chiefly a mixture of fine gravel, rounded grains of quartz, and rounded grains of feldspar. The pebbles and sand are not soluble; the feldspar is. The former remain behind; the latter follows the in-draft, and settles beneath the evaporating surface through and beneath the floating peat. If, however, the area of forming coal-bed be surrounded by clay land, instead of sandy or gravelly land, then the percolation is reduced to a minimum, and with it the solution of feldspar. The supply of water in the pool or marsh is kept up from the land-surface, and not from the underground; and under such conditions the incoming rain-water must be much less muddy and the deposit of under-clay is reduced to a minimum. We might look then for a law somewhat like this: Where a coal-bed has a heavy under-clay, the margins of its basin were probably sand- or gravel-banks. Where a coal-bed (of such a size as to argue for its great age) has a small under-clay, it grew within a circle of older light clay deposits. Where a limestone underlies a coal-bed, stretches of exposed older lime-deposits must have been within drainage-reach all around or on some principal side of it."

"The corollary is, that the thickest under-clays belong to beds next or near the great sand-rock members

of the system; which is a fact: the most persistent fire-clay beds belong near the base of the Lower Productive coal-measures. Another consequence of such a law would be, that sand-rocks lying geologically below great under-clays should be more open and discreet, purer sands and gravels, than others that had not been robbed of so large a quantity of interstitial clay. I say *geologically* close below, for of course the coal-bed itself

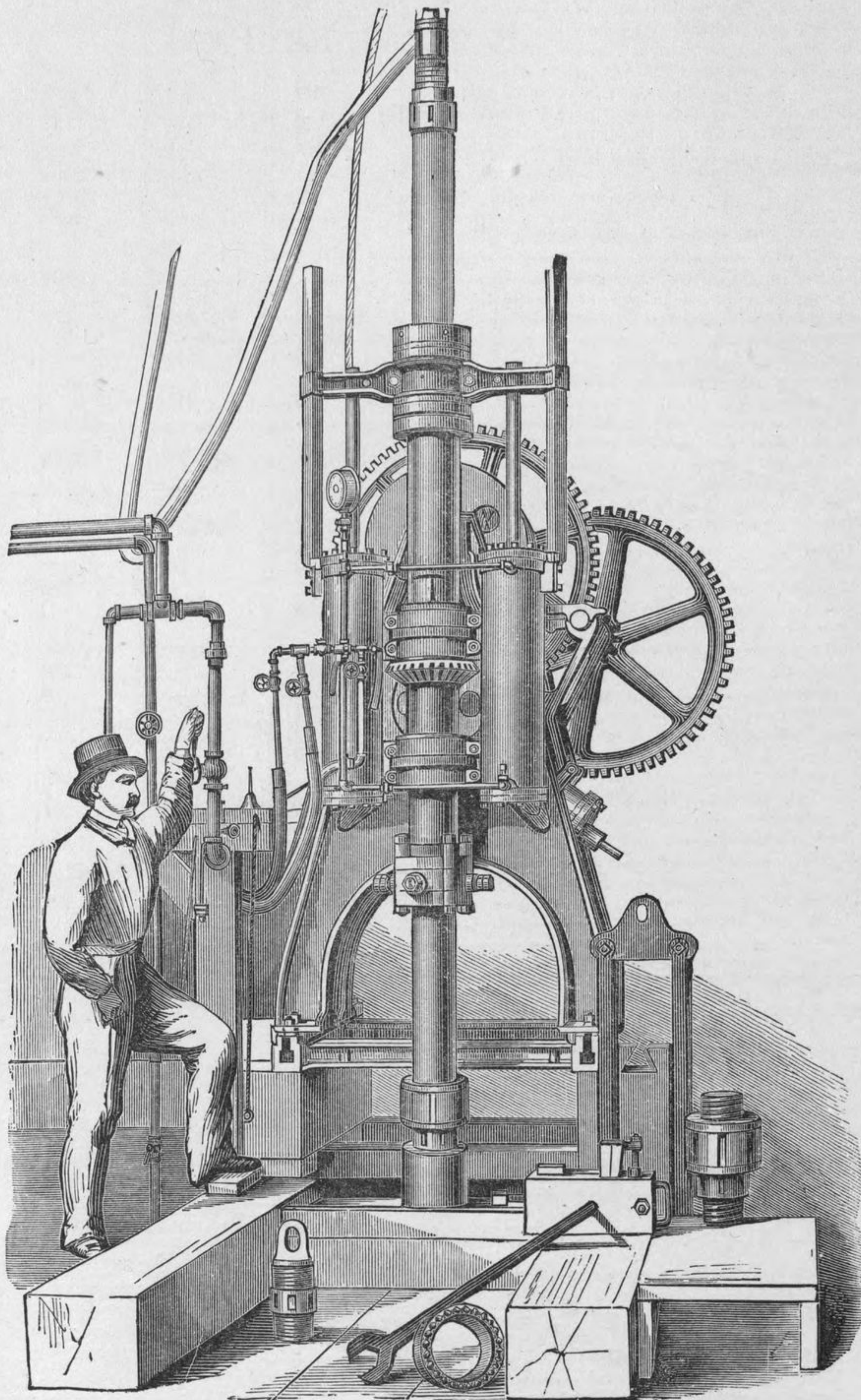


FIG. 37.—Diamond Drill.

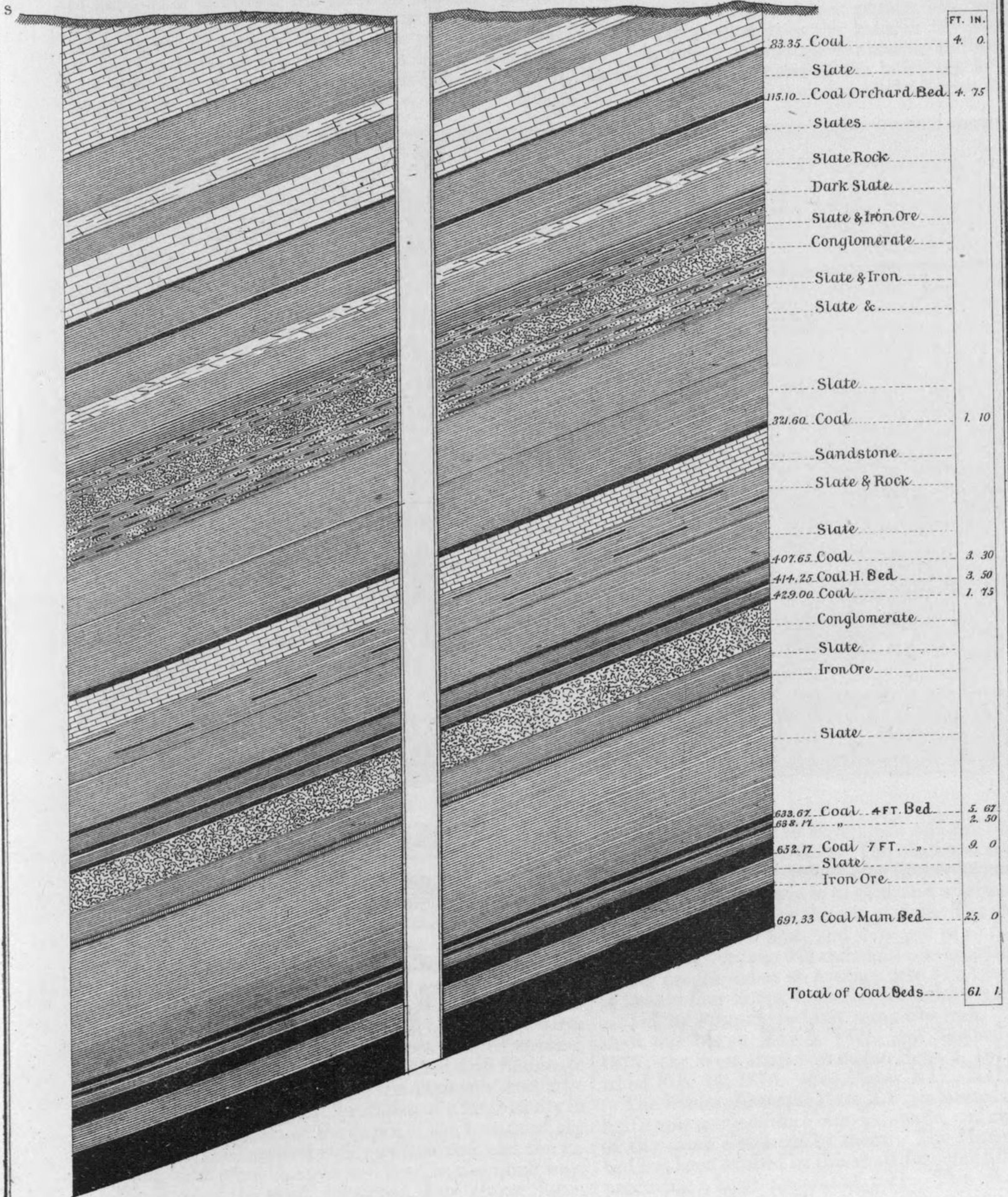
would protect from this operation a sand or gravel deposit lying actually or topically underneath it. When the surrounding land contained iron I would expect ball ore in the fire-clay. In fact, the ponds of New England receive such accumulations."

MINING OPERATIONS.

DEEP COAL-SHAFTS.—The Pottsville shafts of the Philadelphia and Reading Coal and Iron Company,

CROSS SECTION
(OF)
WADESVILLE SHAFT
NEAR
PORTSVILLE, PA.
BY
W. S. SHEAFER, M.E.

→ N



near Pottsville, Pa., are nearly 1700 feet in depth—much the deepest coal-shafts in America—and were put down very quickly by means of the diamond drill. These shafts, two in number, as required by the Pennsylvania mining law, are situated 700 feet apart. They are known as the East and the West shafts. The former is intended solely for raising coal: it is 16 feet long and 13 feet 10 inches wide outside of the timbers, and is divided into two compartments. The West shaft is 25 feet 8 inches long outside of the timbers, and is divided into three compartments, two of which are used for hoisting coal, men, timber, rock, etc., and the other for an upcast for ventilation of the collieries. In sinking these shafts it was determined to dispense with the use of hand-labor in drilling the holes for blasting, and the diamond drill (see fig. 37) was chosen as the best instrument for the purpose, adopting a new plan; which was to sink the shaft down to the solid rock in the usual way, and then by a number of diamond drills, each driven by its own steam-engine, to bore a series of holes

about 300 feet deep, which should be so arranged as to dispense with further drilling for blasting until that depth had been reached. In the East shaft twenty-five holes were bored, and in the West shaft thirty-five. The bit adopted for the drill, which has since come into general use, differed from the ordinary diamond bit in use up to that time in being concave instead of convex. It has circular grooves and small cylindrical holes for the outlet and circulation of water, which is forced down through the centre of the boring-rods. The rods are made of gas-pipe $1\frac{1}{2}$ inches in diameter. The water takes up the fine sand or pulverized rock, carries it away from under the bit, and then rises on the outside of the rods or pipes to the surface.

When all the holes were bored to a depth of from 250 to 300 feet, the machines, pumps, etc., were taken to the other shaft to bore the holes in it. During the boring in one shaft the rock was blasted and removed in the other. The diameter of the holes was in all cases $1\frac{3}{4}$ inches. On the completion of the boring they were

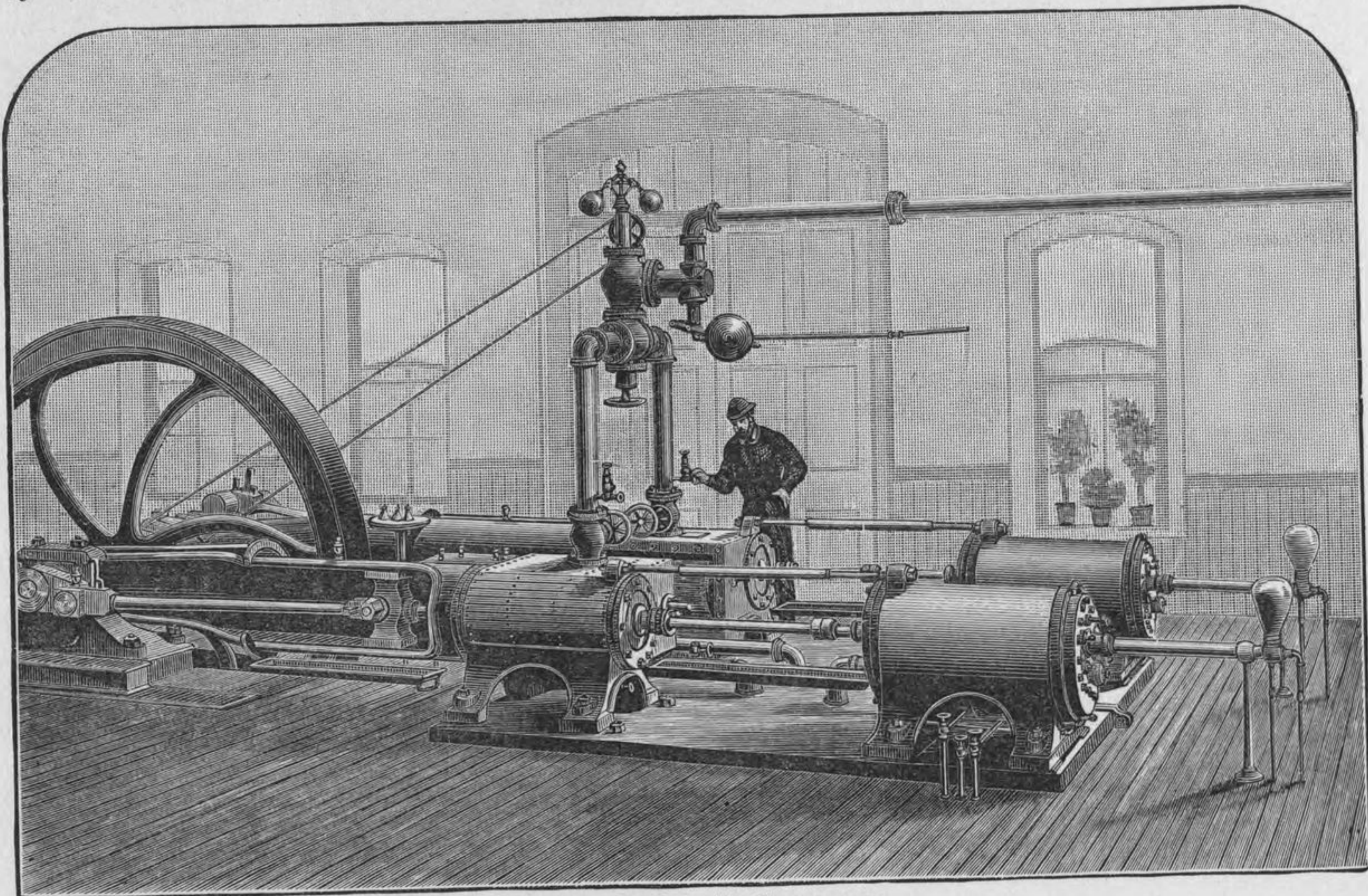


FIG. 38.—Duplex Air-Compressor.

filled to the top with sand, and the work of blasting and removing the rock was begun.

The operation of blasting was conducted as follows: The miner, by means of a small pump, such as is used with ordinary boring-rods, removed the sand from nine holes to a depth of from 3 to 4 feet. Clay was then forced into each hole, so as to make a plug from 6 inches to 1 foot long, and on the top of this a cartridge of dynamite was placed, and the holes were then tamped with clay. The cartridges were connected together by wires leading to a galvanic battery, and were all fired at once. The explosion was produced by a cap filled with fulminate of mercury. The result of the simultaneous discharge of these nine holes was the formation of a large cavity in the centre of the shaft to the depth of the bottom of the cartridges. The loosened rock was removed, and the remaining holes were charged and fired in the same way.

The sides of the shaft preserved their proper form, and no hand-blasting was necessary for trimming them up. When all the holes around the shaft had been fired the miner began again with the nine central holes; and the work went on in this manner until the depth to which the holes had been bored was reached; the ma-

chines were then set to work again and the holes bored from 250 to 300 feet deeper. The shaft was timbered as the work proceeded—yellow-pine timber 12 inches by 12 inches, placed at first skin to skin, and afterwards 2 feet apart, being used below the iron girders. The guides were of Carolina yellow pine, and were put in as required.

The drills were run day and night continuously, and the boring progressed at an average rate of 34 feet per day of twenty-four hours, including all delays, except those caused by stopping to blast away the rock. The East shaft was begun May 5, 1871, and finished Aug. 14, 1875; the West shaft was begun Sept. 1, 1871, and finished Feb. 14, 1876. (See Plates XII., XIII., XIV.)

The *Wadesville shaft* (Plate XV.) is located about one-half a mile north of the Pottsville shafts, and cuts 661 feet of the same strata cut by them. The Mammoth coal-bed has been worked by this shaft for some fifteen years, producing a large amount of coal. This shaft was located in 1864 by the Messrs. Sheaffer, mining engineers, cutting the Mammoth bed at 619 feet from the surface.

The report of the mine inspectors of Great Britain for 1882 says:

"The leading shaft at the Ashton Moss colliery, Ash-

ton-under-Lyne, attained on the 5th of March, 1881, a depth of 897 yards, to the floor of the Great Mine bed. This is now apparently the deepest vertical mine in the kingdom, and it is still being sunk deeper, with the view of working a lower seam in conjunction with the Great Mine. The temperature of the strata, so far as yet proved, appears to be lower than the average. At 871 yards it is stated as being, in rock, 78° Fahr., and at 897 yards, in coal, 86°. From information supplied by mining engineers and the sinkers, it appears that when about 54 yards in depth, the shaft being 18 feet in diameter gross for 16 feet when walled, a system of circle-firing was tried. A circle of eight converging shots, 6 to 6½ feet deep, 2 inches in diameter, equally distributed round a circle 12 to 14 feet in diameter, charged with about 2½ pounds of dynamite, or 20 pounds between them, was first fired, and after firing, the stuff, about 40 tons, was filled out. A circle of twelve straight-down shots, also 6 to 6½ feet deep, and equidistantly distributed round the circumference of the shaft, and charged with 2 pounds each, or 24 pounds between them, was then fired, which generally gave about 40 to 50 tons of stuff. The bottom and sides were squared off with small holes, in which powder was used. The dynamite was put into the holes in 2-ounce cartridges, and the stemming was either water or sand. The firing was by electricity, the batteries being placed in a mouth-ing about 450 yards from the surface. Partly owing to the steepness of the dip of the strata, and partly to the vibration caused in the neighborhood, this system was given up. During fifteen days over which it extended 11 yards were sunk and 7 yards walled, as compared with 15 yards sunk and walled by the ordinary way with powder and tonite. To be successful it appears there should be two shafts sinking, and the work so arranged that the men could go from one pit to the other, one set of men being set to drilling and preparing shot-holes, whilst the other set are filling out the stuff from the firing." These are representative shafts in their respective countries.

The first shaft in the Southern coal-field of Pennsylvania was commenced by Alfred Lawton in 1845, on the west side of Mill Creek, not far south of Mine Hill, in the town of St. Clair. This shaft was sunk 72 feet; then a boring penetrated to a depth of 122 feet to the Primrose bed, when it was abandoned. In 1851, E. W. McGinnis continued the shaft down to the Primrose, and then bored to the Mammoth. He met with decided success, and immediately determined to sink the shaft (10½' × 18') to the Mammoth bed. The following table shows the strata cut and the distances of some of the layers from the surface:

	Thickness.	Depth from surface.
Rock and slate.....	119 feet.	
Primrose coal.....	3 "	122 feet.
Rock and slate.....	68 "	
Holmes coal.....	4 " 6 inches.	194 " 6 inches.
Rock 64 feet, slate 10 ft.	74 "	
Coal.....	1 "	296 " 6 "
Slate.....	51 "	
Coal.....	1 " 8 inches.	322 " 2 "
Rock 54 feet, slate 18 in.	72 "	
Coal, Seven-foot vein...	8 " 6 "	402 " 8 "
Slate.....	14 "	
Mammoth White-ash...	22 "	438 " 8 "

Before continuing the enterprise of Mr. Lawton, however, Mr. McGinnis had prosecuted an extensive boring operation on East Norwegian Creek, on the lands of the Delaware Coal Company. This was begun in 1850 by a shaft sunk 170 feet deep, then by a boring to a depth of 656 feet. The following was the result:

	Thickness.	Depth from surface.
Slate and sandstone...	42 feet.	
Coal and black dirt...	18 "	
Rock and slate, } ...	431 " 8½ inches.	491 feet 8½ inches.
Black dirt.....	6 " 6 "	498 " 2½ "
Slate 4 feet 6, and } ...	25 "	523 " 2½ "
rock 4 feet 6.		
Coal.....	5 "	528 " 2½ "
Rock and slate.....	127 " 9 "	656 "

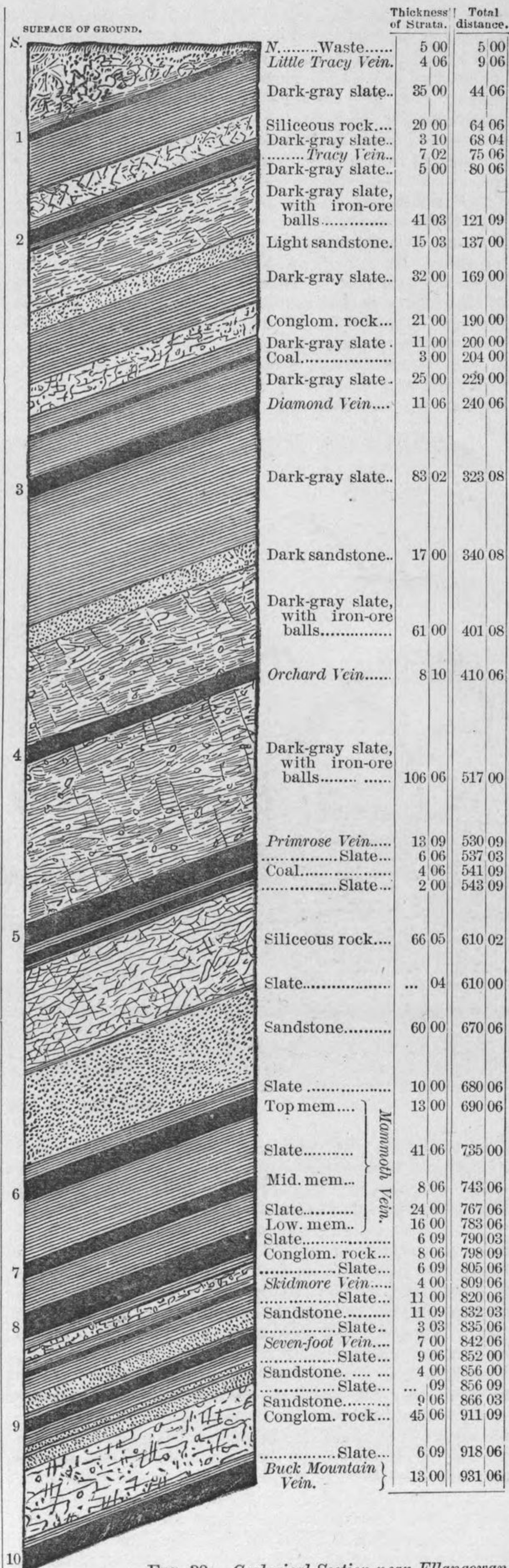


FIG. 39.—Geological Section near Ellangowan Colliery (Philada. and Read. C. and I. Co.), Shenandoah, Schuylkill co., Pa.

FIG. 1.

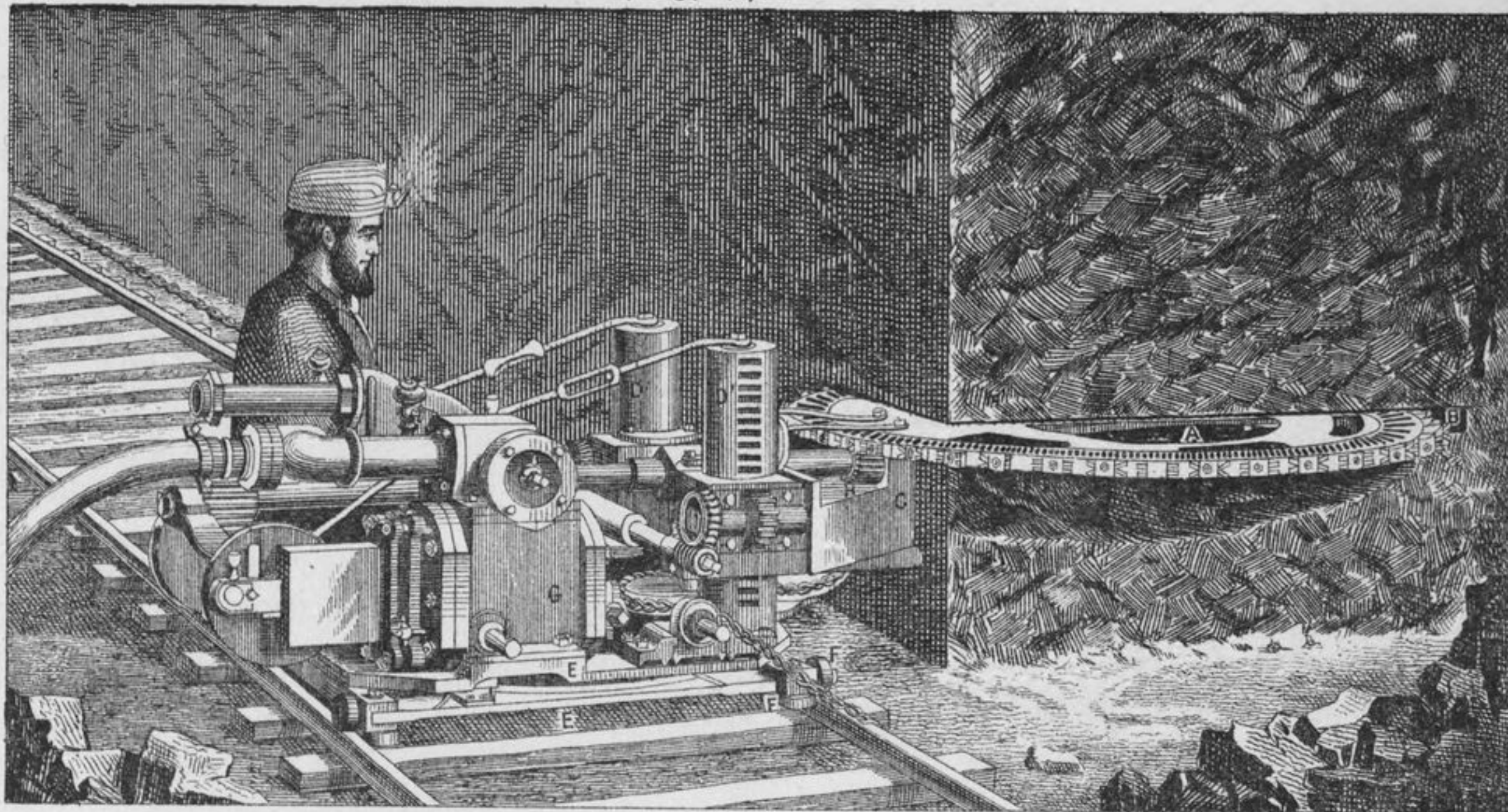


FIG. 3.

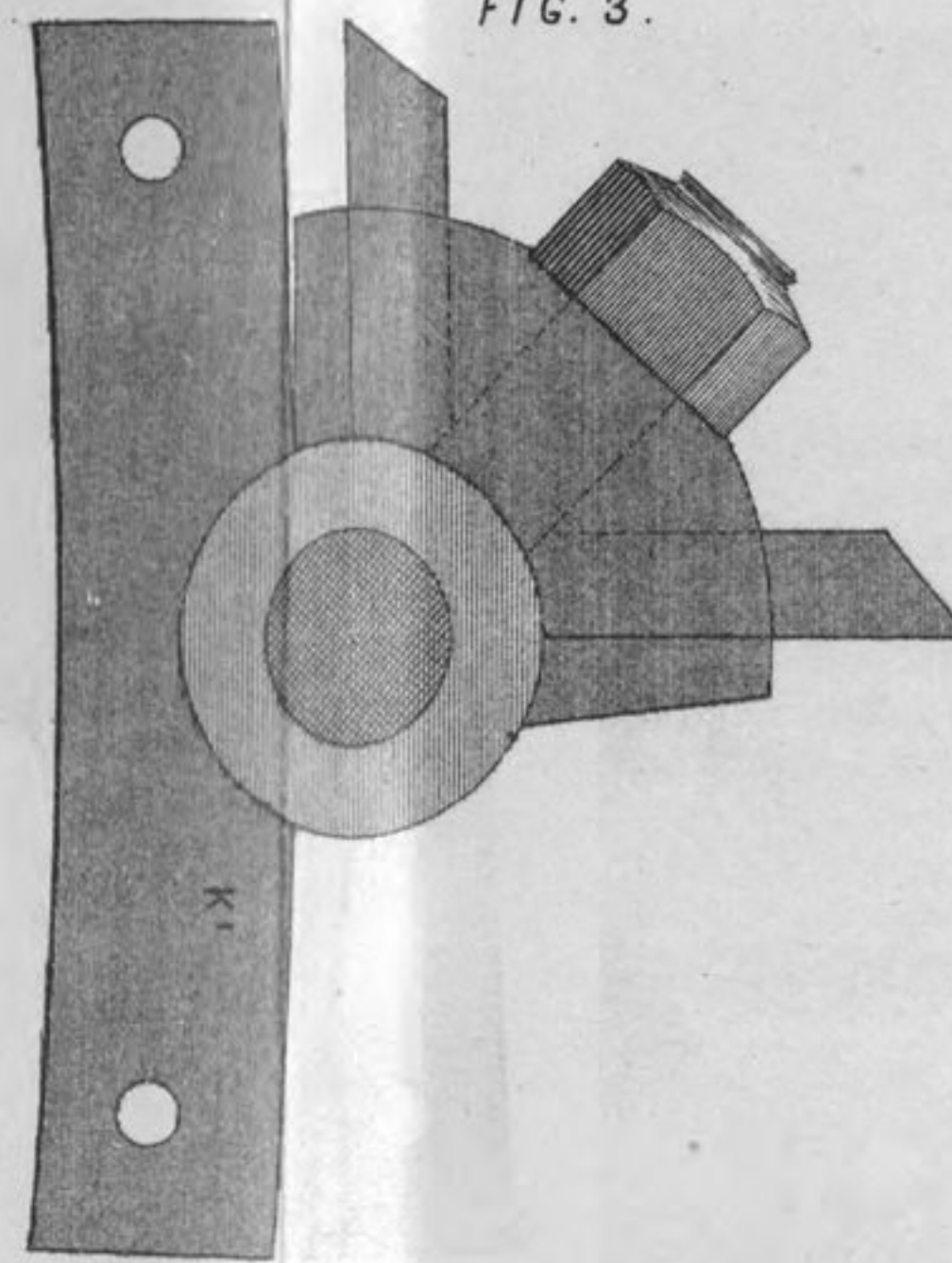
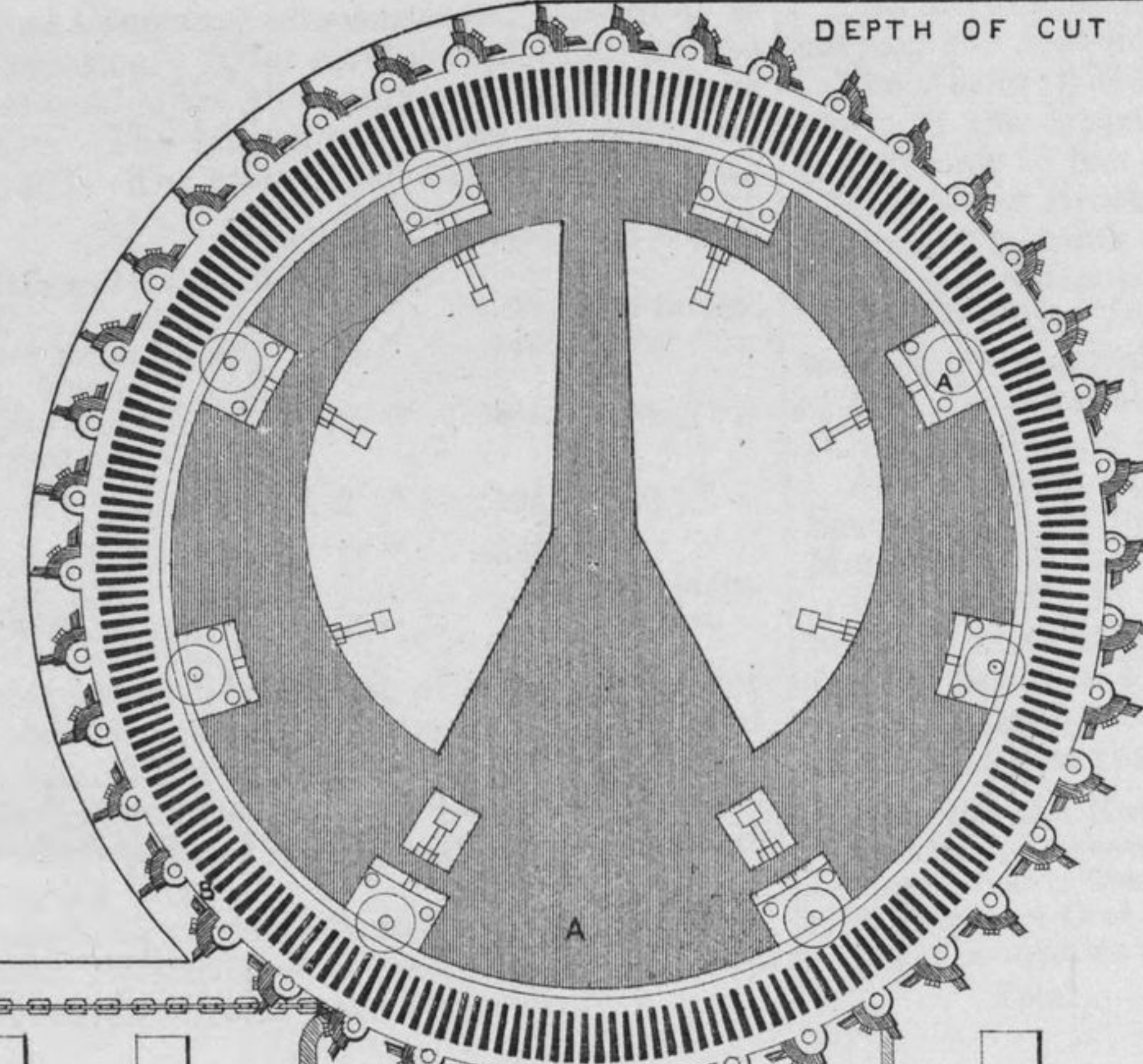


FIG. 2.

DEPTH OF CUT 56 IN



FACE OF COAL

MONITOR COAL CUTTER.

Weight	3,400 lbs.
Cylinders	9 in diam. 8 in. stroke.
Extreme Depth of Cut	56 in.
Height from rail to top of rocker valve chest	23 in.
Air Pressure Required	20 lbs.

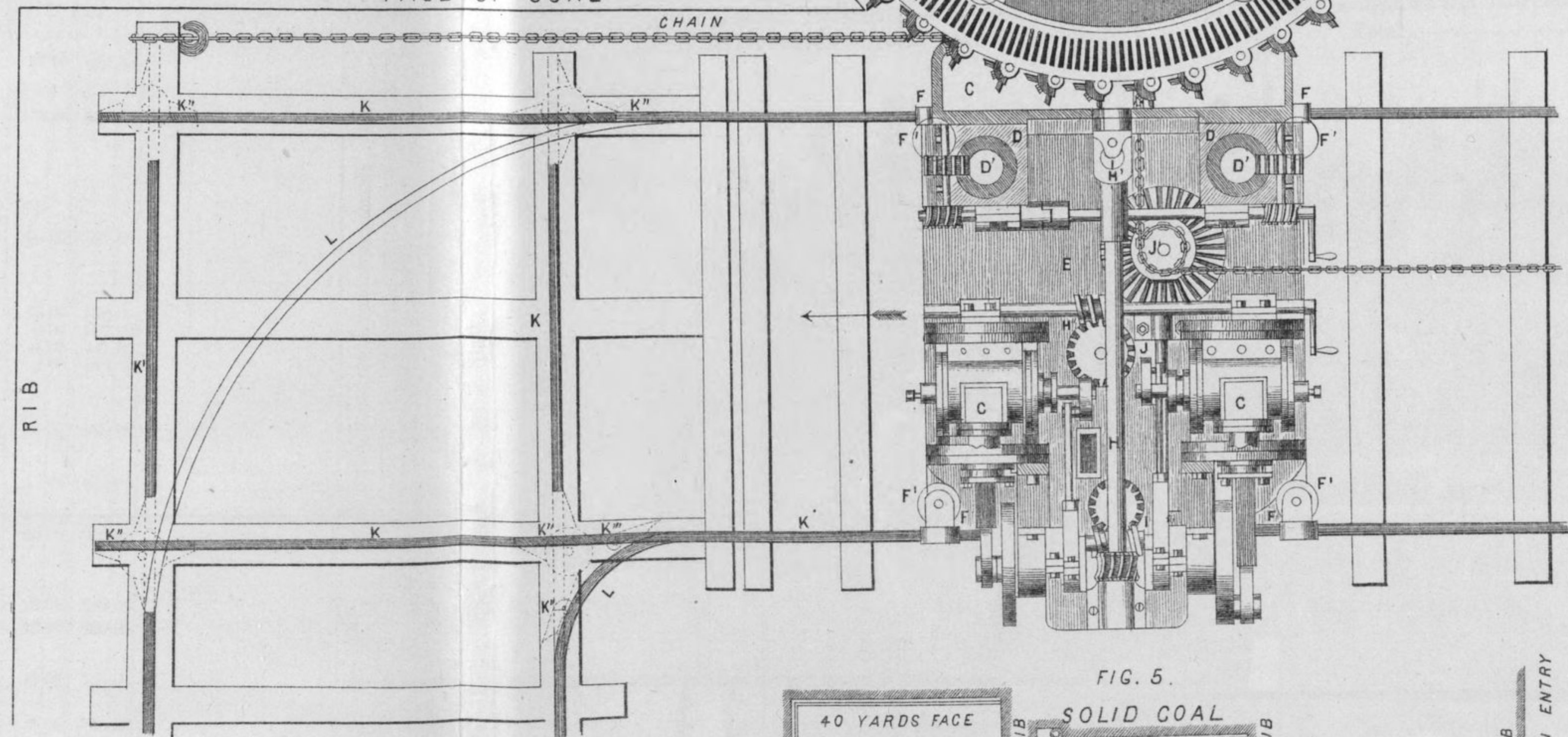
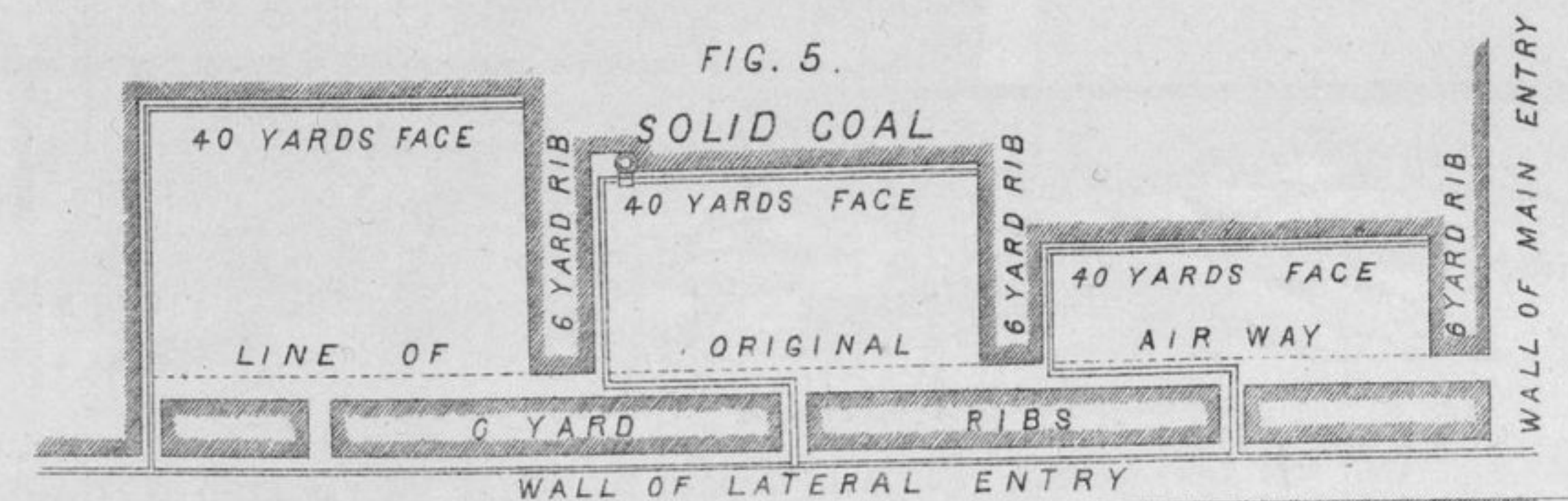


FIG. 4.



FIG. 5.



This boring terminated in slate. Being located farther south from the outcrop of the Mammoth bed than the Mill Creek shaft, it was necessary to penetrate deeper in order to reach that coal.

The third deep boring was undertaken by the North American Coal Company, who employed the writer to direct the operation. After careful exploration of the surface he located upon the company's land in Crow Hollow Valley. The boring was begun in 1852, and finished in 1853. The following shows the strata cut:

	Thickness.	Depth from surface.
Sandstone, slate, and rock	88 feet 1 inch.	
Holmes coal.....	4 " 2 "	92 feet 3 inches.
Sandstone and slate.....	57 " 5½ "	149 " 8½ "
Dark-brown slate, with iron ore and a seam of coal. } ...	35 "	184 " 8½ "
Slate, with header of coal. } ...	10 " 2 "	194 " 10½ "
Rock and slate.....	189 " 1½ "	384 "
Slate.....	21 "	405 ft. { to Mam. bed.

These were but the beginning of a series of enterprises for the development of the Lower large coal-seams, which must undoubtedly form the chief sources of supply for future demands. Among others were—

Brown's shaft to the Primrose, at Mount Laffee, on West Norwegian Creek.

Miller's shaft, 85 yards deep, to the Lewis coal-bed; thence a slope, 100 yards, on the dip of the coal. Also, on West Norwegian Creek, near Pottsville.

The *Eagle Hill* shaft, east of St. Clair, sunk in 1846; now working.

The *Snyder* shaft, at Pine Forest, 300 feet deep, to the Mammoth coal-bed, in Crow Hollow, near St. Clair; sunk in 1866.

The *Donaldson* (Sharp Mountain) shaft, near Tamaqua, 364 feet deep; sunk in 1862.

The *Kaska William* shaft of the Alliance Coal Company, in the Upper Schuylkill Valley, now sinking; recently cut 13 feet of coal.

The *Silver Brook* shaft, on lands of the Catawissa Railroad Co., sunk in 1861 to a depth of 140 feet, to the Mammoth coal-bed.

The *William Penn Colliery* shaft, 250 feet deep, west of Shenandoah; sunk in 1864.

The *Kohinoor* shaft, in West Shenandoah, sunk in 1870; 403 feet, to the bottom of the Mammoth bed.

Plank Ridge shaft, sunk in 1870; 257 feet to the Seven-foot bed, here 14 feet thick; thence to the Mammoth, 33 feet thick.

Other shafts in Schuylkill county are—*Thomaston*, north of Mine Hill; *Ellangowan*, east of Shenandoah (see fig. 39); *Bear Valley* shaft, at Shamokin; and others.

The *Wyoming* coal-region in 1871 had the following number of coal-shafts:

Delaware and Hudson Company.....	7
Delaware, Lackawanna, and Western Railroad Co.....	15
Pennsylvania Coal Company.....	12
Wilkesbarre Coal and Iron Co.....	5
Other companies and individuals.....	14
Total	53

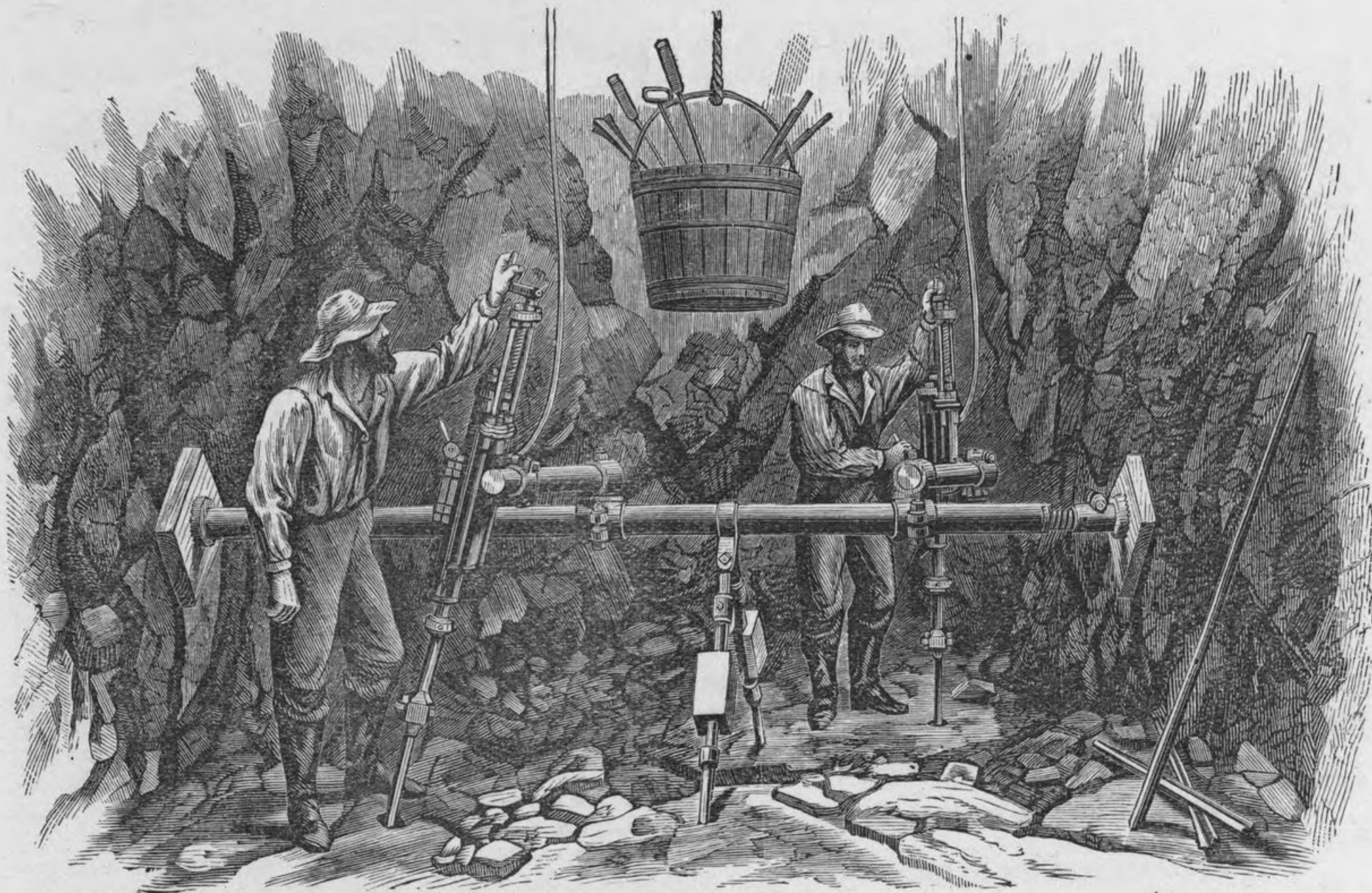


FIG. 40.—The Rand Drill.

EXPLOSIVES form a very important branch of study in mining operations. In few mines, and those not the most valuable, is the coal so soft that it can be profitably dug with pick and shovel. Sometimes, especially in thin beds, "holing" is resorted to, the miner lying on his side and laboriously cutting away the under side of the coal, so that the mass will fall of its own weight; but this is both difficult and dangerous, since, should he miscalculate and cut a little too far, the mass falls on, and crushes, him.

Gunpowder, dynamite, nitro-glycerine, and all other known explosives have been freely used in the work of

mining coal, but there are objections to all of them, the most serious being that they vitiate the air and are apt to fire explosive gases, thus often causing terrible disasters. Efforts are still being made to discover more powerful and less dangerous explosives, but success thus far has been only moderate. The following is a list of new compounds lately tried in the Polnick-Astrau colliery, Austria, all of which are superior to gunpowder or dynamite:

1. *Peralite* is a coarse-grained powder, containing 63 per cent. of nitrate of potassium, 30 per cent. of coal, and 6 per cent. of sulphate of antimony.

2. *Ialine*, which contains from 65 to 75 per cent. of

nitrate of potassium, 10 per cent. of sulphur, 10 to 20 per cent. of lignite, 3 to 8 per cent. of picrate of soda, and 2 per cent. of potassium, is less inflammable and less violent in its action than peralite, but brings away larger quantities of coal and in larger pieces.

3. *Carbazotine*, which contains about 610 parts per 1000 of nitrate of potassium, 8 of sulphate of iron, 247 of soot or lampblack, and 135 of sulphur, has only half the weight of gunpowder, and is very hygrometric, but may readily be dried by the heat of a stove. Its action is slow, and it ignites with difficulty, so that it is perfectly safe, and may be recommended when great precaution is needed.

4. *Coal Dynamite No. 3* is similar to Nobel's cheap dynamites, and consists of a mixture of nitro-glycerine and gunpowder of inferior quality, which in this case takes the place of porous silica.

The proportion of large, medium, and small coal produced by the different substances is as follows:

	Large, per cent.	Medium, per cent.	Small, per cent.
Coal dynamite.....	21.4	35.6	43.0
Carbazotine.....	26.3	37.7	36.0
Peralite.....	19.9	37.7	44.4
Ialine.....	22.9	38.5	38.6

As the use of nitro-glycerine compounds by persons who are unacquainted with their special properties is a frequent cause of accident, the following suggestions for the guidance of those who employ these compounds in mining pursuits are published by the British mine inspectors:

"1. In mines these explosives should be kept in a metal box with a hinged cover.

"2. Frozen cartridges should be thawed in a double metal box, the outer compartment being filled with warm water.

"3. Frozen cartridges should not be placed on any metal, stone, or brick work directly heated by fire.

"4. Frozen cartridges should not be placed in bore-holes, as they are not exploded by ordinary detonators.

"5. Packages containing cartridges must be kept dry.

"6. Packages showing any exterior water-damage should be carefully examined, to see if any nitro-glycerine has exuded from the cartridges.

"7. Damaged packages must not be struck with any metal or hard substance, or roughly handled.

"8. Any nitro-glycerine which has exuded from the cartridges should be absorbed by some soft, dry substance, such as infusorial earth, sawdust, or blotting-paper.

"9. Waste material containing nitro-glycerine and fragments of cartridges must not be thrown into water; they should be destroyed by firing with a detonator, or by mixing them with an excess of sulphate of iron (copperas), or by burning small quantities at a time in an open fire.

"10. In burning the waste, care should be taken not to inhale the fumes, as they are more poisonous than the substance itself.

"11. Bore-holes in wet ground should not be bored upward.

"12. In wet ground a hole must not be put in below a missed shot.

"13. Missed shots must not be bored out.

"14. Charges in wet ground should be fired directly after charging.

"15. Powder must not be charged on top of dynamite or lithofracteur.

"16. Charges should always be fired by a detonator.

"17. The primer, with a cap affixed, must never be rammed.

"18. The cartridge should pass easily to the bottom of the bore-hole. Cartridges that fit the hole tightly must not be forced down by ramming."

Experiments have been made in a number of English collieries with the Reuss system of bringing down coal by means of cartridges exploded by compressed air. From a report made on the subject to the North Staf-

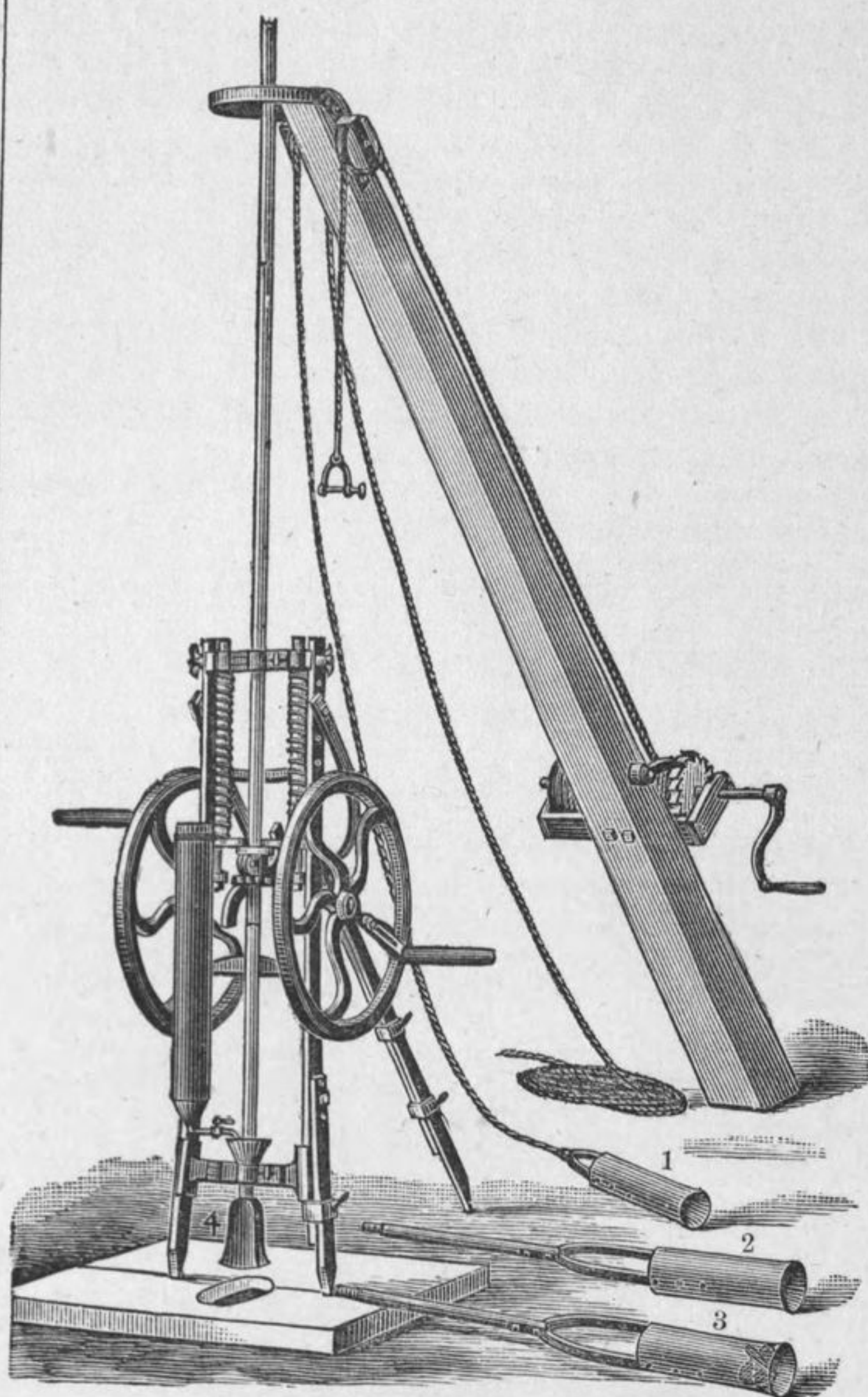


FIG. 41.—Victor Rock Drill.

fordshire Institute of Mining and Mechanical Engineers, by Mr. Ernest Craig, we take the following data: The cartridge is simply a hollow cast-iron cylinder, varying in strength to suit the class of coal. It is estimated that to burst a cartridge half an inch in thickness a pressure of 6700 pounds per square inch is necessary, and for every additional $\frac{1}{16}$ th of an inch in thickness an increase of 1000 to 1500 pounds per square inch is required. The air-compressor pumps the air into the cartridge, the machine being worked by two men. It is made to run on rails, and stands about 3 feet 6 inches in height. The connection between the machine and the cartridge is made by means of hydraulic tubing which has an internal diameter of $\frac{1}{32}$ d part of an inch, the whole machine and construction being made capable of standing a pressure of 20,000 pounds per square inch. With the air, a small quantity of water is also pumped into the cartridge, to act as a slight check upon the violence of the expansion at the bursting of the cartridge. When the pressure reaches about 6700 pounds the cartridge explodes and the coal is brought down. The explosion is not accompanied by any great noise, and pieces of coal are not thrown any distance.

A new method of mining coal by means of lime cartridges is described by Paget Mosley. The method has three objects: First, to take the place of blasting-powder, dynamite, or other explosives, thereby giving absolute immunity from all accidents arising from the use of these agents; secondly, to enable the colliery-owner to secure a greater amount of large coal from a given area, at less cost; thirdly, to lessen the labor of the miner.

The mode of operating is to employ lime in a specially caustic state, made from mountain-limestone. This is ground to a fine powder, and consolidated by a pressure of about 40 tons into the form of cartridges $2\frac{1}{2}$ inches in diameter, having a groove along the side. These are then packed into air-tight boxes to protect them from damp, and are ready to be conveyed to the mine for use.

The shot-holes are first drilled by means of a light boring-machine, and an iron tube about half an inch in diameter, having a small external groove on the upper side, and provided also with perforations, is then inserted along the whole length of the bore-hole. This tube is enclosed in a bag of calico, covering the perforations and one end, and has a tap fitted on the other end.

The cartridge having been inserted, a small force-pump is connected with the tap by a short flexible pipe, and a quantity of water, equal in bulk to the quantity of lime used, is forced in. The water, having reached the end of the hole, escapes along the groove and through the perforations in the tube, flowing into the lime and driving out the air. The tap is then closed, so as to prevent the escape of the steam generated by the action of the water on the lime, and the flexible pipe is removed.

The action of the steam first takes place, cracking the coal away from the roof, followed by the expansive force of the lime. There is always some little time before the steam attains a high pressure, so that all danger can be avoided. The whole time occupied in drilling a hole 3 feet deep and $2\frac{3}{4}$ inches in diameter, setting up the drill, charging the hole, and pumping in the water, is seventeen minutes. The principal advantages of this method are—(1) Absolute freedom from explosions of gas, there being no fire, no smoke, or smell of any kind. (2) The roof is not shaken, and the coal produces less dust; skilled labor is unnecessary. (3) The apparatus is simple and inexpensive, easily carried about, kept in order, and can be used in thin seams. (4) Any number of holes can be charged, and by applying the water in quick succession a continuous pressure is brought to bear along the face, which causes the coal to fall in large masses.

The following tables show interesting comparisons of the accidents in mining in the United States and Great Britain. It should be understood that the statistics for the United States refer only to anthracite mines:

TABLE LVII.—*Accidents in Anthracite Coal-mines, by H. M. Chance. (ART. "Inst. Mining Engineers.")*

Years.	Roof falling.		Explosions.		Miscellaneous.		Totals.	
	Fatal.	Non-fatal.	Fatal.	Non-fatal.	Fatal.	Non-fatal.	Fatal.	Non-fatal.
1871.....	69	144	26	149	115	239	210	532
1872.....	100	111	28	53	95	182	223	346
1873.....	116	200	33	112	115	373	264	685
1874.....	94	173	27	107	110	259	231	539
1875.....	97	209	18	82	133	298	248	589
1876.....	89	144	29	116	100	196	218	456
1877.....	115	197	12	119	61	252	188	468
1878.....	79	199	23	34	85	270	187	503
1879.....	131	243	29	130	102	418	262	791
Totals.....	890	1620	225	902	916	2487	2031	5009
Grand total }	...	2510	...	1127	...	3403	...	7040

TABLE LVIII.—*Fatal Accidents in Mines of Great Britain [from Mine Inspectors' Report 1880].*

Year.	Tons Mined.	Fire-damp Explosion.	Roof and side falling.	Shaft.	Miscel. Under-ground.	Miscel. Surface.	Total.
1871	...	52	426	118	161	69	826
1872	...	62	445	131	179	77	894
1873	128,680,131	44	474	158	211	86	973
1874	126,590,108	44	403	145	200	103	895
1875	133,306,485	41	440	153	196	97	927
1876	134,125,166	42	430	120	146	101	839
1877	134,179,968	45	432	117	172	98	864
1878	132,612,063	31	456	94	146	84	811
1879	133,720,393	35	416	95	167	69	782
1880	146,969,409	28	445	77	177	88	815
Total.....		424	4367	1208	1755	872	8626
Average.....		42.4	436.7	120.8	175.5	87.2	862.6

COAL-CUTTING MACHINES.—The accompanying diagram (Plate XVI.) shows a coal-cutting machine described at a meeting of the American Institute of Mining Engineers in 1875, as used at the Coal Brook mines. The lateral entry is driven as a base, and, separated by a 6-yard rib or pillar, an air-way is carried parallel to it

the same distance. Leaving a 6-yard rib to support the main entry, the wall of the air-way is divided by 6-yard ribs into three 40-yard faces. The machine cuts the most distant face, and is then removed to the second, and repeats the operation while the coal in the first face is taken down. By having a third face always in reserve the machine need not be delayed in case of a failure on the part of the takers-down to have the coal cleared from the first face cut. In the long rib, openings are made at intervals, through which the loaded cars can be pushed to the entry. Doors being provided for closing these openings when not in use, the air-current to the limit of the workings is not interfered with. When the faces are worked back 30 yards, the ribs are drawn and operations transferred to another place. In a 4-foot seam the capacity of one machine, the mine being opened in this manner, would be 50 tons for each shift of 10 hours, or by running night and day the output would reach 100 tons in twenty-four hours. The production of the same quantity by manual labor alone would require the enlargement of the working area so as to accommodate thirty to forty men, together with an accompanying increase of mine-equipment. Machine-cut coal comes out so free from slack that high buildings for dumping and screening are unnecessary, and at drift mines an engine might be entirely dispensed with.

Another very important feature recommending machinery is that, operations being more concentrated, less territory is required to be opened, and the coal is so rapidly removed from the part of the mine worked that much of the annoyance and danger from disintegrated roofing and pillars is escaped. It should also be mentioned that the machine above described can be used very successfully in driving entries and in turning rooms. In entry-work the machine is advanced to the face of the heading, and, moving forward upon a straight track laid along the entry, channels its way in after the manner already described; and when the limit is reached it is swung to the right and to the left, undercutting to the width of 14 feet if desired.

COAL-WASHING.—Mechanical processes have been introduced to clean the coal and increase production. Coal-washing has been adopted in places in order to secure these results. The apparatus illustrated (Plate XVII.) first crushes the coal, then separates slate and impurities by reason of their different specific gravities.

COAL-BREAKERS.—The large and hard masses in which anthracite coal comes out of the mine, and the popular demand for its reduction to certain specified sizes, mainly for domestic uses, have given rise to the mammoth wooden structures seen all over the anthracite region of Pennsylvania, known as coal-breakers. The following account of these peculiar buildings is from a paper by R. A. Wilder, C. E., of Cressona, Pa.:

"The separation of anthracite into lumps of regular size was first done by breaking the coal with hammers on plates of iron having openings a little larger than the size of coal to be made, so that it would readily pass through and preserve something like uniformity of size; the broken coal was shovelled into screens turned by hand or set at an inclination, and the coal thrown against them, so that the waste and small pieces would pass through the meshes and fall behind, and the merchantable sizes roll down the front to the platform, from which it was loaded into wagons for transportation. This preparation increased the sales to such an extent that it was found difficult to meet the demand by the method used, and those interested in the business began to study plans for preparing coal by machinery. The waste and danger of breaking coal by hammers was too great to pass unheeded, and in 1842 crude machinery, driven by steam-power, was tried as an experiment, and failed. Two years later Joseph Batten of Philadelphia patented a machine for breaking coal, consisting of a pair of toothed rollers geared closely together and driven towards each other, through which the coal, not selected for special use as it came

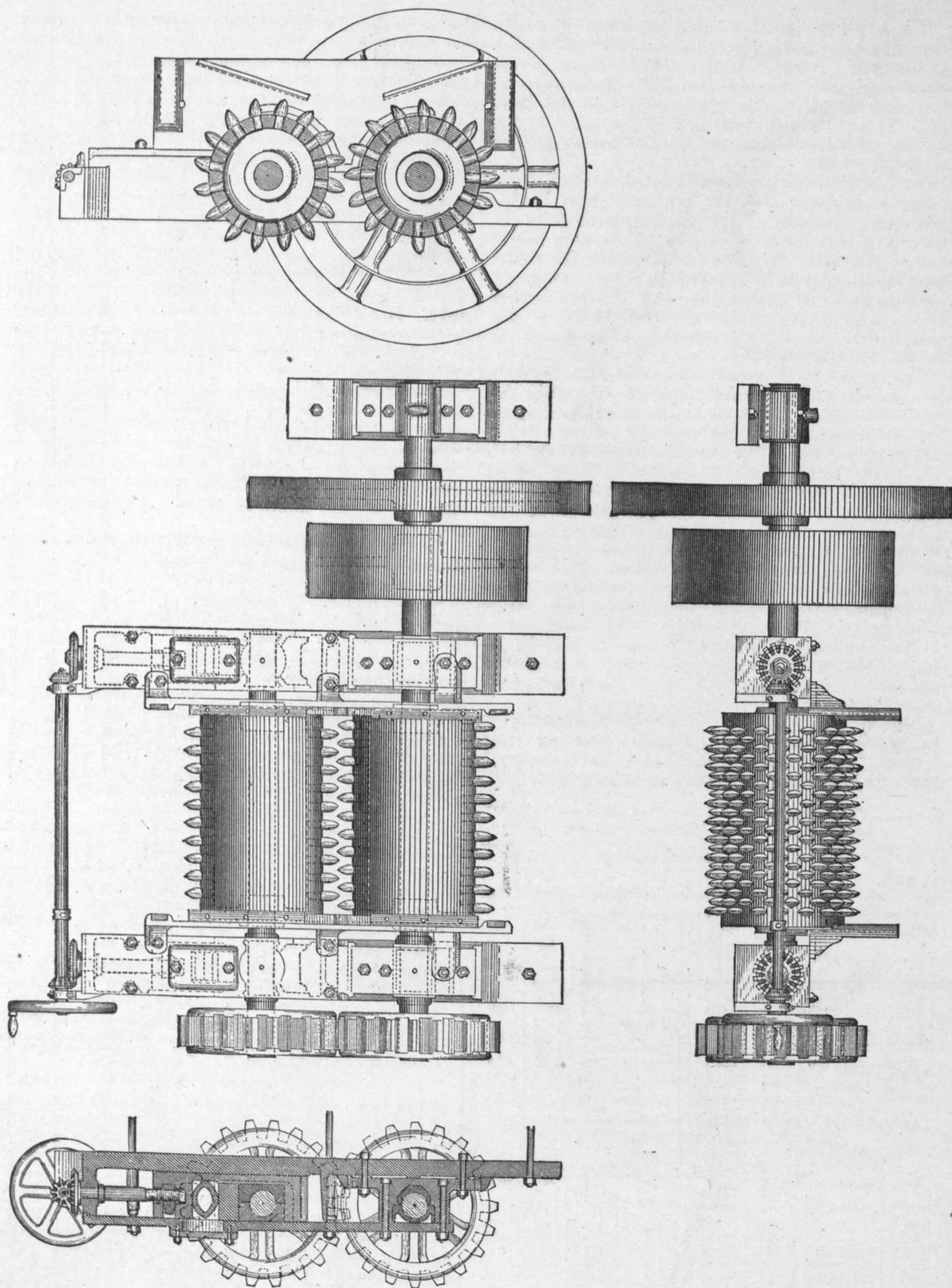
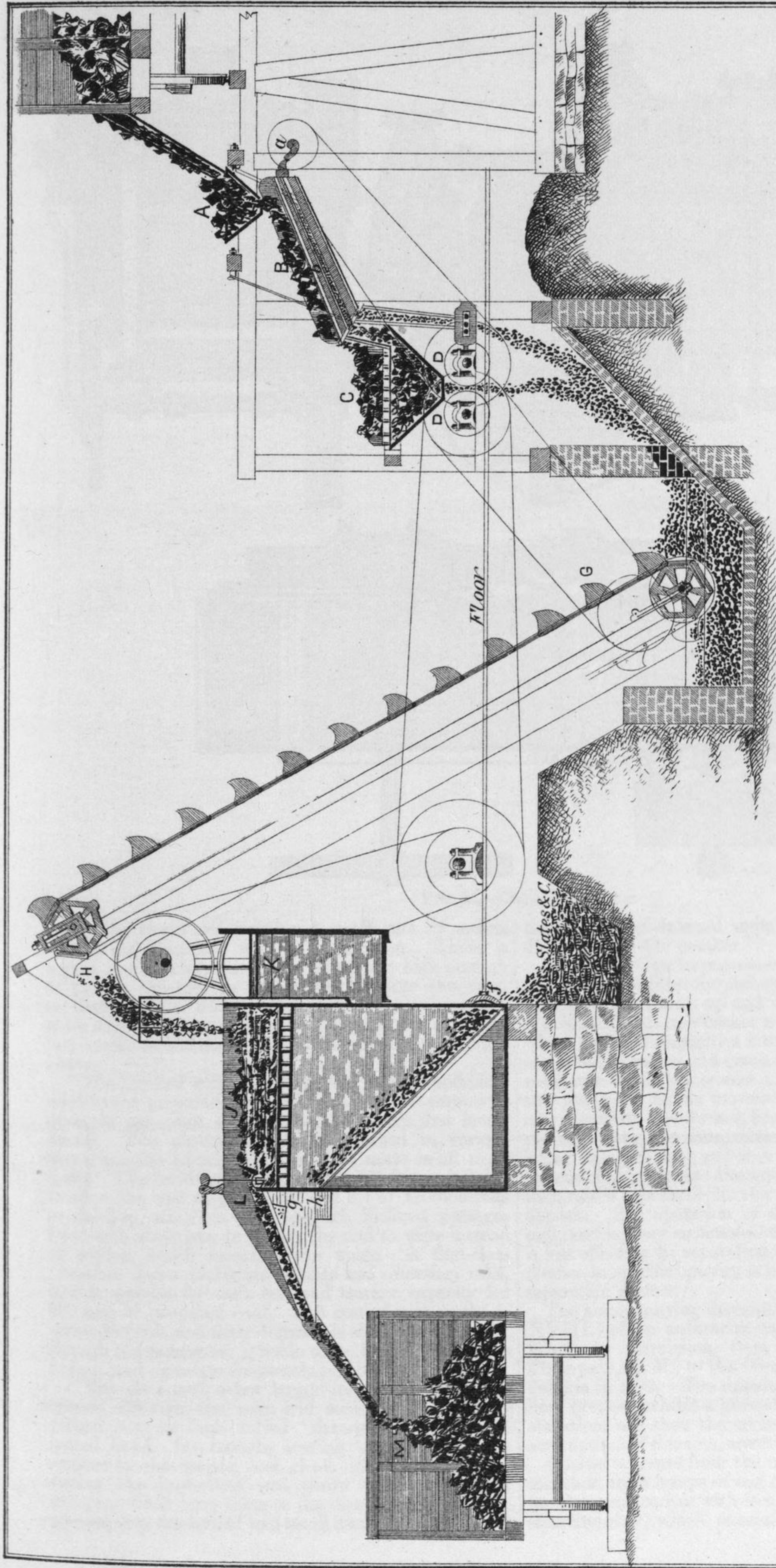


FIG. 42.—Steel Tooth Breaker-Roll.

from the mines, was passed and broken into irregular sizes. One or two cylindrical screens made of light castings or large wire were placed just below the rollers, and the coal fell from them into the upper end. The screens were inclined at such an angle that the coal would move forward with each revolution. The smallest meshes or openings were in the first section, and they increased in size toward the lower end of the screen. The rotation was graduated to the required movement of coal, so that each particular kind would

have time to be separated from the next size. The technical names given to the sizes were 'pea,' 'nut,' 'stove,' 'egg,' and 'broken;' 'steamboat' and 'lump' were taken out before going to the breaker. The sections of the screen were about 5 feet in length, and at the lower end of each a division was made in the trough below it, which took the coal to the main storage-chute, from which it was loaded into the cars; and this is the system in use now.

"The loading is effected by running the railway-cars



COAL WASHING MACHINE,

By John Fulton, M.E.

The method now in use at the furnaces of the Kemble Coal and Iron Company in the Broad Top Coal and Iron Region, for removing, by crushing and washing, slate and other impurities from coal, designed, when coked, for furnace fuel.

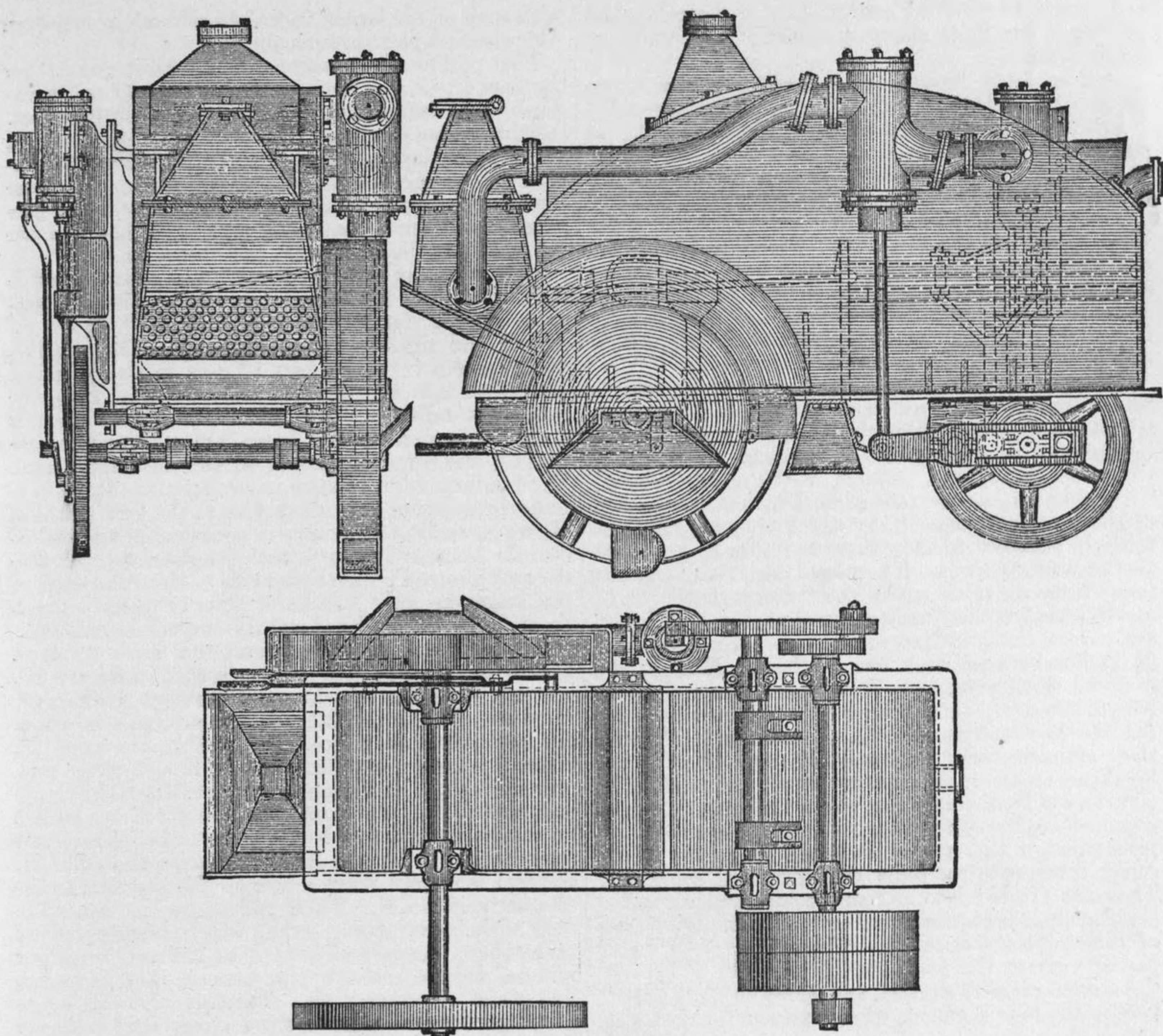


FIG. 43.—Clark's Separator.

under the chute and hoisting a small gate by means of a lever connected with it by a chain. There is a gate at each chute, and it is raised just high enough to permit the coal to run out slowly into the cars, so that the dirt which adhered to it in passing the main screen can be separated by means of a small rotary-screen or stationary bars at the end of the loading-chute.

"The toothed rollers, screens, and other appliances used in the preparation of coal have not been improved upon to any great extent since they were first introduced. The plants have been enlarged in various ways, but the principle is much the same in all their parts. The buildings are frequently 100 feet in height, to allow the coal to pass from one set of toothed rolls to another, which it does through inclined passages lined with sheet iron to permit the coal to slide instead of rolling, which increases the waste. A first-class 'breaker' has a double set of large and secondary rolls, double screens for each set, and storage capacity for 800 tons of prepared coal. The cost of such works is about \$50,000, and their duration is about twelve years, though the machinery is liable to be broken by various causes, and parts are frequently renewed.

"The slate and other larger impurities which are carried through the rolls and screens are generally picked out by boys called 'slate-pickers,' who are seated beside the troughs leading the coal from the screens to the chutes, and check its flow while they gather the impurities and throw them into other troughs, which carry them to the dirt- and slate-chutes, whence they are loaded into small dumping-wagons and

hauled out and dumped upon the culm-banks at some distance from the breaker."

Among the few improvements made in breaker-machinery is a machine for picking slate, called a "jigger." This machine moves up and down in a tank of water: it is virtually an iron basket with a grated bottom, into which coal and impurities intermixed are dumped, and is worked by means of a crank or eccentric motion. The resistance of the water acts upon the coal and slate in this rising and falling movement by their different specific gravities; the former, being lighter, is carried over the edge into one compartment of the tank, and the latter, being heavier and thin in shape, falls and works through the grate into the other compartment; each is then raised by a small elevator and carried to its place of deposit. The operation of this machine washes the coal, and is more economical than picking by hand, but is less effective in separating all impurities, as the difference in specific gravity is not sufficient to make the separation perfect.

The accompanying description and illustration (Plate XVIII.) of an anthracite colliery-breaker are republished, by permission, from the report of Heber S. Thompson, E. M., to the Girard Estate Trust of Philadelphia in 1879. The drawings of the Hammond colliery-breaker exhibit a ground plan and a front and side elevation, and show the arrangement of the machinery and method of cleaning, assorting, and breaking the coal.

Coal as it comes from the mines is of all sizes mixed together, from lumps of one ton in weight down to fine powder, and carries with it harder impurities, such as slate and rock, which generally occur in seams of coal

and cannot be retained conveniently in the mine, also varying in size from minute particles to slabs weighing nearly a ton.

Coal so finely broken as to pass through a screen mesh three-eighths of an inch square is usually called "dirt," and is at present largely a waste product. It occurs quite often in the seam as *dirt*, but is more largely produced by the crushing of the coal during the processes of mining, handling, and transporting.

The purposes for which a breaker is required, are—First, to separate the dirt, slate, "bone," and rock from the coal; second, to separate small coals of different sizes from each other; third, to break down such pieces as are too large into suitable sizes. And it is desirable that these requirements should be fulfilled with as little cost of handling and waste of coal as possible.

At the Hammond colliery the product of the mine is raised through the slope in small cars, called wagons, which run by gravity from the head of the slope to the breaker-tips or dumps, two in number, A, A, where they are dumped and emptied in the manner shown. The empty wagons are pushed back by hand to the foot of the automatic plane B, by which they are raised to a height sufficient to allow them to return by gravity to the head of the slope. The mixed coal, slate, and dirt taken from the mine enters the "dump-shute" C, C, and reaches first the "main dump-shute bars" C¹, which are narrow cast-iron bars so set as to allow a space of 2½ inches between each two of them. Most of the material small enough to do so passes through these bars to the dump-shute "hopper" D, from which it is fed into the counter-screens E, E, one on each side, with their supplementary screens E¹, E¹, and E², E². All breaker-screens are circular, revolving, and slightly inclined away from the end at which the material to be screened is allowed to enter, so that whatever will not pass through the meshes descends gradually as the screen revolves to the other extremity, and drops out. They are divided into as many compartments, called "segments," as required, and covered with wire meshes of different-sized openings. The smaller mesh, being placed next to the end at which material is fed into the screen, extracts the dirt, and allows all large sizes to pass to the next segment, which extracts the next size, and so on.

In the counter-screens E, E, the first segments extract the chestnut coal and all smaller sizes. The pea coal and chestnut coal are separated from the dirt in the supplementary screens E¹, E¹. The other segments separate the large and small stove from the egg coal and larger pieces, which pass out at the ends of the screens, while the stove coals are again cleaned of smaller particles and flat slates in the supplementary screens E², E².

The dirt from all these screens passes down the counter dirt-shute D⁵, and is hauled away on the tramway Z, across the trestling Y, Y, to the dirt-bank in small cars called "dumpers," which may be tipped on either side. The slate and bone separated from this coal, in part by the so-called slate-picker screens, and in part by hand-picking, containing a considerable quantity of good coal mixed with or adhering to it, is collected in the slate-picker hopper D, from which it is taken along the tramway Z¹ to the boiler fires, and used as fuel.

When it leaves the counter-screens the coal descends by its own weight along the narrow troughs F, F, called "telegraphs," the hand-picking being done by men and boys at convenient places along them, and is distributed thus: the pea and chestnut to the main pea and chestnut coal screens L¹, L¹, L¹; the large and small stove to the main screens L, L; and the egg and broken to the prepared-coal rollers K¹.

As the counter-screen material is usually wet, and the dirt adheres to it, this second screening is necessary in order to clean it properly. This completes the distribution of that portion of the wagon's contents which passes through the 2½-inch openings between the bars C¹ C¹ which is only the smaller sizes from egg down,

with such of the larger thin slabs of coal as may turn edgewise and pass through the bars.

That portion of the wagon contents which passes over the bars C¹, C¹, goes to the steamboat bars C² on its way down to the dump-shutes, which are set 4½ inches apart. All that passes through the bars C² goes to the bars C³, set 2½ inches apart, through which all below (and including) the egg coal passes to the dirt-screen E³, where the dirt is separated from it, the coal going to the prepared-coal roller K¹ and main screens L, L, while the dirt goes into the hopper D⁴, and thence to D⁵.

In this process coal that should have passed through the bars C¹, but has been crowded over them, is separated in the dump-shute C, C, by bars C², and is removed and distributed as described. That portion which passes over the bars C³ goes to the principal steamboat bars C⁴, where it joins the coal from the steamboat roller K. The remainder of the wagon's contents goes down the dump-shute to the platform bars C⁵, and contains nothing smaller than lump coal. The platform bars are set 9 inches apart, and that portion which passes over them goes to the first platform H, where such of the lumps as are suitable are pushed into the lump-coal shute I, and the slate and rock into the rock-shutes I¹, I¹, on either side. Here also such of the lumps as have streaks of slate or bone through them are broken by hand and the impurities removed.

All that is not suitable for lump coal is thrown down a hole in the platform to the second platform H¹, where it joins that which passes through the bars C⁵. Here the slate is carefully picked out again by hand, and sent down the rock-shutes I¹, I¹, to the point I², where it is loaded into dumpers and hauled to the dirt-or rock-bank. The lump coal passes down the lump-coal shute I, I, to the point I³, where it reaches such a level as will allow it to be loaded into the railroad-cars for market. After the slate has been removed at H, the coal is thrown down a hole in the platform to the steamboat rollers K. These rollers are cast-iron cylinders with large, strong teeth, which revolve toward each other at a speed of from 90 to 120 revolutions per minute, and the coal dropping between them is broken into pieces of various sizes. The two rollers are set so near together that none of these pieces shall be larger than steamboat coal. The coal passes from the roller K to the principal steamboat bars C⁴, set 4½ inches apart, and all that will not go through them is steamboat coal, and goes to the steamboat shute G, whence it is loaded into the railroad-cars at G¹ in the same manner as is done with the lump coal at I³, the same track answering for both. The coal which passes through the steamboat bars C⁴ goes to the prepared-coal rollers K¹, which are similar to the steamboat rollers, except that they have smaller teeth and are set nearer together, so that they produce no coal larger than broken. From these rollers the coal enters the main screens L, L, which are similar in construction to the counter-screens described above, except that they are larger. The dirt and pea and chestnut coals are taken out in the first three segments, and go together to the pea and chestnut screens L¹, L¹, L¹, which are double screens having a surrounding mesh outside the screen called a "jacket." All but the chestnut coal passes through the inner screen, the chestnut dropping out at the end, and the dirt passes through the jacket, while the pea coal drops out at the end of the jacket. The dirt drops into the dirt-hopper D², and is hauled to the dirt-banks; the pea goes to the pea-coal bins N⁶, and the chestnut to the chestnut-coal bins N⁵, without further preparation.

The next segment in each main screen separates the small stove, the next the large stove, the next the egg, and the broken coal falls out at the end.

All the coal but the broken passes, each size separately, over short "dusting-bars" M¹, set ⅜ths of an inch apart, which remove the dirt made by attrition in the screens, and thence over the picking-floors M, M, which are so inclined that the coal slides over them by gravity, each size in its own compartment. These com-

different sizes from egg to buckwheat coal. Dirt was made through $\frac{1}{4}$ -inch to $\frac{5}{16}$ -inch mesh in main screens, and $\frac{3}{8}$ -inch to $\frac{1}{2}$ -inch mesh in counter-screens, according to the condition of the coal, whether dry or wet. The breaker was idle thirty-one days during the year. It was worked, however, through one-half of the breaker for two months, the other half having been destroyed by fire. During five months of the year two locomotives were used for the hauling from the mines to the breaker, and in the remaining seven months three

mine-locomotives were in use. An account of their cost in comparison with mule-power is given in this article under a separate title ("Mine-locomotives *versus* Mules," page 266). From detailed data published in the recent report of the Second Geological survey of Pennsylvania on the waste of anthracite, we compile the following table, showing the quantities of coal shipped, dust made, and rock thrown over the dumps, together with a statement of the thickness of the bed and its pitch:

TABLE LIX.

Collieries.	Bed Mined.	Thickness, feet.	Pitch.	Coal shipped, tons.	Dust.	Rock.	Coal shipped, per cent.
<i>Hard White-Ash.</i>							
North Mahanoy.....	Three beds below Mammoth.....	Total, 18	25	83,302	44,427	1,133	65.8
Mahanoy City.....	Mammoth and Holmes.....	15 and 8	25	95,535	47,366	5,220	67.0
Elmwood.....	Mammoth and Seven-foot.....	12 " 7	30	36,036	19,325	1,166	65.5
Ellangowan.....	Three benches of Mammoth.....	8, 12 " 15	30	107,381	29,026	7,853	78.8 ¹
West Shenandoah.....	Seven-foot, Mammoth & Buck Mt.....	7, 45 " 12	30	106,834	34,500	14,781	76.5 ¹
Boston Run.....	Mammoth.....	25	50	68,748	23,220	6,457	75.0
Conner.....	Buck Mountain.....	10 to 15	4 to 15	132,866	60,921	...	68.6
Hammond.....	Two benches of Mammoth.....	12 and 20	35 to 45	65,617	56,472	...	53.9
Preston No. 3.....	Mammoth.....	18 to 20	75 to 80	13,661	14,495	...	49.0
Girard.....	Mammoth.....	40	60	54,680	70,557	11,151	43.6
<i>Free-burning White-Ash.</i>							
Tunnel.....	Mammoth.....	25, coal 17	60 to 70	60,727	44,794	8,127	57.6
Potts.....	Mammoth.....	25, " 17	55	39,304	34,962	4,963	52.3
Keystone.....	Mammoth.....	20	60	31,215	32,569	6,292	49.0
Locust Spring.....	Mammoth.....	25	25	53,888	30,106	2,082	64.2
Mount Carmel.....	Two benches of Mammoth.....	14	12 to 30	190,208	106,243	...	64.1
<i>Shamokin Coals.</i>							
Burnside.....	Two benches of Mammoth.....	10 and 10	20 to 50	75,429	48,827	...	61.0
North Franklin No. 2.....	Mammoth Nos. 8 and 9.....	10 " 10	45	77,234	70,697	...	52.0
<i>Pottsville and Lykens Valley Free-burning White-Ash.</i>							
Pine Forest.....	Seven-ft., top and bot. bench Mam.....	7, 6 and 15	35	29,320	25,351	2,690	53.6
Wadesville Shaft.....	Two benches of Mammoth.....	8 and 25	15	85,532	47,908	705	64.0
Beechwood.....	Top and bottom of Mammoth.....	45	10	26,879	10,461	4,160	72.0
Mine Hill Gap.....	Top and bottom of Mammoth.....	12 and 15	50	29,860	35,182	6,178	46.0
Pottsville Mine.....	Diamond and Primrose.....	5 " 3	40	25,853	20,008	1,053	56.5
Thomaston.....	Holmes and three benches Mam.....	10, 12 ⁴ , and 7	...	41,604	40,175	7,314	50.9
Glendower.....	Mammoth.....	12	48	16,662	14,061	3,575	54.3
<i>Red-and-White Ash and Red-Ash.</i>							
Otto.....	Top bench Mam. and Primrose.....	8 and 9	33	45,095	42,236	20,467	{ About 58.0
Phoenix Park No. 2.....	Primrose.....	9	36	16,289	10,135	4,028	61.7
<i>Lykens Valley Coal.</i>							
West Brookside.....	Lykens Valley.....	9	10	221,514	100,659	...	68.8

¹ Considered erroneous by Mr. Platt, the author of the report, though working favorable to high returns.

UTILIZING ANTHRACITE WASTE.—Until very recently anthracite coal-dust, or "culm," as it is frequently called, has been considered valueless, and it is still hauled away from the breaker at much expense, and deposited in mounds which gradually extend over several acres of ground and rise to a height of from 25 to 100 feet, or even more. These mounds often take fire, either from spontaneous combustion or from ignition,

and burn slowly for years, no attention being paid to the fire unless it approaches so near the breaker or other buildings as to menace their safety. Numberless experiments have been made with the costly and intrinsically valuable material of which these mounds are composed, but, though several processes have been invented by which it can be used as a fuel, they are all too expensive to enable the culm to compete with the

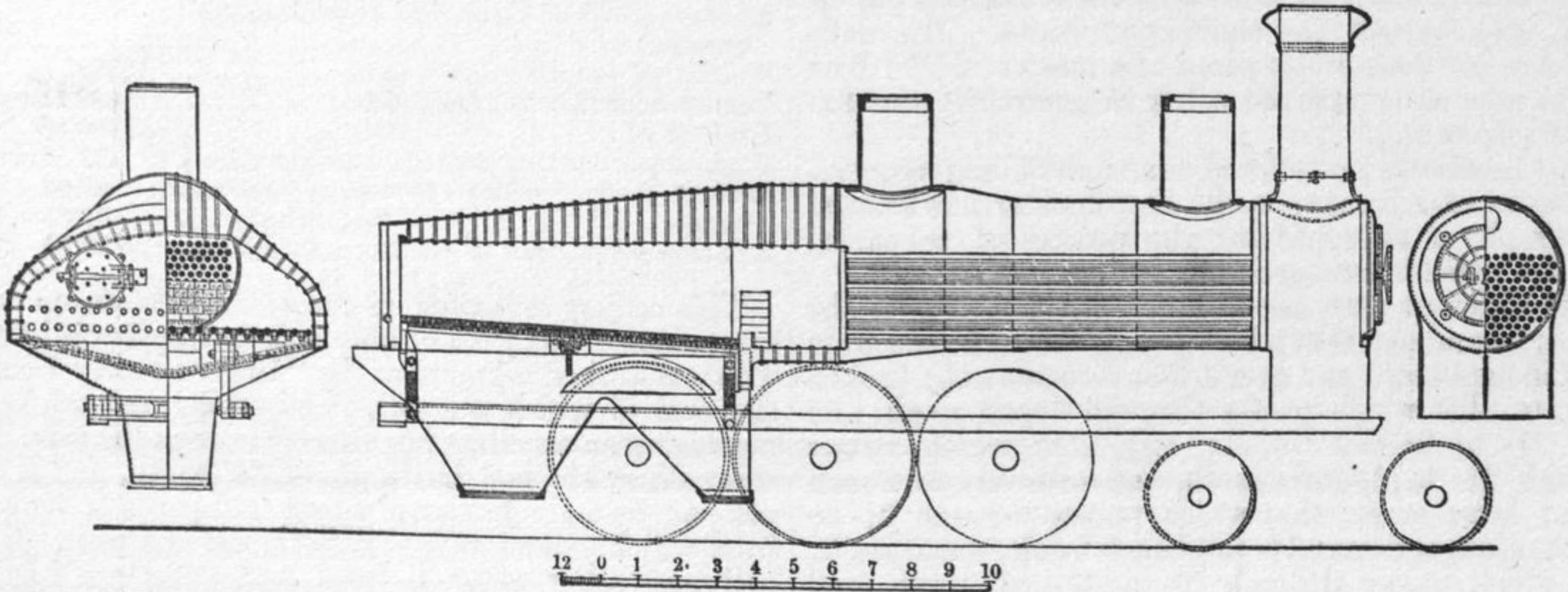
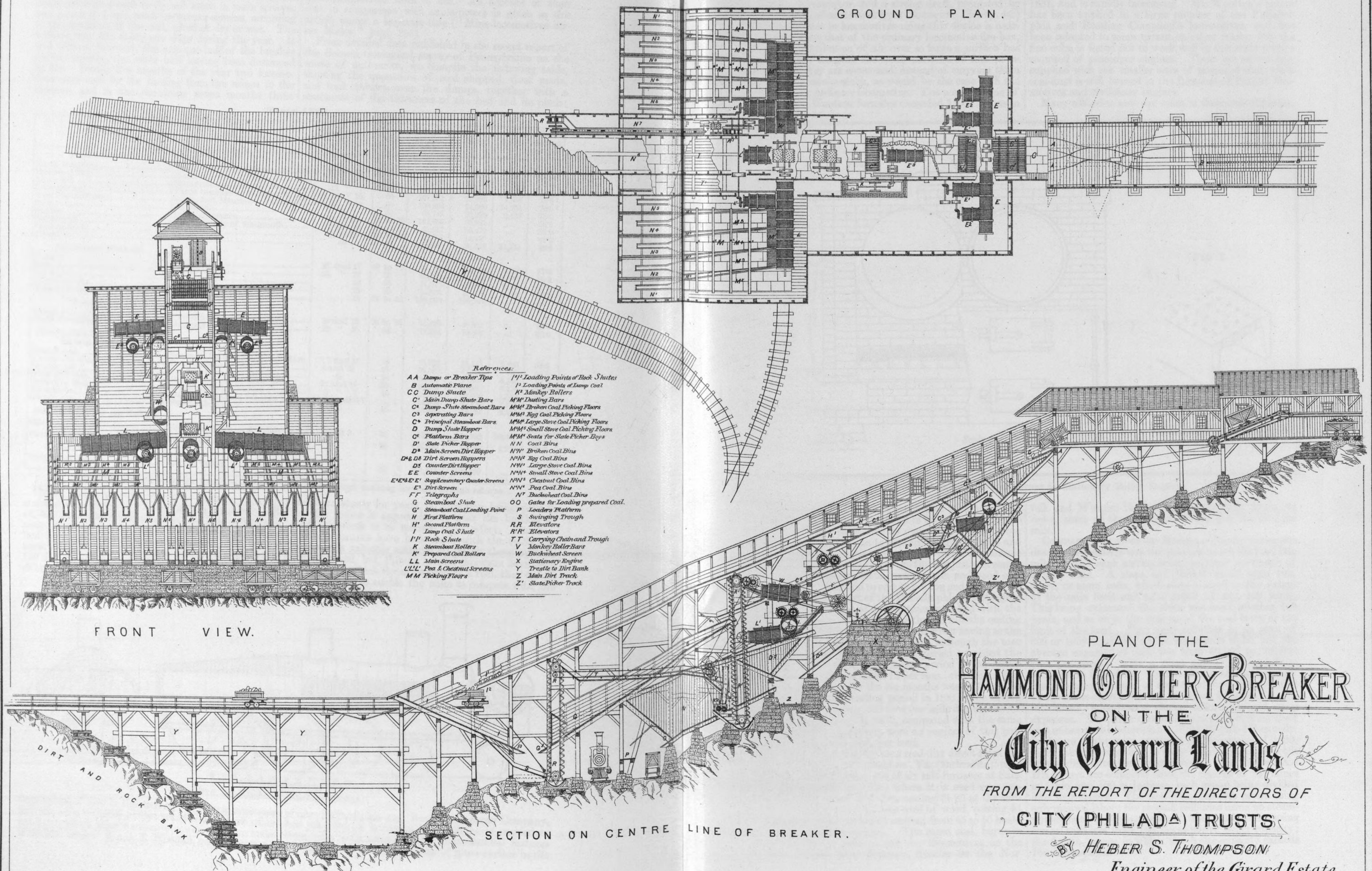


FIG. 44.—Coal-dirt-Burning Engine.

larger sizes of coal in the market. All these processes mix the culm with clay, refuse petroleum, or some other substance which gives it adhesive power, and then make it up into blocks. Mr. J. E. Wootten, general manager

of the Philadelphia and Reading Railroad Company, has patented an invention by which he is enabled to burn culm in its natural state. The essential features of his plan are a very wide area of grate-surface in the



PLAN OF THE
HAMMOND COLLIERY BREAKER
 ON THE
City Girard Lands

FROM THE REPORT OF THE DIRECTORS OF
CITY (PHILADA) TRUSTS

BY **HEBER S. THOMPSON**

Engineer of the Girard Estate.

POTTSVILLE, PA.

combustion-chamber, and a strong draft, promoted by introducing exhaust steam from the engine. (See fig. 44.) The grate-area in locomotives using this device is nearly three times that of the ordinary locomotive fire-box, and the distribution of air over so large a surface has the effect of keeping the small particles of fuel quiescent until they are consumed, instead of carrying them out of the smoke-stack, as would be the case with the draft of the ordinary locomotive. The consumption of culm in the Wootten furnaces exceeded 150,000 tons in

1881, and is rapidly increasing. Mr. Wootten's patent has been applied to a large number of the Philadelphia and Reading Company's locomotives, and has been adopted to some extent on other roads; but the fine culm is found not to work well in the rapid service required of passenger engines. These are accordingly supplied with the smaller sizes of prepared coal, while coal-dust is still burned in the furnaces of freight locomotives and stationary engines.

Many collieries now use culm in their own furnaces.

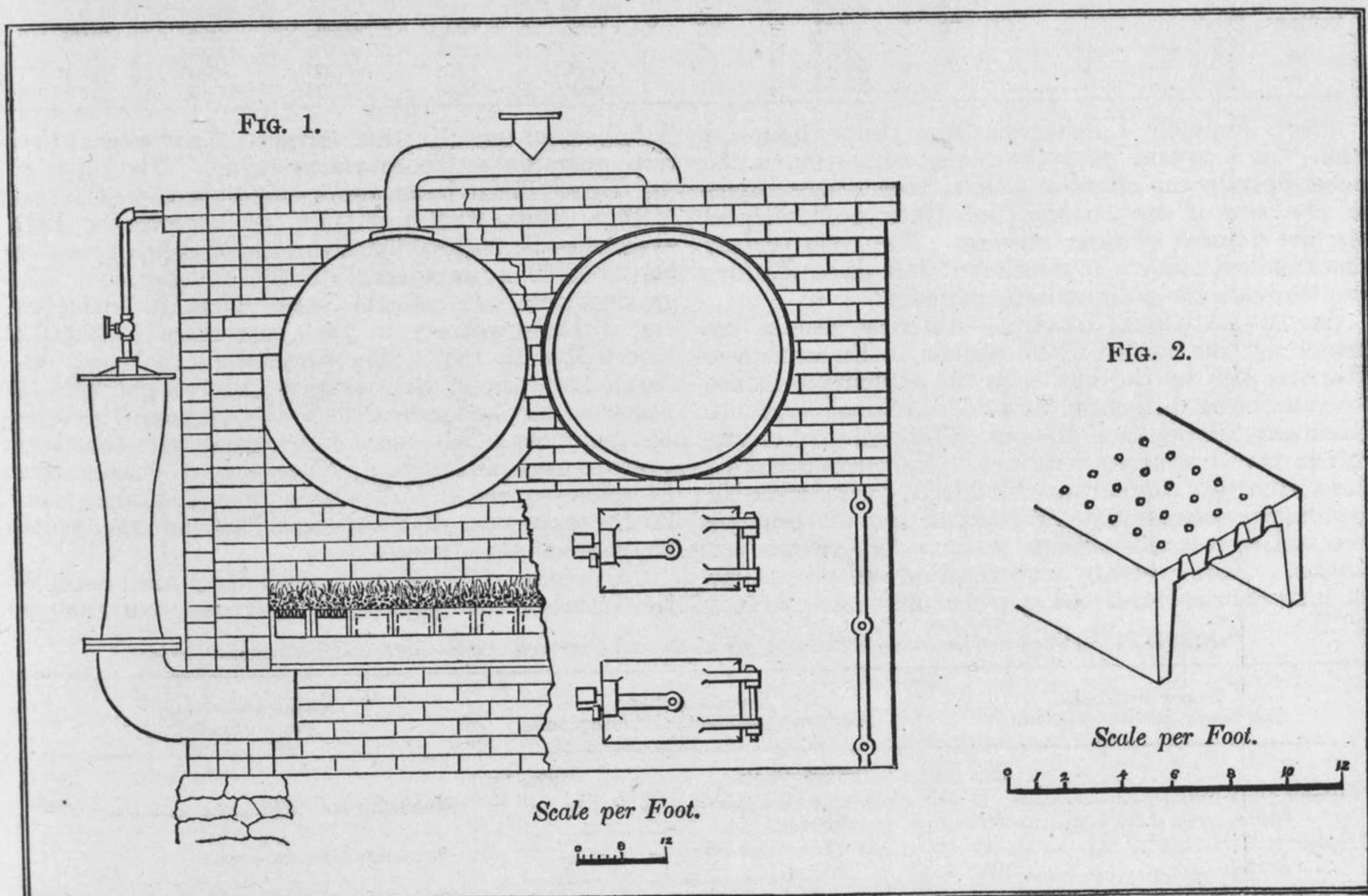


FIG. 45.—Anthracite Coal-dirt-Burner in Stationary Boiler Engine.

(See fig. 45.) The fire-boxes are floored with a plate of perforated iron, and a steam-jet is used to increase the draft, while the loose dust is dampened before being thrown into the furnace to prevent its flying about and being carried out of the smoke-stack. With this simple preparation it is shovelled into the furnace just as it comes from the culm-bank—slate, rock, refuse, and good coal intermingled. It is said to make a hot fire and give perfect satisfaction. A report of the Philadelphia and Reading Railroad on the use of locomotives supplied with the Wootten furnace shows that for the six months ending May 31, 1882, their use resulted in a direct saving to the company in fuel of \$94,500, and that, although the tons hauled one mile during the same period exceeded the performance of the corresponding period to the extent of 66,000,000 tons, or about 15 per cent., the cost of fuel used by all engines for the six months was \$51,000 less than for the corresponding period in 1881. The saving in cost of transporting 100 tons one mile during the six months ending May 31, 1882, compared with the same period in 1879, when there were no engines of this pattern in service, was 17 $\frac{5}{10}$ per cent.

The writer has recently seen coal-dirt direct from the mines of Altoona in Pulaski co., Va. (anthracite), used under the boilers of five out of six salt-furnaces at Saltville, Washington co., Va., where it is used very successfully, one ton of coal-dirt, costing \$1.85 at the salt-works, doing the work of one cord of wood, costing \$4 at the same point, and each making from 45 to 50 bushels of salt per ton or cord. The same coal, burnt in larger pieces, is used to run the locomotives on the branch railroad from Martin's Station on the Nor-

folk and Western Railroad to the Altoona mines, 8 $\frac{1}{2}$ miles, some of the grades of which are 242 feet per mile.

COMPARATIVE COST OF MINING.—In the anthracite districts it formerly was the practice to cut the land into mile lengths, each section being perhaps one-fourth of a mile wide. A slope and tunnel would open two, three, or more beds, which were worked to the extent of the mile limit and to a depth of, say, 100 yards. This being exhausted, the slope was sunk another 100 yards, and so on to the bottom of the coal-basin or the limit of the land. Four such collieries in an area of 800 or 1000 acres was not an uncommon sight, and the average capacity of each was from 50,000 to 100,000 tons per annum, with a plant costing perhaps from \$100,000 to \$300,000. By one plant costing one-fourth less, the same amount of coal could have been mined at about one-fourth the cost, including salaries of superintendents, mine-bosses, clerks, office-rent, and other expenses. The large companies are now working their own mines on the latter plan. Prof. Raphael Pumpelly, in charge of the mine statistics of the census of 1880, gives the following data to show the comparative profit of working mines on a large scale. (See Table LX.) His figures are compiled from the returns of 187 mines in Ohio and 100 in Indiana, each group being divided into four classes. The first class includes mines using only manual labor; the second, collieries using no steam-power, but employing animals; the third, mines using steam with less than 100 horse-power boiler-capacity; the fourth, mines in which the boiler-capacity exceeds 100 horse-power:

TABLE LX.

Class.	Number of mines.	Average annual production, net tons.	Average cost of labor per ton.	Average wages per day.	Average product per man per day.	Per cent. of value of product paid for labor.	Per cent. of value of product paid for materials.	Per cent. of value of product for profit, interest, repairs, and royalty.
Ohio, No. 1.....	12	832	\$0.93	\$1.23	1.33	59.10	7.47	33.43
“ No. 2.....	88	23,500	.77	1.27	1.64	68.42	16.57	15.01
“ No. 3.....	78	27,300	.96	1.42	1.49	69.34	10.86	19.80
“ No. 4.....	9	44,990	1.03	1.70	1.66	66.13	10.95	22.92
Indiana, No. 1.....	12	817	.87	1.25	1.44	64.00	5.00	31.00
“ No. 2.....	36	3,991	.84	1.57	1.88	56.00	14.60	29.40
“ No. 3.....	48	23,839	.97	1.50	1.55	65.00	7.00	28.00
“ No. 4.....	4	30,654	1.11	1.64	1.48	73.00	7.00	20.00

Prof. Pumpelly's deduction from these figures is that, "as a general rule, the mines employing capital most liberally can afford to yield to labor a larger share of the value of the product, since their profits depend on the volume of their business. They also employ more skilled labor. It is believed that these features run through the entire mining industry."

AMERICAN COAL-LEASES.—American mines are leased by the ton of 2240 pounds in the anthracite districts, and by the bushel in the bituminous mines, the rate being in Pennsylvania 76, in Indiana 70, and in Kentucky, Illinois, and Missouri, 80 bushels per ton; the prices vary in different localities. The operator takes a lease from the land-owners for fifteen years, erects his own improvements, pays a royalty of about 25 cents per ton, and is generally obliged to mine 50,000 tons per annum. More recently higher prices are given—say 40 cents per ton for all coal above chestnut size, 20 cents

for chestnut, and 10 cents for pea. This refers to private operators in the anthracite region. The report of the Girard Estate lands, belonging to the City of Philadelphia, shows that from their ten collieries, in 1881, were mined 1,354,850 tons, which paid them in royalties \$412,603.60, or an average of 30½ cents per ton. The product from this valuable estate, since its first opening with one colliery in 1863, aggregated 13,903,933 tons to Jan. 1, 1882. The rentals have not been uniform, however, in this instance: they began with 25 cents per ton, and increased, as they do now, 1 cent per ton per year. The term of five years was found too short to open and work a colliery, and the leases were therefore extended to the usual term of fifteen years. At the expiration of these leases they are renewed to the same or other lessees.

The several railroad companies which own most of the anthracite coal-lands mine their own coal, and do

TABLE LXI.—Comparative Cross-Sections of English and American Anthracite and Bituminous Coals.

Bituminous Coal, New Castle District, England.		Anthracite Coal, Southern Coal-Field of Pennsylvania.		Bituminous Coal, Pennsylvania.	
	Ft. In.		Ft. In.		Ft.
Closing Hill Bed.....	1 8	Sand Rock.....	...	Washington Bed.....	3.25
Strata.....	450 0	Red-Ash Coal Bed.....	3 0		
Hebburn Fell Bed.....	2 8	Strata.....	...	Two smaller coal-beds.	
Strata.....	250 0	Gate Vein Coal Bed.....	7 0		
Five-quarter Bed.....	4 0	Strata.....	...	Waynesburg coal-bed.....	4.00
Strata.....	260 0	Little Tracy Bed.....	3 0		
Three-quarter (Black Close).....	2 0	Strata.....	...	Uniontown Bed.....	2.50
Strata.....	50 to 180 0	Big Tracy Bed.....	6 0		
1. High Main coal.....	6 0	Strata.....	...	Sewickley Bed.....	3.00
Strata.....	33 to 150 0	Diamond Bed.....	6 0		
2. Metal coal.....	1 6	Strata.....	...	Red Stone Bed.....	2.50
Strata.....	33 0	Little Orchard Bed.....	3 0		
3. Stone coal.....	1 6	Strata.....	...	Pittsburg Bed.....	9.00
Strata.....	60 to 100 0	Big Orchard Bed.....	6 0		
4. Yard coal (variable).....	2 10	Strata.....	...	Six smaller beds.	
Strata.....	60 to 100 0	Primrose Bed, gray-ash.....	10 0		
5. Bensham coal.....	2.5 to 5 0	Strata.....	...	Freeport, upper bed.....	4.00
Strata.....	78 0	Holmes Bed, white-ash.....	5 0		
6. Five-quarter coal.....	3 0	Strata.....	...	Freeport, lower bed.....	3.00
Strata.....	48 0	Seven-foot Bed, white-ash.....	7 0		
7. Low Main or Hutton coal.....	6 0	Strata.....	...	Kittanning, upper bed.....	3.00
Strata.....	30 to 100 0	Mammoth Bed, white-ash.....	25 0		
8. Crow coal (inconstant).....	2 10	Strata.....	...	Kittanning, middle bed.....	2.50
Strata.....	24 0	Skidmore Bed, white-ash.....	6 0		
9. Five-quarter coal.....	3 8	Strata.....	...	Kittanning, lower bed.....	4.00
Strata.....	30 0	Buck Mountain Bed, white-ash.....	9 0		
10. Ruler coal.....	1 10	Strata.....	...	Clarion Bed.....	2.50
Strata.....	96 0	Upper Lykens Valley Bed.....	8 0		
11. Townley or Harvey coal.....	3 1	Strata.....	...	Brockville Bed.....	3.00
Strata.....	42 0	Lower Lykens Valley Bed.....	3 0		
12. Jetty coal.....	2 2	Strata.....	...	One small bed.	
Strata.....	42 0				
13. Stone coal.....	2 5			Quakertown Bed.....	2.00
Strata.....	18 0				
14. Five quarter coal.....	3 4			Sharon Bed.....	2.50
Strata.....	30 0				
15. Three-quarter coal.....	2 6			Mercer Bed.....	2.50
Strata.....	54 0				
16. Brockwell coal.....	2 11				
Total thickness.....	2145 11	Total thickness of coal.....	107 0	Total thickness of coal.....	53.25
20 beds, from 1 ft. 6 in. to 6 ft., av. 3 feet.		15 beds, from 3 ft. to 25 ft., av. 7.0 feet.		16 beds, from 2.50 to 9 ft., av. 3.33 feet.	
Total thickness of coal 60 feet.		The total thickness of these measures is about 2600 feet.			

The comparison of English and American bituminous coals is quite significant.

so, if not more cheaply, certainly better, than individual operators, who endeavor only to get out the most and best coal at the cheapest rate, neglecting the smaller and inferior coals, which are never reclaimed, but help to make up the aggregate of the fearful loss per acre of American anthracites. A better plan of leasing would be to adopt the system of some English landlords, who lease their lands by the acre for so much per foot of coal-thickness. This plan ensures accurate surveys and maps of the mines and constant and close inspection and supervision of all workings, so as to recover all the coal possible, and at the same time keep the mine in the best working condition.

Waste in mining, especially in bituminous beds, in America, should not be greater than, or possibly not so great as, in English mines, for the reason that our beds

are not large (see Table LVI.), are often above the natural drainage of the surface, and are, as a rule, nearly horizontal; they are readily accessible, do not require much timber for propping or roof-supports, and are easily and cheaply ventilated and drained,—all of which are grand elements for cheap and large production of coal.

Unquestionably, the better mode of mining is to develop large areas by large collieries, having extensive machinery for hoisting coal, pumping water (the latter especially, as many more tons of water than of coal are hoisted), ventilating, etc.; the improvements being so located as to mine all the coal in the largest available area—one colliery doing the work more cheaply than could be done by placing several collieries in the same area, thus cutting up the work and multiplying the machinery.

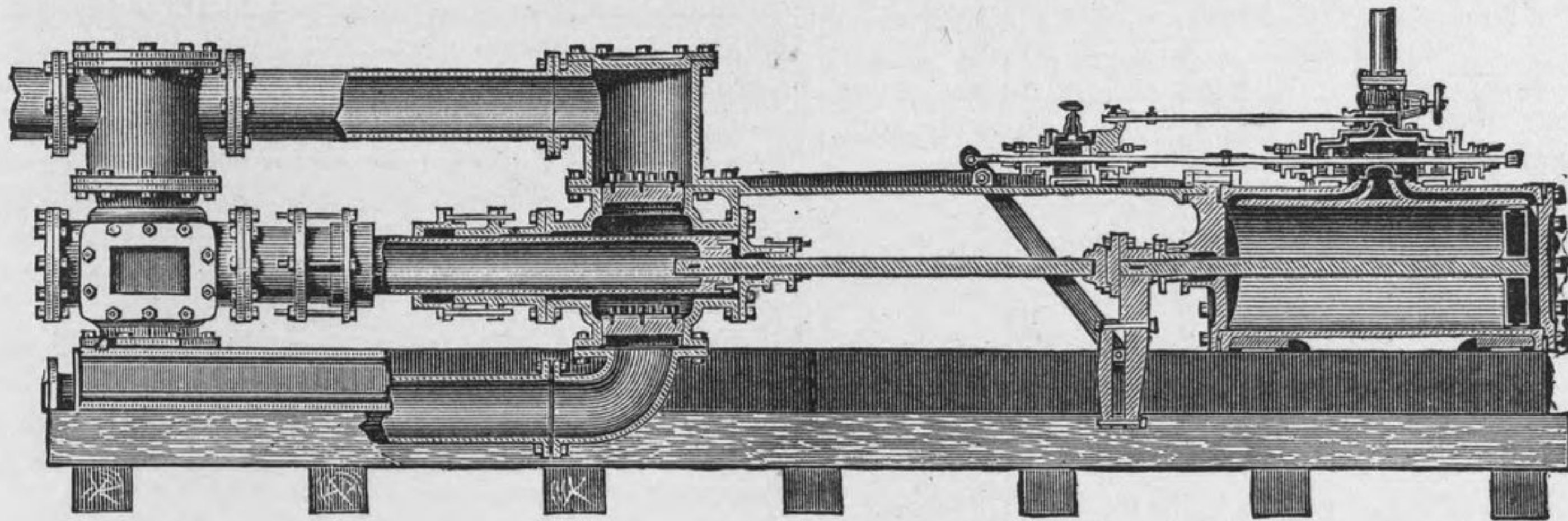


FIG. 46.—Mining Pump.

DRAINING DEEP MINES.—One of the most costly and difficult operations at a colliery working below water-level, is the removal of the water which constantly accumulates, and which often flows into the mine in enormous quantities. A great many plans of pumping-engines have been devised, the object of each being the removal of the water in the shortest time and at the least expense. The one figured in the illustration, Allison's isochronal pumping-engine (fig. 46), which is coming into extensive use in anthracite collieries, is one of the best of these, and is given as a representative of its class. Its leading and peculiar features are the cataract and the self-governing device. The combination of these secures results that justly entitle it to the characteristic name of "isochronal," or equal spaces in equal times; for the strokes of the piston are all equal in length and are made in equal times, not being affected by variations in the steam-pressure or in the resistance against which the pump is working. In all pumping operations the variations of steam-pressure and of load or resistance are frequent and unavoidable, and in many instances have been attended with disastrous results. The isochronal not only neutralizes their effects, but also secures other advantages of great value. The movements of the main steam-valve are automatically graduated and controlled by means of the cataract, so that the speed of the piston is reduced as it nears the end of its stroke, which allows the valves to seat themselves quietly and gently, and permits the moving column of water to come to a gradual and easy rest. The cataract consists of a cylinder with a passage from one end to the other. In the centre of this passage is a valve, which makes it possible, when desired, to shut off the communication between the ends of the cylinder. The cataract cylinder is filled with oil, and the passage of the oil from one side of the piston to the other is regulated by the valve. The main slide-valve is moved by steam-pressure on two pistons mounted on the valve-rod, and the motion is controlled by the oil in the cataract cylinder. The oil has to pass from one side of the cylinder to the other while the pump on the main piston is making its full stroke. The time required to pass the oil is regulated by the valve in the passage of the cataract cylinder. If the valve is closed, so that it will take one minute for the oil to pass, the

pump will make only one stroke in that time. This governing feature is accomplished by the oil pressing against the piston and retarding the movement of the main slide-valve, thereby letting into the main piston just the quantity of steam necessary to give the pump the number of strokes the cataract-valve is set to give. The advantages obtained by this movement are—

First. The speed of the piston is automatically slowed down at the end of its stroke, giving time for the column of water to come gradually to a rest, and for the valves to seat gently and quietly, avoiding all concussion, jar, or the slightest tremor.

Second. The speed of the engine can be adjusted as desired under any pressure, and automatically maintained. Should it be working under full head of steam and against a heavy pressure, and the pressure be instantly removed, the speed would continue unchanged.

Third. The piston works to the end of its stroke under all pressure, avoiding the great waste of steam incident to the piston falling short of its stroke several inches, as is the case with all other direct-acting pumping engines working under variable loads.

LABOR IN THE ANTHRACITE MINES.—A summary of the data collected by the Census Bureau on the labor in anthracite collieries in 1880 is as follows:

Number of men above ground.....	15,564
Number of men below ground.....	36,952
Number of boys above ground under 16 years of age.....	11,921
Number of boys below ground under 16 years....	3,802
Total employés.....	68,239
Of whom miners number.....	19,585
Of whom laborers number.....	47,410
Of whom administrative force number.....	1,244
Per cent. of total force, miners.....	28.7
“ “ “ boys.....	23.0
“ “ “ laborers and boys.....	69.5
“ “ “ administrative force.....	1.8
Total wages paid.....	\$21,680,120
Average yearly income of man.....	\$359.08
Average monthly income of man.....	\$42.33
Total number of months worked by one man...	512,204
Total number of months of enforced idleness....	207,090
Total number of months lost in strikes.....	5,234
Per cent. of year worked.....	70.69
Per cent. of year lost by stoppages, etc.....	28.60
Per cent. of year lost in strikes.....	0.72

appears to have been directed by the observations of Faraday and Lyell in 1845, was made the subject of some experiments in France in 1867 by M. Verpillena, who came to the conclusion that coal-dust plays an important part in coal-mine explosions. The subject was further and more fully examined in France, by the aid of experiments on a small scale, by M. Vital in 1875, in connection with an inquiry into the nature and cause of an explosion which occurred in the preceding year in the Campagnac colliery, and in a part of that colliery where no fire-damp had ever been detected. On this occasion an examination for gas had been made by the overman with the Mueseler lamp just before firing a "shot" or blast. After the first shot a second hole was charged; the fuse having been ignited, the men retreated, when, after a few seconds, a violent explosion occurred, and the men saw a large body of red flame advancing upon them. After examining the nature of the dust collected in the mine, and instituting some special experiments upon a very small scale for the purpose of ascertaining whether and to what extent the flame from a small charge of powder was lengthened when projected, like the flame from a blown-out shot, into air containing fine coal-dust in suspension, M. Vital concluded that very fine coal-dust, very rich in volatile (inflammable) constituents, will take fire when raised by an explosion, and that portions of the coal are successively decomposed, yielding explosive mixtures with the air, whereby the fire is carried along; the intensity or violence of the burning being much influenced by the physical characters (fineness, etc.) of the dust. He also pointed out that an explosion of fire-damp, while taking place almost instantaneously, inflames or decomposes a small quantity of coal-dust raised by its explosion, and that explosive action is thus propagated when the fire-damp explosion ceases. Soon after M. Vital's investigation of the subject, Mr. W. Galloway commenced a series of valuable experiments upon a larger scale, with the view of investigating the influence of coal-dust in colliery explosions; and the results were communicated by him to the Royal Society in two papers in 1876 and 1879. The conclusions to which Mr. Galloway was led by the experiments described in his first paper were to the effect that a mixture of air and a particular coal-dust which had been made the subject of chemical examination and practical experiment was not inflammable at the ordinary pressure and temperature, but that the presence of a very small proportion of fire-damp in the air, the existence of which could not be detected with the Davy lamp by the most experienced observer, rendered this dust inflammable, and caused it to burn freely with a red, smoky flame. From this it was inferred that an explosion, when originated in any way whatever in a dry and dusty mine, may extend itself to remote parts of the workings where the presence of fire-damp was quite unsuspected.

In the experiments with coal-dust it was shown that as small a proportion as about 2 per cent. of fire-damp in air, in currents travelling at a moderate velocity (600 feet per minute), may be brought to ignition by coal-dust; or, what amounts to the same thing in regard to the result, that small proportions of fire-damp may be instrumental in determining the ignition of, and the propagation of flame by, coal-dust.

In some experiments made in currents of very low velocity (100 feet per minute) with the most sensitive of the coal-dust used in these experiments (from Leycett colliery), it was found that when a mixture containing only 1.25 per cent. of gas, charged with the dust, reached the naked lamp-flame, the latter became surrounded by a large fringe of flame filled with incandescent dust-particles. When the proportion of gas was increased to 1.5 per cent. a long flame was at once produced, which soon increased to a large flame, and after a short interval the mixture of dust and air with this small quantity of fire-damp burned from end to end of the gallery.

The most sensitive dusts, which were also the richest in coal and the finest, produced explosive mixtures with air containing only 2.5 per cent. of fire-damp. The next to these in order of sensitiveness, and not greatly different from them, also followed next in order, both as regards richness in coal and fineness; but the one next following, and differing but little in sensitiveness from the preceding one, was the dust which chemical examination showed to be poorest in coal (containing nearly half its weight of non-combustible constituents). This dust, though not so uniformly fine as the preceding samples, was very uniformly suspended throughout the air-current which conveyed it; 2.75 per cent of fire-damp being sufficient to produce with it a mixture which was exploded by the lamp-flame. Of the other six samples, four ranked closely together, being less sensitive than those already referred to. These were different from each other in regard to richness in coal and the proportions of very fine dust which they contained. Lastly, there were two samples decidedly less sensitive than these; they did not present any very marked difference from one or other of the preceding four samples in point of richness of coal, but they could not be so plentifully and uniformly suspended in the air-current as the others. These six samples all formed, more or less readily, explosive mixtures when suspended in air containing 3 per cent. of fire-damp.

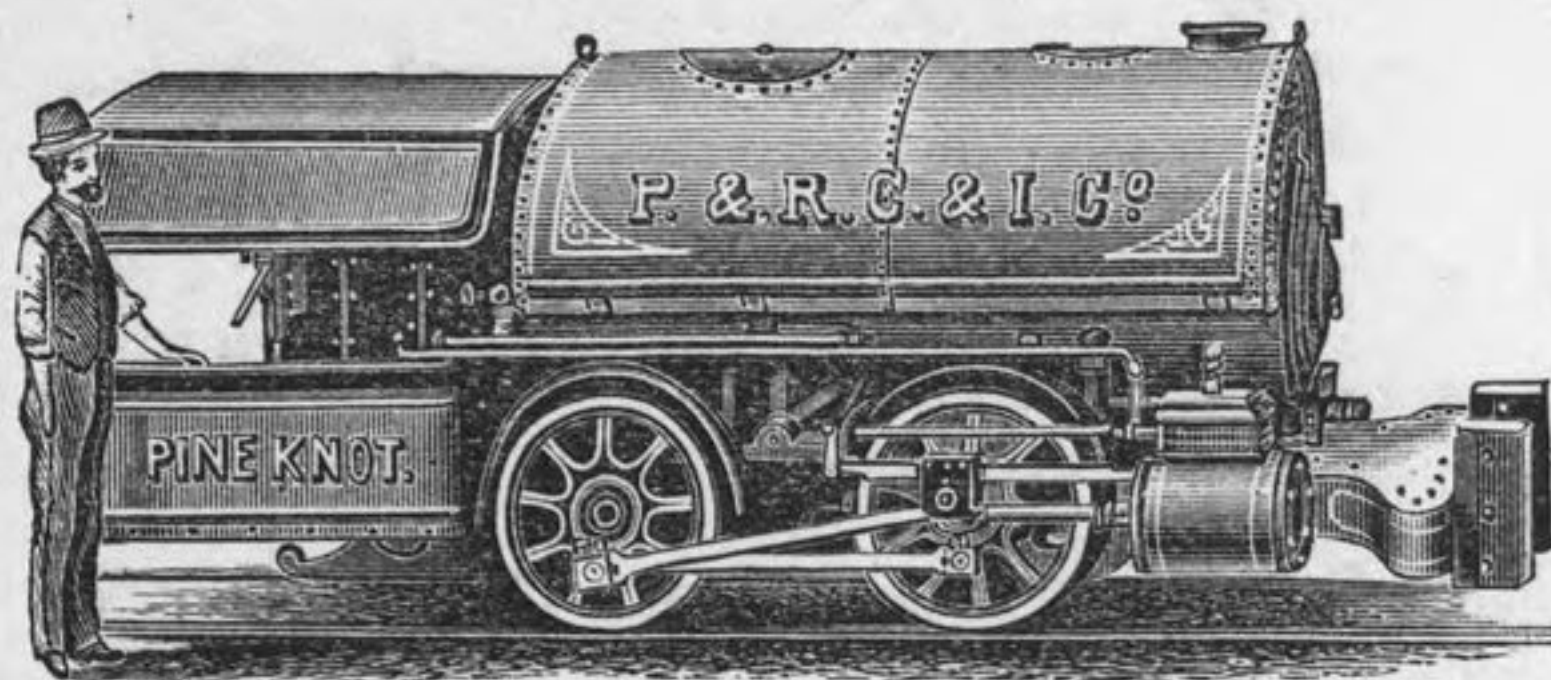


FIG. 47.

MINE LOCOMOTIVES.—The accompanying engraving represents the "Pine-knot" engine, for use in coal and other mines. This one is but a representative of the many of its kind now used in the anthracite and bituminous coal districts of Pennsylvania, and even finding their way into the gold-mines of the Pacific coast. Horse-power for draught purposes is rapidly giving place to these little engines, the latter being much the cheaper, because doing a vast deal more work than horses could do in a given time. The following description and work of the style of engine named in this article is from a report made by Mr. W. H. Wallis, superintendent of the Bald Mountain Gold-mining Co., Cal., to the Baldwin Locomotive Works of Philadelphia, Pa., where the engine was built. He says: "The engine is employed in a tunnel 4000 feet in length, in which is a track of only 20-inch gauge, laid with T rails, and having grades, some of which are as steep as 220 feet per mile. The tunnel is 4 feet wide at the track, and for 18 inches up; thence it tapers to 2½ feet at the top. The extreme height from level of rails to top of tunnel is 5½ feet. The track has curves of from 60 to 150 feet radius. Small four-wheeled cars, having wheels 12 inches in diameter and a wheel-base of 20 inches, and which weigh 750 pounds each, and can carry two tons each, are used on this track. The ventilation is obtained from air-shafts and air-warp, without any blowers or furnaces, the current of air moving at the rate of about four miles per hour. We can haul 45 of our cars, with 80 men and 10 loads of timber and material, up our grade and into the mine, making the trip in five minutes, or at the rate of 9 miles per hour. We can bring out 18 loaded cars with the engine alone, with the use of the brake which we put on here. We have no brakemen. We use anthracite coal, and find no deleterious effects from steam or gas on our ventilation. Our air-shaft is sunk 2000

feet from the mouth of the tunnel, and is in two compartments of $3\frac{1}{2}$ feet square each. At the top we drop two inches of water into the centre of each compartment, which forces a strong current of air down the shaft and through the air-ways, giving the air to the workmen first, and carrying off the steam and what little gas is generated from the coal. We have already made a saving of more than the cost of the locomotive and attending expenses in the working of the mine. The following is a statement of six days' work, which is a fair comparison with all of the work:

Length of haul, 3800 feet.	Grade, 166 to 220 feet per mile.
Weight of cars, each, 750 lbs.	
Wheel-base, 20 inches.	Diameter of wheels, 12 inches.
Cars each carry, 2 tons.	Gauge of track, 20 inches.
Car-loads of gravel taken out per week, 2936 = 5872 tons.	

Expense.

4370 pounds of anthracite coal.....	\$87.40
Engineer's wages.....	48.00
Head-lights, oil, and tallow.....	4.10
Total.....	\$139.50

Cost per car-load, $4\frac{1}{2}$ cents = $2\frac{3}{4}$ cents per ton. Distance run, not including switching, 200 miles. Mule-power costs 9 cents per load; man-power costs 21 cents per load.

The engraving (fig. 47) represents an engine having outside cylinders, which require a width of gangway 32 inches greater than the gauge of the track. The No. 4 engine, also built by the Baldwin Locomotive Co., has an inside cylinder, requiring a width of gangway 16 inches greater than the gauge of the track. The little "Pine-knot" engine stands upon the track with the following dimensions: cylinders, 8 by 12 inches; diameter of driving-wheels, 24 inches; wheel-base, 3 feet 4 inches; tank-capacity, 110 gallons; weight in working order, 15,000 pounds; height, 61 inches; width across cylinders, $46\frac{1}{2}$ inches; width across tank, 39 inches.

MINE-LOCOMOTIVES vs. MULES.—Thomas H. Phillips, superintendent of the Kalmia Colliery in the anthracite coal-regions of Pennsylvania, furnishes the following facts as the basis of the comparative cost and expense of mine-locomotives and their substitution for mules:

There are three locomotives of the Baldwin inside-connected class (class 4, 10 C.), a style used on account of the narrowness of the gangways. The cost of expenses for repairs is estimated, as the repairs were made at the colliery, and no account kept. For each locomotive an engineer is employed, also a boy to turn switches and couple and uncouple cars. The colliery is opened by a water-level tunnel. The distance from the mouth to

the end of the run of the locomotive is 3 miles, making a round trip of 6 miles. The time consumed for each trip is one hour and forty minutes, including stoppages and shifting. The daily consumption of coal is 1097 pounds for each locomotive, and the average number of mine-cars hauled by each locomotive daily is 133, the number at each trip varying from 18 to 26. Their capacity is $2\frac{1}{2}$ tons of coal each. Steam-pressure averages 105 pounds.

The average expense per day for each locomotive is—

Coal.....	\$1.35
Oil, waste, packing, etc.....	.70
Repairs and renewing, estimated.....	.60
Wages of engineer and boy.....	3.33
Total.....	\$5.98

per 133 cars, or 4.5 cents per car for 3 miles; 1.5 cents per car per mile, or $\frac{1}{10}$ of a cent per ton per mile for every ton of material hauled out.

The average cost per ton for hauling by mules is estimated. Supposing that everything is arranged for mule-hauling, with no delays and an average speed of $2\frac{1}{2}$ miles per hour kept up, including transfers, for 10 hours per day, with an average of 2 mine-cars to each mule, and the teams composed of six mules each, there would be required to do the work of the three locomotives 48 mules and 8 drivers, or an average of 16 mules for every locomotive. It is estimated that at this colliery a mule cannot be cared for, fed, shod, and harness kept in repair for less than 83 cents per day, including replacement of mules from death and loss by accident.

Using this estimate, the average daily expense would be

Keeping 16 mules, at 83 cents.....	\$13.28
Drivers (\$1.70 per day for 6 mules).....	4.53
Oil and cotton.....	.40
Total.....	\$18.21

for 133 cars, or 13.69 cents per car for 3 miles; 4.56 cents per car per mile, or 1.82 cents per ton per mile for every ton of material hauled.

This estimate would make a saving of 9.19 cents per car in favor of the locomotives; \$12.23 for each locomotive, or \$36.69 for the three locomotives daily. This excludes the larger outlay that would be required for mine-cars and turnouts, and the increased expense of keeping the roads in repair for the travel of so many mules. Ninety-two cars are required to do the work with locomotives, and to do the work with mules would require 124 cars. The outlay for 16 mules and harness would about offset the cost of a locomotive.

(P. W. S.)

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COAST AND GEODETIC SURVEY. One of the recognized duties of the national government is to facilitate foreign and interstate commerce along the coasts, by promoting the safety of navigation by every means in its power. To secure this end a detailed survey of the coast is of primary importance, and the maps embodying the knowledge gained by it serve as the basis of reference for all collateral facts of importance to the navigator; nor must their manifold uses to the general government be lost sight of, as for instance, in planning works for defense, for the improvement of harbors and for protecting them against undesirable changes from natural causes whose effects become manifest only by the comparison of surveys made in the lapse of years.

A survey of so large an extent of coast, furthermore, involves the use of a method to which that practised in surveying small areas is no longer applicable; it becomes necessary to take into account the figure of the earth, in order to correlate the surveys of different localities, and therefore it is both desirable and necessary to make them on a uniform plan.

The United States Coast Survey may be said to have had its beginning in 1807, when Congress, on the recommendation of President Jefferson, passed an act authorizing the President to cause a survey of the coasts of the United States to be taken. The act requires that in this survey "shall be designated the islands and shoals, with the roads or places of anchorage, within 20 leagues of any part of the shores of the United States; and also the respective courses and distances between the principal capes or headlands, together with such other matters as he may deem proper for completing an accurate chart of every part of the coasts within the extent aforesaid." It further declares that it shall be lawful for the President to extend the examinations to St. George's Bank, and any other bank or shoal, and the soundings and current observations beyond the above limits to the Gulf stream.

In reply to a circular issued by Albert Gallatin, Secretary of the Treasury, inviting an expression of opinion of scientific men as to the best method of conducting the proposed survey, Ferdinand Rudolph Hassler, a Swiss by birth, submitted a plan for a trigonometric survey, and to him was intrusted the duty of organizing it. For this task Hassler was eminently fitted by his previous experience in conducting a trigonometric survey in Switzerland; by his thorough knowledge of the best scientific methods and appliances of his day, by a far-sightedness which led him to make his work conform rigorously to a system admitting of all the extension required by the subsequently increased scope of the work, and by the indomitable courage with which he encountered much opposition, born of ignorance, to his plans. When he undertook the organization there were not in the United States either the workshops to make the necessary scientific instruments nor men trained to their use. He therefore went to Europe to superintend the construction of instruments, but, owing to the political exigencies of the times at home and abroad, his return was delayed, and work was only begun, in 1817, in New York Bay, to be suspended almost immediately thereafter by the failure of Congress to provide funds for its continuance.

Owing to the pressing demands of commerce, and the inadequacy of various attempts made under the direction of the Navy Department to conduct necessary surveys, after the suspension of the Coast Survey, Congress in 1832, upon the recommendation of the Secretary of the Navy and others, recurred to the law of 1807, and the survey was again placed under Hassler's charge, and under the administrative direction of the Treasury Department, under which it has remained ever since. Hassler, under the title of Superintendent, continued to direct the work until his death, which occurred in 1843. He left the work well

advanced between Narragansett Bay and Cape Henlopen, and the survey efficiently organized in all its varied detail. Previous to his death, but in the same year, a board of civil, naval and military officers was convened by the President in compliance with an act of Congress to submit a plan for the reorganization of the survey. This board adopted the scientific methods proposed by Hassler, as the basis of the reorganization, and recommended the continuance of the survey under the Treasury Department. The plan submitted forms the legal basis of the present organization.

Hassler was succeeded by Alexander Dallas Bache, under whom the survey reached its fuller development. Recognizing at once the necessity for an increased scale of operations, he began surveys in many different localities, adapting the work to the different climatic conditions found on the extended coast, by pushing it forward in the south during the winter, and in the north during the summer, and extending it, upon the acquisition of new territory, to the coast of Texas and California. These surveys in widely different localities were all conducted on a common system which ultimately will unite them into a harmonious whole. He instituted systematic observations of the tides, and began a magnetic survey of the coasts and extended the hydrographic explorations into the Gulf stream. During his administration, which was a period of rapid development of the country, the important duty of recommending favorable sites for light-houses was assigned to the survey as part of its regular function.

Two of the most important adjuncts to modern geodesy were introduced and perfected at the very outset of Bache's superintendency, namely, Talcott's method of determining latitudes and the telegraphic method of determining longitudes; refinements were introduced in every branch of the work, which made rapid and admirable progress until it was in great measure interrupted by the civil war. During this period the efforts of the Coast Survey were mainly directed towards a co-operation with the naval and military authorities by constructing military maps and making surveys, and by utilizing the personal knowledge which its officers possessed of the southern coasts, by assigning them to special duty with the naval squadrons.

Under the pressure of his arduous labors the health of Bache gave way, and during a lingering illness of about two years, beginning in 1864, the duty of directing the conduct of the survey devolved upon his principal co-laborer, Assistant Hilgard.

Upon the death of Bache, Benjamin Peirce, the eminent mathematician, was appointed to succeed him in February, 1867. He continued the work according to the methods and plans of his predecessor, and began the extension of the main triangulation into the interior so as to connect the triangulations of the Atlantic and Pacific coasts. The success of this undertaking (not yet completed at the time of writing), in addition to fulfilling its primary object, will contribute this country's fair share to our knowledge of the figure of the earth, hitherto entirely derived from the labors of other nations, and will serve as a basis or connecting link of such trigonometric surveys of the country as the progress of time will inevitably make necessary.

By special enactment of Congress a survey of Lake Champlain was undertaken and completed, and upon the purchase of Alaska a reconnoissance of its coast was immediately begun, and has been continued from time to time in greater detail ever since. In February, 1874, Carlile Pollock Patterson, for many years previously connected with the survey as Hydrographic Inspector, was appointed to succeed Peirce and superintend the work until his death, in 1881. In recognition of the extension of the surveys into the interior directed by Congress, that body in an act of 1879 and thereafter used the designation Coast and Geodetic

Survey. The death of Patterson was followed in December of the same year by the appointment of Julius Erasmus Hilgard, the present Superintendent.

Methods.—For an elucidation of the principles involved in the operations of extended surveys, the reader is referred to GEODESY in the *ENCYCLOPÆDIA BRITANNICA*. We purpose here merely to give an account of their application in the conduct of this work. The basis of this survey is a series of main triangles, having sides as long as practicable, carried along the whole line of the coast and connected at proper intervals with base lines measured by the most approved means which modern science affords. At numerous favorable points of this main series, observations are made for latitude, longitude and azimuth. Series of smaller triangles based upon the lines of the primary triangulation or upon independent base lines connected with the primary triangles, furnish points for the topography and also, in connection with the latter, for the hydrography or soundings.

The unit of length adopted in this work is the meter. The particular standard representing the meter to which all measurements have been referred is an iron bar known as the Committee meter. It is one of a number of similar bars whose length was ascertained in the construction of the original meter, by comparison with the toise, in 1799. Its relation to the French standard is perfectly known. Tralles presented it to Hassler, who brought it to this country in 1805.

The first base line was measured by Hassler with an apparatus involving a mode of measurement which has been recently revived in Europe. The apparatus consisted of three microscopes arranged in stands in line of the base. A combination of iron bars, forming a single bar 8 meters long, was made to measure successively the distance between the microscopes by the optical contact of a spider line stretched across a hole in the end of the bar, and another fine line, visible beneath it, on the tripod carrying the microscope. The objectives of the microscopes were each composed of two half lenses of different foci, by means of which the images of the spider line and other line referred to were centered in the eye. This apparatus was superseded by a very elaborate, compensating one designed by Bache. Although it is possible to ascertain the co-efficient of linear expansion of a metal with extreme accuracy, it is very difficult to find out, within the limits of accuracy required, what the temperature of a metal bar is under such circumstances as are presented during base line measurement. It is the object of a compensating apparatus to secure invariability in length of the measuring bar during changes of temperature.

In the one under notice, two bars, one of iron and one of brass, are firmly united at one end and left free to expand at the other. The cross-sections of these bars are so proportioned to their conducting powers and specific heats that their changes of temperature go on at the same rates under different exposures. The compensation is secured by the arrangement of a lever at one end, fastened to the brass and pivoting on the iron. The long arm of the lever is connected with a small rod having a contact plane of agate. At the other end the bars carry a contact level and abutting rod with an agate knife-edge. The bars are enclosed in a spar-shaped tube which is supported on trestles admitting of adjustment in height, inclination and alignment. There are two such tubes, each 6 meters long, and the measurement is made by bringing them successively into contact, which is determined by the position of the bubble of the delicate contact level. The performance of this apparatus has been tested by the measurement of many base lines, and particularly of the one near Atlanta, Ga., which was measured twice in winter and once in summer under extreme differences of temperature, with results yielding great accuracy but showing

at the same time that the compensation is not perfect. Recently another compensating apparatus, composed of zinc and steel bars, 5 meters long, has been constructed and used in the measurement of a base line in California. It is also a contact apparatus, contact being effected by screw motion, and judged by the coincidence of lines on a principle designed originally for the non-compensating apparatus intended for the measurement of base lines of secondary importance.

It may be remarked in regard to the different forms of measuring apparatus used in the survey that the merely mechanical part of measuring can be performed with any of them with all the requisite accuracy, that the difficulty of finding the true temperature of the bars while measuring remains the chief source of error, and that the degree of accuracy attained is as great as can be maintained in any system of triangulation depending upon the bases. To illustrate the accuracy achieved, it may be instanced that, taking into account all sources of error, the uncertainty of any one result of the three measures of the Atlanta Base is only about one inch.

The base measurements serve rather as a verification of the connecting triangulation than conversely, but as a remarkable instance of the results of the general refinement of the methods employed in both operations it may be stated that, in a portion of the main triangulation of the Atlantic coast, the computed lengths of the common line of junction $29\frac{1}{2}$ miles long, situated midway between two bases 600 miles apart, of two independent systems of triangulation, differed only about half an inch.

The angles of the primary triangulation have been measured with theodolites, whose graduated circles are from 12 to 30 inches in diameter, and the preference is now given to this class of instruments with circles of from 18 to 24 inches in diameter, over repeating circles, which have also been used.

The sides of the primary triangles are generally as long as the configuration of the country will admit, and vary from comparatively short lines in flat country to long ones such as connect by a single step, the Contra Costa Mountains with the Sierra Nevada Mountains in California reaching a length of 169 miles. To render the stations visible at such great distances, heliotropes with mirrors 7 inches in diameter were employed to reflect the sunlight in the direction of the observer. On short sides, signal poles or other marks are erected and observed upon. Night signals, consisting of oil lamps and magnesium lights, have also been used, but not very extensively.

The altitudes of the stations are determined by trigonometric methods consisting of observations of zenith distances made with vertical circles, supplemented by micrometric observation made with the powerful telescopes of the theodolites, to determine differences of zenith distance. In addition to these observations a line of precise levels has been commenced, and it is intended that it shall connect the tide-waters of the two oceans; at present it extends from the Atlantic to within a short distance of the Mississippi River.

The direction of the triangulation with reference to the meridian is determined by azimuth observations. These are made with the theodolites used for the measurement of horizontal angles, by observations on one or more of the following stars, α , λ , δ and 6 Ursæ Minoris and 51 Cephei, and generally only one reference mark is used. The observations are combined so as to eliminate either errors of chronometer time and right ascensions when observing the stars near culmination, or errors of declination when observing them at elongation. Another refined method often practised is to use the ocular micrometer of a transit instrument to observe the transits of circumpolar stars over the thread of the micrometer at equal distances from, and on both sides of, the line of collimation, and to refer the observations to a mark placed

either in the meridian or in the vertical plane of the observed star's elongation. The average probable error of a determination of an azimuth and its connection with the triangulation derived from observations at 48 stations along the Atlantic coast is a little greater than .3 second of arc.

The different instruments for determining latitudes, tried in earlier years, such as vertical circles, repeating-reflecting circles, the zenith sector, and the method of prime vertical transits, were all superseded by the zenith telescope in its application to the method invented by Captain Andrew Talcott, U. S. A., prior to 1836, first used in the Survey in 1846, and afterwards remodelled and improved for the purposes of the work.

The method consists in measuring with a micrometer the differences of zenith distances of stars culminating within a short time of each other, at nearly the same altitudes, on opposite sides of the zenith. In more recent years the use of the zenith telescope as an independent instrument is being gradually abandoned, and in its stead the portable transit is used, which, by a simple modification, the addition of a delicate level and ocular micrometer, and by making either the stand or the telescope reversible, has been adapted to the purpose of latitude determinations.

The accuracy of modern star catalogues is such that the latitude of any station can be determined with comparative ease and with greater dispatch than by any other known method, within one-tenth of a second.

In 1846, also, the telegraphic determination of longitudes was for the first time put into practice in the history of Geodesy, and soon after, the chronograph, for recording time by means of the electromagnet, was originated as an accessory part of such determinations. The first telegraphic difference of longitude actually observed was that between Philadelphia and Washington, Oct. 10, 1846.

By the introduction of this method it became possible to determine the amplitude of latitudinal arcs with a degree of precision which before had only been reached in the measurement of meridional arcs, and thus a new element was introduced in geodesy and astronomical science. Its application was immediately extended, and on the laying of the first Atlantic cable, the difference of longitude between Cambridge, Mass., and Greenwich, England, was successfully determined in the fall of 1866, and subsequently two other determinations through two new cables were made, the last of which involved the difference of longitude between Paris and Greenwich, which was then, by that expedient, for the first time determined with a degree of accuracy commensurate with its importance.

Previous to the laying of the Atlantic cable, every means known to science was exhausted by the Survey to determine the difference of longitude between Europe and America; to this end a large number of comparable observations of eclipses, occultations, and moon culminations, made abroad and in the United States, were collected and reduced, and as the co-operation of astronomers had been enlisted for this purpose, the science of astronomy received a stimulus to which it owes much of its progress in this country. In addition to the purely astronomical methods invoked, chronometric expeditions were organized and carried out by the survey on an unparalleled scale between the years 1849 and 1855, and it is worthy of note that the subsequent telegraphic determinations confirm the greater reliability of the chronometric over the astronomical results.

In telegraphic longitude determinations, as in all work of precision, it is always deemed necessary to secure a check on the accuracy of any result which has been obtained, and for this reason the method of procedure is so arranged that, if any two stations have been determined from an initial point, the resulting difference of longitude between the two new stations is

checked by an independent series of observations made directly between them. In this way the reliability of a longitude determination made by the Survey has been tested, and it has been found that the uncertainty of such a result is only about .03 of time.

Bearing in mind the limits of uncertainty of the results of the different processes here described, it will readily be perceived that if the astronomical observations made at one station are referred to and compared with those made at another, any gross discrepancies must be ascribed to some cause not inherent in the methods used. Such discrepancies, however, are found and are ascribed to local irregularities in the form and density of the earth, which manifest themselves by the difference between the observed and computed direction of the plumb-line, and for this reason it is essential to make the observations at numerous points so that abnormal deflections may be distinguished by comparison.

When the triangulation is finished in any particular locality, and the latitudes and longitudes of the points have become known, they are plotted on a suitably prepared sheet of paper having on it a polyconic projection of the meridians and parallels covering the area to be mapped. These points then form a framework which unites and properly relates the topographical survey of one locality to that of another. The topographer by means of a plane table fills in the details of the map by representing the features of the country by certain conventional signs. The elevations or depressions are shown by contour lines or curves of equal elevation. The topography extends as far inland as necessary for the purposes of navigation or coast defence. The scales on which these maps are drawn in the field vary, but two are used in general on which the distances on the map are represented respectively by the .0001 and .00005 of the actual distances.

The duties of the hydrographer are analogous to those of the topographer in completing the required detail of the map. It is his province to explore the bottom of the sea by sounding its depth, to develop the channels and discover hidden dangers, and to lay down his observations in their proper places on the map for which the triangulation and topography have furnished the frame-work. He must note the currents and their changes in direction and velocity with the ebb and flow of the tide, and the assistance they may render or the danger they may cause to ships.

By means of angles measured, between objects on shore whose position is known, with a sextant at the place where a sounding is made, its relation to the rest of the map is determined. When, however, the work extends far seaward and out of sight of land, resort is had to the methods of determining a ship's position at sea known to navigators.

It is not only deemed requisite to determine the depth, but also the character of the bottom, and to this end appliances for bringing up specimens are attached to the sounding lead. By a system of abbreviations of words denoting the nature of the bottom, its characteristics, as determined by the sounding, are represented on the map. The information thus conveyed often enables the navigator to determine his position or to select a suitable anchorage. As the depth varies with the height of the tide, the soundings are referred to a particular stage of it, namely, to mean low water; and the depths at this stage are given on the map expressed in fathoms, and in shoal places in feet. The measurement of moderate depths is effected with comparative ease, but great difficulties were encountered in the beginning when the profound depths of the ocean off the coast were to be determined, as was the case in the explorations of the Gulf stream undertaken by Bache. The art of deep sea sounding was in its infancy when the Gulf stream explorations were begun in 1845, and the methods employed were necessarily tentative. But it was that period of experimental work which contributed largely to the improve-

ments made more recently in the methods and appliances of deep sea sounding.

The greatest difficulty formerly encountered in sounding was the friction on the sounding rope due to the great pressure of the water; this has been overcome by the introduction of suitable wire. The capabilities of modern methods as applied and perfected in the survey are illustrated by the complete survey of the Gulf of Mexico, whose greatest depths, between 12,000 and 13,000 feet, were sounded out with unerring accuracy; at the same time the temperature at those and intermediate depths was ascertained.

The importance of the Gulf stream as a hydrographic feature of the Atlantic coast led to the explorations referred to above. Its characteristic feature is the higher temperature of its waters over those of the surrounding ocean, and on this fact the explorations to determine its limits were based. At different points in its course lines of soundings were run across it at right angles to the supposed axis of its current, and the temperature of its waters was observed not only at the surface, where atmospheric influences might affect the temperature and vitiate the conclusions, but also at various depths below, where the phenomena were supposed to be free from such fluctuations.

Reference has already been made to the reduction of all soundings to a common plane of reference, namely, that of mean low water. For the purpose of making these reductions, observations are always made while the soundings are in progress, at stations near by, to determine the extent and times of the rise and fall of the tides. In addition, however, observations continued through many years, in some cases through a complete lunar cycle of nineteen years, have been made at selected stations along the coast for the purpose of studying the complicated laws which govern the tides on the coasts of the United States. For the purpose of recording the rise and fall of the tides a self-registering gauge is used. The apparatus consists of clock-work moving a sheet of paper, on which is traced a continuous line representing the successive stages of the tide, by means of a pencil which is moved by the rise and fall. As a result of these observations and investigations tide-tables are published annually by the Survey, in which are predicted the times and height of the tides at the principal ports of the United States, together with other data, by means of which the same information for all intermediate ports may be obtained.

The declination of the magnetic needle or variation of the compass is an element of great importance in navigation, and its amount is given on the charts. It varies in regard to time and place and has therefore been made the subject of special observations, and the laws governing its changes have been investigated by the Survey. Observations for declination, dip and intensity have been made at many points on the coast and in the interior with portable instruments, and a permanent observatory is maintained, with the co-operation of the University of Wisconsin, at Madison, in which the never-ceasing fluctuations of the magnetic needle are recorded by photography. Its own observations and those made by others have been collated and subjected to analysis by the Survey, and in consequence the direction of the needle can be foretold for the future and revealed for the past within certain limits. This latter fact, it need hardly be said, is of great value to land surveyors throughout the country. Charts showing the lines of equal magnetic declination have been published by the Survey.

Incidental but highly important results are brought out by the progress of the triangulation, namely, the measurement of terrestrial arcs. So far the following arcs have been completed: The Nantucket arc, extending from Farmington, Me., in lat. $44^{\circ} 40'$, to Nantucket Cliff, in lat. $41^{\circ} 18'$. The Pamlico-Chesapeake arc, from the head of Chesapeake Bay, in lat. $39^{\circ} 35' 5''$, to Ocracoke Inlet, N. C., lat. 35°

$04'$. The two just mentioned are meridional; the most important, however, is the oblique arc, extending along the Atlantic coast from Calais, Me., in lat. $45^{\circ} 11'$, to Atlanta, Ga., in lat. $33^{\circ} 45'$, and having a length of 1200 statute miles. A discussion of these geodetic measures has resulted in the adoption, by the Survey, of the elements of the spheroid as deduced by Clarke, in place of those of Bessel, as most closely according with that portion of the earth's figure over which the triangulation has been extended.

The results of the work, of whatever kind, are forwarded to and discussed and published at the office of the Survey, in Washington, D. C. Annual reports are made by the Superintendent, which are communicated to Congress. They consist mainly of a review of the progress of the work during the year; a summary of the means proposed for promoting its efficiency; estimates for future progress, an abstract of work done in the field and office, with sketches illustrating the statements of progress. Professional and scientific papers relating to methods and results of the survey are usually appended.

A series of volumes containing full descriptions of the coast, the shores of the harbors, dangers, directions for entering harbors, with charts and views of the coast, is in course of publication under the title of *Coast Pilot*.

The charts, which are all drawn on a polyconic development of the earth's surface, are of two general descriptions, which may be distinguished as preliminary and finished. The preliminary charts are those which are issued as soon after the several surveys as is consistent with accuracy of general delineation, and are designed to supply the immediate and pressing demands of navigation. The finished charts embody all the information furnished by the Survey, including the minutest details. The two classes of charts differ in regard to the amount of the information which they furnish, but not in regard to correctness of that which is given. The charts are various in character, according to the objects which they are designed to subserve. The most important distinctions are the following:

1. Sailing charts, on a scale of 1:1,200,000, which exhibit the approaches to a large extent of coast, give the offshore soundings, and enable the navigator to identify his position as he approaches from the open sea.

2. General charts of the coasts, on scales of 1:400,000 and 1:200,000. These are intended especially for coastwise navigation, and are more general than

3. Coast charts, on a scale of 1:80,000, by means of which the navigator is enabled to avail himself of the channels for entering larger bays and harbors, and to recognize the beacons, buoys, and light-houses by their distinctive features and positions.

4. Harbor charts, on large scales, intended to meet the needs of local navigation.

It remains briefly to notice the fact that the first successful attempt to introduce uniformity and system into the weights and measures of the Union was made under the direction of Hassler, and that the highly important office of Weights and Measures has been continued under the care of the Superintendent of the Survey ever since. (O. H. T.)

COATESVILLE, a borough of Chester co., Pa., finely situated in the fertile Chester Valley. It is 38 miles W. of Philadelphia, on the Pennsylvania Railroad and on the Wilmington and Norristown Railroad. The former has here an iron bridge 900 feet long and 60 feet high. Coatesville has a national bank, a public hall, three hotels, two weekly newspapers, six churches, and eight schools. Its industries comprise seven iron-mills, a foundry, a tannery, two cotton and woollen mills, paper-mills, a box-board-factory, two flour-mills, two planing-mills, and a carriage-factory. It is lighted with gas and has water-works. It was settled in 1820, and incorporated in 1857. The west branch of the

Brandywine, passing through the town, affords good water-power. Its property is valued at \$2,000,000, and its public debt is \$100,000. Its population in 1880 was 2766, but within a mile of its limits there are 5000 inhabitants.

COBB, HOWELL (1815-1868), a Georgia statesman, was born at Cherry Hill, Ga., Sept. 7, 1815. He graduated at Franklin College in 1834, studied law, and was admitted to the bar in 1836. He was elected by the legislature solicitor-general of the western circuit of the State. In 1843 he was elected to Congress, and soon became the leader of the Southern Democratic members. In December, 1849, after a prolonged contest, the Whig party proved unable to re-elect Mr. R. C. Winthrop Speaker of the House, and the Southern members united on Mr. Cobb, and elected him on the fortieth ballot. When Mr. Clay's compromise measures were introduced in 1850, Mr. Cobb supported them, and in 1851 was elected governor of Georgia in opposition to the extreme Southern party, which opposed the compromise. In 1855 he was again elected to Congress, and having strongly supported Mr. Buchanan for President, was made by him Secretary of the Treasury, which position he held till Dec. 10, 1860, when he resigned to take part in the secession movement. In February, 1861, he was chosen president of the Confederate Congress at Montgomery, Ala., but a year later retired on account of personal differences with Jefferson Davis. Though appointed a major-general in the Confederate army, he took no part in military affairs. After the close of the war he opposed the reconstruction policy. He died suddenly while on a visit to New York, Oct. 9, 1868.

COBBE, FRANCES POWER, an English philanthropist and writer on social, moral, and religious subjects, was born in 1822. She is descended from Richard Cobbe, who sat in Cromwell's Parliament in 1656 as knight of the shire for Hampshire, where the family has been settled for several centuries. Her father, Charles Cobbe, was lieutenant of light dragoons in the battle of Assaye, afterwards deputy-lieutenant and high sheriff for county Dublin, Ireland. Miss Cobbe was educated at Brighton. After the death of her father, in 1858, she was for many years engaged, in company with Miss Mary Carpenter of Bristol and other friends, in reformatory work, ragged-school and night-school work, the befriending of workhouse girls, and the relief of destitute incurable sufferers throughout England. She also made several journeys to Italy and the East, and then settled in London, where she has taken part in the agitation for woman suffrage. An effort to obtain legal separations for wives subjected to aggravated assaults was originated by her, and has been successful. Since 1876 she has been chiefly engaged in founding and directing the Victoria Street Society for the Protection of Animals from Vivisection, of which Lord Shaftesbury is president and Miss Cobbe secretary. They have succeeded in securing the passage of an act restricting the practice of vivisection. Miss Cobbe has been a frequent contributor to the daily press, as well as to the *Quarterly*, *Contemporary*, and *Fortnightly Reviews*, the *New Quarterly*, *Fraser's*, and *Cornhill Magazines*. Her first work was an *Essay on Intuitive Morals*, published in 1845, and republished in America. Her works on religious subjects comprise *Thanksgiving*, a *Chapter of Religious Duty* (1863), *Broken Lights*, an *Inquiry into the Present Condition and Future Prospects of Religious Faith* (1864), *Dawning Lights*, an *Inquiry concerning the Secular Results of the New Reformation* (1868), *Darwinism in Morals* (1872), *The Hopes of the Human Race, Hereafter and Here* (1874). She has also edited *Alone to the Alone, Prayers for Theists, by Several Contributors* (1871), and the *Collected Works of Theodore Parker*, in 12 volumes. On philanthropic and social subjects she has written *The Workhouse as a Hospital* (1861), *Friendless Girls*, and *How to Help them* (1861), *Female Education* (1862), *The Pursuits of Women* (1863), *Studies New and Old*

of *Ethical and Social Subjects* (1865), *Criminals, Idiots, Women, and Minors*, a discussion of the laws concerning the property of married women (1869), and *Moral Aspects of Vivisection*, which has passed through several editions. She has also published, as results of her observations abroad, *Italics: Brief Notes on Politics, People, and Places in Italy* (1864), and *Cities of the Past* (1864). Among her later volumes are *False Beasts and True* (1875), *Re-echoes* (1876), *The Duties of Women* (1881). Her last work, *The Peak in Darien* (1882), is an octave of essays on atheism, pessimism, vivisection, and immortality. Miss Cobbe is an incisive and suggestive writer, a vigorous supporter of the intuitive theory of morals, and a representative of the devout theism which finds no sufficient evidence of the truth of revelation.

COBET, CAREL GABRIEL, a Dutch philologist, was born at Paris, about 1813. He was sent to Holland by his father, and after studying at the Hague and at Leyden, travelled in Italy. In 1847 he became a professor at the University of Leyden, from which he received, for his works, the honorary title of doctor. In 1871 he was made Correspondent, and in 1876 Foreign Associate, of the French Academy of Inscriptions and Belles-Lettres. His works display great erudition. Among them are: *Prosopographia Xenophontea* (Leyden, 1836); *Observationes criticae in Platonis comici reliquias* (Amsterdam, 1840); *Variae lectiones qui bus continentur observationes criticae in scriptores Graecos* (Leyden, 1854); *Novae lectiones* (1858); *Miscellanea philologica et critica* (1873); with editions of Lysias and other Greek authors.

COBOURG, a town of Ontario, Canada, in Northumberland co., the county-seat of Northumberland and Durham counties, on the N. shore of Lake Ontario, 65 miles E.N.E. of Toronto. It is on the Grand Trunk and the Cobourg, Peterborough, and Marmora Railways; has fine town and county buildings, and is the seat of the University of Victoria College (Wesleyan). Cobourg has 2 banks, 2 newspapers, 8 churches, 10 schools, besides a collegiate institute and a county model school; also grist-mills, car-works, foundries, woollen and cotton mills, dye-works, and manufactures of matting, cards, etc. It is a handsome town, gas-lighted, and regularly laid out. Property valuation, \$3,000,000; public debt, \$200,000; yearly expenses, \$32,000. Its port is artificial, and much iron-ore is here shipped. Population, 4957.

COCCULUS. The drug known as *Cocculus indicus* is obtained from a plant belonging to the natural order *Menispermaceae*, of which there is in the United States a good representative in *Menispermum Canadense*, and in *Cocculus Caroliniensis* of the Southern Atlantic States. It has in modern times been divided from *Menispermum* and *Cocculus*, and forms a genus of this single species under the name of *Anamirta Cocculus*. It is a native of Malabar, chiefly, where it is commonly known as *Natsiatam*. It is a strong climbing plant, having a stem as thick as one's arm, which is deeply coursed by numerous fissures. The leathery leaves are about 6 inches in diameter, and somewhat heart-shaped; and the short leaf-stalk is tumid at both ends. The male and female flowers are borne on separate plants. The female flowers are in somewhat compound racemes a foot long, from the axils of the upper leaves, and the fruit, which is first white, then red, and finally black, resemble bunches of small grapes. The drupe contains a single stone about the size of a pea, and it is from this the intoxicating material is obtained which has, for so many ages, made the plant famous. The venomous principle is known as *picro toxine*; and *Menispermine*, a powerful alkaloid, is found in the pericarp. The fruit is made into a paste with flour and water, and a little red lead to give it color; and when a small portion is thrown into the water, fish greedily eat it, and soon come to the surface floating back downwards, when they are easily caught by the hand. The powdered fruit is one of the best

insecticides for infested hair. Up to the time of Linnæus this was all known of its value. In his *Materia Medica* he dismisses it in two words, "*pediculis—piscibus*." Afterwards it was discovered that it could be used as a substitute for malt, in brewing, and immense fortunes were made by its use in "London Porter," until the fact was discovered, and its employment for that purpose interdicted by law. About 3 lbs. of the poisonous drug were used to about 300 lbs. of malt. The Colomba, Calumba, or Kalumba, root, as it is variously spelled, is obtained from the root of *Cocculus Palmatus*, a native of eastern Africa, and is a favorite tonic in the pharmacopœia. The American Columbo is the root of a gentianaceous plant—*Frasera Caroliniensis*, and its virtues are said to be equal to its African namesake. *Cocculus Peltatus*, *C. flavescens*, *C. platyphyllus*, and *C. Bakis* are used in the same capacity in various parts of the East Indies. In Arabia a spirit is distilled from *C. Cabatha*. The American *C. Caroliniensis* has a special reputation only as an ornamental plant. It grows with great rapidity, and is popular wherever free-growing vines are desirable. Its fruit hangs in bunches like red currants, and is particularly ornamental, but on account of the unisexuality, single plants seldom bear fruit under cultivation.

COCCYX (Gr. κόκκυξ, a cuckoo), the termination of the spinal column or back-bone, in man consisting normally of the last four vertebræ ankylosed together in adult life; the apparently single bone resulting from this fusion being likened in shape to a cuckoo's bill. The bones are much stunted and degraded vertebræ, scarcely exhibiting the processes and other points of structure of well-developed vertebræ, and not transmitting spinal nerves throughout. The human coccyx has normally one more bone than that of the gorilla, man being therefore more tailed than that ape; it is ankylosed or articulated with the sacrum, usually the latter, and more freely in the female than in the male sex; it is said to be freest during pregnancy, and to yield during parturition some little increase of antero-posterior diameter of the inferior strait of the pelvis. It gives attachment to several muscles and ligaments. Any bone of the coccyx is a *coccygeal* vertebra, and in animals with long tails the adjective is synonymous with *caudal*. In such cases the elongated bones are freely movable, are for the most part devoid of a canal for the transmission of nerves, and in general resemble both in form and function the phalanges of a digit; they are often reinforced on the under side by certain processes known as chevron-bones. The number ranges from about three to upwards of one hundred. In most birds, more or fewer terminal coccygeal vertebræ are enlarged and welded together into a peculiar coccyx called the share-bone, vomer or *pygostyle*, borne at the end of a number of less modified free caudal vertebræ, and serving for the support of the tail-feathers. (E. C.)

COCHIN CHINA. The interference of France in the affairs of Anam has called considerable attention to this hitherto almost unknown country; and French travellers and geographers have been industrious in collecting additional information respecting it.

The name Cochin China is strictly limited to a part only of the once powerful empire of Anam, which consisted of three very distinct regions; viz., Lower Cochin China, now in the hands of the French republic; Upper Cochin China, which contains the Anamese capital, and Tong-king, which is by far the most populous and most important of these countries.

RACES—Anamites.—The predominant race throughout is the Anamite, and is probably, like the Siamese and the Shan races, an offshoot from the Chinese stock. The Chinese emperor Yaon, who came to the throne B. C. 2356, sent the tribe of Hi to take the government of the country to the south of the Yangtse-kiang, and kingdoms thus formed extended in B. C. 2208 to the south of Tong-king. The earliest

dynasties of the Anamites and Shans are traced to Chinese imperial families, and their kingdoms were within the bounds of the empire before its earliest contraction. Successive waves of Chinese emigration appear to have swept over almost the entire Indo-Chinese peninsula, driving the aborigines to the mountains, and waging war against the opposing Malay element that met them in the south.

Intermixture with other races, and the lapse of many centuries, during which the surroundings have been diverse from those of the actual Chinese, have made of the Anamite a race as distinct from the former as is the German from the Anglo-Saxon. The true Anamites are of small stature, but possessed of great endurance, and with a full share of oriental duplicity. They are reserved and proud, repressing all outward show of affection. Timid by nature, they are yet capable of making an energetic resistance when well led, as was proved by the French in the war which resulted in the annexation of Lower Cochin China. Buddhists by profession, they are incapable of comprehending the refinements of that creed, and actually practise ancestor-worship to even a greater extent than do the less educated classes of the Chinese. Their reverence for tombs is very great, so much so that on the surrender of Lower Cochin China to the French it was made a condition that the tombs of the royal family of Nguyen should be kept in order by the conquerors. The father is absolute master of his wives and children, and marriages of the second order are frequent.

Every Anamite dish has for its basis a preparation of putrid fish, called nuoc-mam, the scent of which renders their thatched habitations unbearable to a European.

Mois.—Scattered among the forests of the mountains which separate the basin of the Me-kong from the cultivated lands of Anam are the tribes of the Mois, apparently the remnants of an aboriginal people. Though socially below the level of the Anamites, these people have taller forms and in many respects nobler features than the predominant race, which, though it has driven them to the mountains, does not really rule them. The possession of a beard, and several other characters, suggest, in spite of their degradation, affinities to the Indo-European race. The Mois devote themselves to agriculture, clearing patches in the midst of the forest, at a distance from the cultivated lowlands of the Anamites, and also trade ivory, honey, skins, pepper, betel, etc., in exchange for other commodities. Occasionally they make a foray into Anamite territory, and carry away women and children, whom they sell in the markets of Laos.

Hoi.—Upon the lower slopes of the eastern side of the mountains, below the districts occupied by the Mois, dwells a people called the Hoi, few in numbers, with better developed limbs than the Anamites, and seemingly more energetic, but sunk to the lowest level of degradation. These are looked upon in the province of Binh-dinh (Upper Cochin China) as the last descendants of the Tsiampas, who figure so largely in Anamite history.

Laotians.—The Laos or Laotians are supposed to be of Chinese origin, and probably constituted one of the oldest of the swarms that emanated from Southern China. The name Lau or Lao signifies old. Independent Laotian tribes occupy a large portion of the hill-country, country of Tong-king, preferring poverty to submission to the exactions of the Anamite mandarins. The same race is master of the upper valley of the Me-kong, and occurs along the length of that river. The Laos are a rather good-looking, decidedly lazy race, raising only what is barely necessary to sustain them, and without aptitude for commerce.

Chinese.—Nearly the whole of Indo-China, wherever business can be transacted, swarms with modern Chinese. In their hands is all the commerce of the

fertile delta of the Me-kong, they have seized upon the trade of Tong-king, and whatever is grown by Laos or Mois passes through their hands before it reaches the markets of the world. If Europeans traffic here, the Chinaman is the medium between them and the producer or collector. The Chinese trade in Tong-king is chiefly an illicit one, carried on by bands called the Black Flags, in the composition of which the elements of smuggler, pirate, and rebel enter in about equal proportion. No Chinaman can enter into the civil service of Anam, yet the Chinese bands are so numerous and so powerful that the Anamite governors bend before them.

History.—The Anamite annals show that for ten centuries the narrow strip of Upper Cochin China was the scene of a constant struggle between the Giaochi, from whom the modern Anamese are descended, and the Tsiampas, a race of sea-faring people, or rather pirates, whose headquarters was in the province of Binh-dinh, and whose chief port was the ancient Gia, the modern Thi-nai or Qui-nhon. The origin of the Tsiampas is not surely known, but probably they were Malays, possibly a colony from the Philippines. In spite of the continuous defeats and terrific slaughter which, according to Anamite annals, were regularly inflicted upon the Tsiampas, their kingdom existed, though at a low ebb, in 1313. In 1377 they captured the Anamite king by stratagem, and in 1405 received help from China.

Le-loi, the great hero of Tong-king, was victorious over the Chinese; yet in 1470 the Tsiampa pirates pillaged more than ever the coasts of Anam. At that period Le-thanh-tong directed against them 100,000 men by sea and 160,000 by land, overran their country, and annexed it to Anam. In 1509 they attempted to regain their independence, but were definitively annexed in 1649. From this time until the eighteenth century the Anamite kings were undisputed masters of Cochin China and Tonquin, but at this date there was a division. The family of Nguyen, originally the governors of the southern provinces, became independent, and the governor of Tong-king also rebelled against his sovereign. At the end of the eighteenth century the Tay-son rose in the south, and the unfortunate Nguyen-anh was forced to fly to an island in the Gulf of Siam, whence he secretly returned, and, with a force of character seldom found in an Anamite, attempted to reconquer his kingdom. In this, with the aid of a few French officers, he finally succeeded, and added Tong-king also to his dominions. From this epoch the French have always had a hand in the affairs of Anam. The treaty of 1787 gave the port of Tourane and the archipelago of Pulo Condor to France. It was not till 1801 that the citadel of Binh-dinh fell into the hands of the Anamite king, who during his life, grateful to the French for the assistance they had rendered him, continued friendly to them, but who counselled his successor Minh-Mang to get rid of such dangerous allies. An era of persecution of native Christians and massacre of French and Spanish missionaries succeeded, and resulted in the capture of Saigon in 1859 by 800 French and Spaniards. The Anamite forces immediately blockaded them, and it was not until additional troops arrived that the lines of Ki-hoa were carried. Peace was made in 1862, and part of Lower Cochin China was annexed, but the three western provinces were still in the hands of the Anamite king, and insurrections were frequent. The light boats or sampans of the Anamites did them good service. In 1867 these insurrections were put down, chiefly by the aid of light-draught gunboats that could traverse the canals of the Me-kong delta, and Admiral de la Grandière succeeded in adding the remaining three provinces to the French colony. A treaty signed in 1863, by the same admiral, gave France the protectorate of Cambodia.

French relations with Tong-king date from the

forcible ascent of the Red River by M. Dupuis in 1872. M. Dupuis had been a confidant of Mâ, then all-powerful in Yunnan, and was commissioned by him to endeavor to open the route of the Red River as an outlet for the productions of that province. He descended the river in safety, and then, foreseeing the great advantages that would accrue to his native country by possession of the right of way, proceeded to France, and laid his scheme before the government. This was at the close of the Franco-Prussian war, and all that he could obtain was leave to employ French gunboats at his own expense. Armed with this permission, he proceeded to the Red River with two gunboats and a sloop, manned by 25 Europeans and 125 Malays and Chinese. As Ly-Tuang, the representative of Tu-Duc, king of Anam, delayed to grant leave of passage, the small flotilla passed up the river to Ha-noi, from whence M. Dupuis proceeded onwards with a small party to Yunnan, leaving M. Millot in command. After the return of M. Dupuis to Ha-noi armed with credentials from China, and accompanied by 150 Chinese soldiers, the opposition of the Anamites grew to open warfare; but the small body of strangers, aided by additional forces brought by M. Francis Garnier, carried all before it, so that in a short time the strong places of Phu-ly, Hai-Dzuong, Namh-Dinh, and Ning-Binh fell into the hands of the French. The brave Garnier perished at Ning-Binh, yet the struggle was continued, and soon after the arrival of a few troops from Saigon in Dec., 1872, almost the whole of Tong-king was conquered. At this moment M. Philastre arrived from Saigon, and gave orders for the evacuation of all the places taken. Eventually a treaty was signed in 1874, by which the French were permitted to keep consuls at Hue, Qui-nhon and Ha-noi, each with a guard of 100 men, while the Red River was declared open to commerce. The non-fulfilment of the latter stipulation led to new troubles.

In April, 1882, the citadel of Ha-noi was taken by the French, and, though soon afterwards surrendered, was early in 1883 again in their hands. The bombardment of Hue, together with the successes of General Bouet in Tong-king, forced from the king of Anam, Hiep-hoa (the successor of Tu-duc), a treaty which gave France the full protectorate of Tong-king and Anam, added the province of Bin-thuan to French Cochin China, promised the recall of the Anamite troops from Tong-king, permitted French troops to occupy the forts of the river of Hue, gave the customs of Anam entirely into the hands of France, and allowed the French government to establish fortified posts upon the Red River, wherever it might think necessary. The Black Flags, assisted by China, still remained to be dealt with, and China put forth more strenuously than ever her claims to suzerainty over Anam. (See CHINA.)

The claims of the Chinese emperor are doubtless based on an ancient right, and on ancient race traditions, but are really obsolete, since Anam always acted independently of China, and its sovereign styled his empire the Great Southern Kingdom, thus placing it in the same rank with China. Fear of a powerful and aggressive neighbor so near her doors, and the wish to preserve the trade of Yunnan and Tong-king in Chinese hands, are the actual motives of the claim.

French Cochin China.—Lower or French Cochin China has an area of rather less than 23,000 square miles, and consists to a great extent of the recently formed delta of the Me-kong. The various channels of this river, connected with each other by numerous *arroyos* or canals, natural and artificial, give great facilities for communication. At various points the flat, marshy country is broken by granitic heights, formerly islands in the Gulf of the Me-kong. The real highlands commence near Saigon and extend through the provinces of Bien-hoa, Baria, and Bin-thuan; all of which are furrowed by the ramifications

of the mountains that separate Anam from the basin of the Mekong.

The climate is unhealthy, especially to Europeans. In the wet season the thermometer varies from 68° to 86°, and in the dry season (Oct. to April) it rises to 95°. Even at night it only descends to about 65°, and this continued heat, coupled with the moisture, brings on dysentery, fevers, and chronic diarrhoea. In 1861 the mortality of the French troops reached 11.56 per cent., but it has now been reduced to 4.82. Cholera and small-pox commit great ravages among the natives, but their sway is checked somewhat by the protective measures of the French government, which has placed a physician in most of the principal centres, and has introduced vaccination.

The island of Pulo Condor is set apart as a penal colony, but very possibly may never be used except for native criminals, since it is known that Europeans cannot work in the climate.

At the entrance of the River of Saigon, which is the principal port and centre of the colony, is a light-house with a range of 28 miles. At this spot terminate the telegraphic cables from Singapore and China. Other maritime ports are Hatien, Rach-gia, Camau, and Cangio; Mytho, Vinh-long, Chandoc, and Sadoc are river-ports, while Gorong, Tay-minh, and Thudan-mot are also centres of trade.

Upper Cochin China or Anam.—The central part of the empire of Anam is much less known than the northern and southern portions. It appears to be for the most part a mountainous, infertile, and insalubrious country, scarcely producing sufficient rice for its own inhabitants, and dependent for the greater portion of its supplies upon Lower Cochin China and Tonquin. When Nguyen-anh had finally reconquered his dominions and annexed Tong-king, he fixed his capital at Hue, in the centre of Anam properly so called, rather than at Ha-noi, the ancient capital of Tong-king, on account of the central position and inaccessibility of the former place.

Hue can scarcely be called a city; it is a citadel and a market, with perhaps from 30,000 to 40,000 inhabitants around it.

The population of Anam is certainly inferior to that of Tong-king, and its area is about 47,000 square miles. The province of Binh-dinh, in the south of Anam, is relatively rich and populous, and contains about 530 villages and 50 to 60 markets. The only road of any importance is the royal road which traverses the entire length of the country from French Cochin China to the Chinese province of Quang-si.

Tong-king.—The area of Tong-king is given by Millot at about 57,000 square miles. The portion of the population resident in the thickly populated delta of the Song-ka or Red River, and in the less mountainous part of the country, and subject to the king of Anam, is by the same authority placed at 10,000,000, while the total population, including the independent Laotian tribes of the mountains of the north and west, may be 15,000,000. Another estimate is as high as 18,000,000. The climate of Tong-king, owing to its more northern position, is comparatively salubrious. In the rainy season, which lasts from April to September, the temperature varies from about 60° to 95° F.; but the greatest heat is tempered by the monsoon. The principal rivers are the Song-ka, which rises in the plateaux of Yunnan, traverses Tong-king from west to east, and forms an extensive delta at its mouth; the Thai-bink, the Clear, and Black Rivers, the Song-Mâ, which waters the province of Thanh-Hoa, the Song-Mô, and the Song-Giauk, formerly the boundary between Tong-king and Cochin China.

The principal cities are the capital, Ha-noi, with 150,000 inhabitants, Namh-Dinh, with 50,000, and Hai-Dzuong and Thanh-Hoa, with 40,000 each. There are some 20 other towns of less importance in the delta and lower portions of the country. The chief vegetable productions are rice, which is the staple vegetable

food in the delta of the Red River, and in the provinces of Thanh-Hoa, Nghe-An, and Ha-Thin; corn, yams, sweet potatoes, sugar-cane, tobacco, cotton, cinnamon, eagle-wood, indigo, and castor-oil. The gardens of all the better class have a patch of sugar-cane, and in Namh-dinh another kind of sugar-cane is grown on a larger scale. Cotton succeeds well in lowlands exposed to the sea-breeze, and since the treaty of 1874 a small quantity has been exported. The mountaineers of the Yunnan border cultivate an excellent quality of tea.

Among the peculiar productions of the country are a tree, the oil from the fruit of which preserves wood from the action of water; a plant called Hoang-Nau, of the strychnine family, reputed an effectual remedy in cases of hydrophobia, paralysis, bites of venomous serpents, etc.; and *calambac*, a wood so odoriferous that its scent can be perceived even when it is buried five feet deep. Rosewood, ironwood, ebony, sandal-wood, various essences, gums and varnishes, and timbers, suitable for ship-building, grow upon the mountains. Coffee has been grown with success by the missionaries at Keso.

The mineral riches of Tong-king are great, and include gold, silver, copper, tin, mercury, zinc, galena, bismuth, antimony, iron, precious stones, and coal.

The cupriferous deposits of Tong-king are continuous with those of Yunnan, and are believed to eclipse even those of America in richness. All the vessels of the natives of Thanh-Hoa are of this metal. The tin mines of Lao-Kai are at present not worked for want of capital. The silk-worm succeeds well, but the natives do not know how to prepare the cocoons, nor do their silks equal those of China.

The most remarkable feature in the topography of Tong-king is the delta, which is as much the work of man as the gift of the river. The moment a rising bank of silt is perceived, a dyke is constructed, the flood-waters of the river are regulated by sluices, rice-fields spring up behind the dyke, and villages rise among the rice-fields. The dykes, the largest of which are some 14 feet wide at the summit, and some 20 feet high, form a network of roads, the only means of communication by land during the wet season, and the means by which the entire country can be flooded at pleasure.

The boundary between Tong-king and the Chinese province of Quan-tung is one of the most singular ever traced. A detached tract of Anamite territory, much of which is overflowed at high tide, is separated from the rest of Tong-king by a peninsula belonging to China, and the rocky promontory of Paklung, together with a number of islands, effectually conceal a channel along which passes a flourishing contraband trade, the headquarters of which, and of the Black Flags, is Mong-Kai, a thoroughly Chinese town on Anamite territory. Mong-Kai is a city of rich merchants and well-built houses, contrasting strongly with the thatched dwellings of the Anamites. The Anamite provinces of Lang-So'n and Cao-bang are in the basin of the Bay of Canton; and these provinces were garrisoned by Chinese troops until the French successes in April, 1884. The French troops, almost without a conflict, seized the citadels garrisoned by the Chinese. In May China engaged to withdraw her forces and to recognize henceforth any treaty made between France and Anam. The claim to suzerainty was thus reduced to a shadow, yet conceded by France.

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COCHRANE, ALEXANDER DUNDAS ROSS WISHEART BAILLIE, known as Baillie Cochrane, a British author, the son of Admiral Sir Thomas John Cochrane, was born Nov., 1816, and was educated at Eton and at Trinity College, Cambridge. He was a conservative member of parliament for Bridport, 1841-46, and 1847-52; sat for Honiton, 1859-68, and in 1870-80 was representative for the Isle of Wight. He is author of a volume of *Poems* (1838); *Exeter Hall* (1841); *The Morea, a poem* (1841); *The State of Greece* (1847); *Ernest Vane* (1849); *Florence the Beautiful* (1854); *A Young Artist's Life* (1864); *Young Italy* (1865); *Francis I. and other Historic Studies* (1870); *Historic Châteaux* (1876).

COCKBURN, SIR ALEXANDER JAMES EDMUND, Bart. (1802-1880), a British jurist, born in London in 1802. He was educated at Trinity Hall, Cambridge; came to the bar in 1829; was made queen's counsel in 1841; entered parliament for Southampton, 1847; was knighted and made solicitor-general, 1850; was attorney-general, 1851-52 and 1852-56; became chief-justice of the common pleas in 1856, and chief-justice of the queen's bench in 1859. In 1858 he succeeded to a baronetcy. In 1871 he was appointed one of the arbitrators for the settlement of the Alabama claims, but at the Geneva conference he refused to concur with the rest of the arbitrators, and afterwards published his reasons for this refusal in an elaborate statement. In 1873 he was made a knight Grand Cross of the Bath. He was a liberal in politics, an eloquent speaker, and a lawyer of high reputation; but his private life occasioned unfavorable criticism. He died at London, Nov. 21, 1880.

COD. *Natural History*.—The cod-fish of commerce is the *Gadus morrhua* of naturalists, and belongs to the family *Gadidae*. The *Gadidae* belong to that division of the true fishes which is known as *Physoclisti* (from *φύσα*, bladder, and *κλειστός*, closed), on account of the absence of any connection between the swim-bladder or air-bladder, and the gullet. The entire family of *Gadidae* may be broadly called cod-fishes, and though the species known as *Gadus morrhua* or *G. callarias* is by far the most useful and widely spread, most of the species are highly valued as food.

The *Gadidae* are fishes of elongate form, and are covered with smooth (cycloid) scales, which are small and in some species wanting. The gill-openings are very wide, and the head, body, and fins are entirely devoid of spines. The absence of spinous rays in the fins is a character which separates the cod family and a few others from the majority of the physoclistous fishes, which are usually provided with several spines in the dorsal fin, beside some in the anal fin and one in each ventral fin. In the *Gadidae* all the fin rays are formed of small joints or articulations, and are therefore flexible. The dorsal or back fin extends along almost the whole length of the back, and may form a single fin, or be divided into two or three fins; and the opposite anal fin is long and often divided. The caudal or tail-fin is sometimes confluent with the dorsal and anal, but more usually distinct, and is of symmetrical shape. The ventral fins are situated in advance of the pectoral or breast-fins, and consist of from one to eight rays. The air-bladder is usually well developed, and there are four gills.

The family includes 35 genera and about 90 species, chiefly inhabitants of the northern seas. They frequent water with a temperature of 39° to 41°, and are mostly bottom-feeders. In the true cod-fishes of the genus *Gadus* the chin is furnished with a barbel; bands of teeth are present on the jaws and vomer, but none on the palatine bones; there are three dorsal and two anal fins, and the ventral fins have about seven rays. The common cod (*G. morrhua*) is a rather large fish, three feet or more in length. It is subject to many variations in color, often greenish or brownish,

sometimes yellowish or reddish; the back and sides have numerous rounded brownish spots, the lateral line is pale, and the fins darker than the body. The proportions of the head vary from about two-sevenths to about two-ninths of the total length; the eye is of moderate size, about half the length of the snout, and the outer row of teeth in the upper jaw and the inner row in the lower jaw are slightly enlarged. The first dorsal is rather low, about equal in height to the length of the pectorals, the caudal is slightly emarginate, and the vent is situated under the front of the second dorsal. The greatest depth is about one-fourth of the length; the dorsal fins have 14, 21, and 19 rays respectively, and the anal 20 and 18. The cod is found in all the northern seas, extending southward to Virginia on the Atlantic and to Oregon on the Pacific coast. On the Asiatic coast of the Pacific it reaches to Japan. The fish of the Pacific Ocean has been described as a distinct species, but presents no external differences, though it is said that the sounds or swim-bladders are smaller. The cod-fish of Greenland (*var ogac*) is very dark, and has a more slender caudal peduncle, longer barbel, larger eyes placed more widely apart, longer pectorals, and more advanced ventrals than the normal form. *Gadus gracilis*, found in Bering's Sea and in the Pacific from Alaska to Japan, has the second ray of the ventrals longer than it is in the other species, and the vertebræ are constructed as in the Hake (*Merlucius*). The Tom-cod (*G. Tom-cod*) of the Atlantic coast is a small species with long filamentous ventrals and long pectorals, and is found from Virginia to Labrador, and the Tom-cod of the Pacific (*G. proximus*) is a very similar species found from Monterey to Alaska. The latter of these is slightly the larger, but does not exceed a foot in length. It may be recognized by its more elongate snout, and the more anterior position of the vent. The Pollack, Coal-fish, or Green Cod, has short pectorals and ventrals, is of a greenish brown color, and is common in the north of both coasts of the Atlantic. The Haddock (*G. aeglefinus*) is an important food-fish of both coasts of the North Atlantic, reaching a considerable size. It may be known by the black lateral line, the large dark blotch above the pectorals, and the elevated anterior rays of the first dorsal. *G. chalcogrammus* is another North Pacific species, occurring south to Monterey, and may be known from the common cod by its large eye, high first dorsal, filamentous ventrals, and the minute black spots in body and fins.

In the Hakes (*Merlucius*) there is no barbel on the chin; the teeth of the jaws are in two series, those of the inner longer and movable; there are two dorsals, and the vertebræ have their neural spines wedged into one another. The species are very similar. They are large voracious fishes, common in Europe and on both coasts of North America, but not highly valued as food. The Pacific form extends southward as far as Santa Barbara, the Atlantic form to New England. The Cusk (*Brosme brosme*) has a single long low dorsal and single anal, with a rounded caudal. Teeth are present on the palatines as well as on the jaws and vomer. It is a fish of the Arctic regions, but occurs southward to Cape Cod and Denmark. To the genus *Phycis* belong several species with a barbel, long filamentous ventrals placed wide apart, and consisting of only two or three rays; two dorsals, the second long, and a single anal. Five species—*P. regius*, *P. earlii*, *P. chuss*, *P. tenuis*, and *P. chesteri*—are enumerated from the Atlantic coast of North America. The first is said to exhibit electric powers during life. The species are commonly known as Codlings, White Hakes or Squirrel Hakes. The Rocklings (*Onus*) are small gadoid fishes of the North Atlantic, more slender in form than the cod or hake, with a chin-barbel and two or four barbels on the snout, two dorsals and an anal. The first dorsal is composed of small fringe-like rays concealed in a groove, with a single long ray

in front. The Four-bearded Rockling (*O. cimbrius*) is the best known.

Dinematichthys marginatus, the Cusk of the Pacific coast, has very rudimentary scales sunken in the skin, a single long low dorsal and anal, and two-rayed filamentous ventrals. It is of a reddish brown color, and occurs in deep water. Other American deep-water *Gadidæ* are *Bythites fuscus* from Greenland; *Haloporphyrus viola*, a deep purple fish with a U-shaped mouth hidden below the snout, found on the Banks of Newfoundland and southward; *Physiculus dalwigkii*, which has been taken in Massachusetts as well as in Madeira; and *Hypsicometes gobioides*, found in the Gulf Stream, off the coast of Rhode Island, and characterized by its much projecting lower jaw.

The Ling (*Molva vulgaris*) is found in Greenland as well as in Northern Europe. The lower jaw has large canines which are arrow-shaped and movable. The only fresh-water gadoid found in the United States is the Burbot (*Lota maculosa*), which lives in the streams and lakes of New England and the British Possessions, and occurs also throughout Northern Europe and Asia. It is a slender fish, about two feet long, and has a long barbel on the chin, and one in front of each nostril. The scales are very small and embedded, and the first dorsal is very short. Two genera of *Gadidæ*, *Stygicola* and *Lucifuga*, are blind, and inhabit the cave streams of Cuba.

A species of *Bythites* has recently been taken by the *Talisman* at a depth of about 2300 fathoms. It appears probable the cod itself inhabits much greater depths than those at which the fisheries are usually carried on.

As many as 10 genera and 19 species of the family occur in the Mediterranean.

Habits.—Cod-fish are gregarious, and both sexes are found together both on the spawning and feeding-ground and when migrating. The schools are quite dense when migrating, but become grouped in smaller bunches on the feeding-grounds. Though the school-fish differ much in size, all seem to have reached maturity, and it seems probable that the young fish remain separate, spending the first three or four years of their life among rocks and algæ. Cod-fish sometimes take long journeys. Some fish captured at Cape Ann in the winter of 1877-78 had in their mouth hooks identical with those used by the French trawlers at the Grand Banks five to eight hundred miles away.

The abundance and migrations of their food, and the spawning instinct, seem to be the chief causes which determine the movements of cod. Their food, in the feeding season, embraces nearly everything organic, and they will snap at and even swallow bright inorganic objects. In the spawning season they cease to search for food, yet will usually take bait. Notwithstanding its voracity it is on the whole a dainty fish, and must be fished for with the flesh it prefers. During the feeding-season one school seems to live upon one kind of food, and another on another kind; thus fishermen speak of the clam-school, the herring-school, and the squid-school, and will pay high prices for the bait on which the fish are feeding. Mr. Earll states his belief that this is not of so much importance with spawning fish as it is in the feeding-season. Clams (*Mya*), sperling or young herring, fresh and frozen herring, fresh and salt squid, fresh and salt menhaden, capelin (*Mallotus villosus*), and alewives are the principal bait used in New England. On the Alaska coast the flesh of the salmon is used.

The "school-fish" which live in deep water are very shapely, with small distinct spots on a light background; while the shore-fish, which are more or less solitary, less active, and less well fed, seem to have a larger head in proportion to the body, are in poorer condition, and have larger and less distinct spots on a darker ground.

On the coast of North America the "pasture school" of spawning fish makes its appearance about

November 1. The fish probably average from 12 to 14 pounds. Exceptional specimens attain a great size. One taken in 1883 near Portland measured 5 feet 5 inches in length, and weighed 100 pounds, and there is an authentic record of a fish caught off Cape Cod in February, 1878, that weighed 107 pounds after evisceration, which is equivalent to 125 pounds "round."

The principal enemies of the cod are dog-fish. The season of spawning appears to be somewhat prolonged, for the first ripe female seen during the season of 1878-79 was taken Sept. 2, and even in the June following some had not finished oviposition. This is accounted for by the vast number of eggs, of which only a small portion are ripe when the female commences to lay. A 21-pound fish has 2,700,000 eggs, a 75-pound one 9,100,000. The largest number of eggs found in a series of seven haddock was 1,840,000, the smallest 169,000. The pollack may have more than 4,000,000 eggs.

Artificial Propagation.—The artificial culture of cod was commenced in this country in 1878. As the eggs float, at a varying depth, near the surface, the hatching apparatus which was found most satisfactory consists of a row of buckets connected by a pole, and kept in motion, backwards and forwards, by a steam-engine. They are thus swung through about 90°, and an arrangement of valves and slits permits a free circulation of water among the ova. During the first year this apparatus was used more than 70 per cent. of the eggs developed to young cod-fish, and half a million were placed in the sea at Gloucester, Mass. Several millions in all were placed in the water there, and large numbers at Wood's Holl. During the last five months of 1883, frequent allusion is made in papers and letters to the presence of young fish, weighing from half a pound to two and a half pounds, in Gloucester Harbor, and also near Portsmouth, N. H. It may therefore be considered that the artificial propagation of cod-fish is a success, and that the coast-waters from Cape Cod to the Bay of Fundy may thus again swarm with cod, as they did before the fishermen nearly exhausted this portion of the coast.

As in a state of nature but few of the numerous ova are fertilized, and by far the greater number of those which hatch perish before they are at all able to take care of themselves, it is evident that artificial fertilization and care of the young in their early stages must have great influence upon the actual increase of the species.

Extent of Fishery.—The cod-fishery is the most important of the fisheries of the Atlantic coast of North America, and is carried on at various points between Greenland and Cape Cod. It is difficult to estimate the exact amount taken in any year, since not only the Americans and British, but also the French, engage largely in the pursuit, and there is an extensive local consumption of fresh cod.

The first mention of cod-fish on the New England coast is by Bartholomew Gosnold, of the ship *Concord*, in 1602. Soon after this the fishery commenced, and in 1622 the ships brought out colonists who were to engage in agriculture except during the fishing season. It was not until the beginning of last century that the fisheries became extensive. In 1741 Gloucester owned 70 sail. At the beginning of the present century the bank fleet had decreased to eight sail of more than 30 tons, but the inshore grounds were fished by fully 200 boats. In 1819 the fisheries were so depressed that Congress passed "the bounty act" for their encouragement. By 1847 the fleet had increased to 287 sail, with an aggregate of 12,354 tons. The Cape Ann fishermen first visited the famous George's Bank about 1830, and by 1850 this was a favorite resort for both the cod and halibut fleets. In the spring of 1879 there were 39 fishing-firms at Gloucester and 378 vessels of over 5 tons burden, and the total number of fishing-vessels belonging to Cape Ann was about 415 sail.

Other banks frequented are Brown's Banks, La

Have, Quereau, Western and the Grand Banks of Newfoundland.

Since 1867, in which year the tonnage of vessels engaged in the cod-fishery of the United States was 44,567 tons, and that of vessels engaged in the mackerel fishery 31,498 tons, the mackerel licenses have not been issued separately, and the tonnage of the combined cod and mackerel vessels has been as follows :

	Tons.		Tons.
1868	83,887	1876	87,802
1869	62,704	1877	91,085
1870	91,460	1878	86,547
1871	92,865	1879	79,885
1872	97,545	1880	77,538
1873	109,519	1881	76,137
1874	78,290	1882	77,863
1875	80,207		

The quantity of cod-fish landed in Gloucester, the year ending June 30, 1879, was 36,665,620 lbs. of cured fish, which, at the low average of three cents per pound, would have a total value of about \$1,100,000. This quantity of cured fish represents not far from 91,650,000 lbs. of round fish. The weight of fresh and salted cod-fish brought into the same port in the year ending May 31, 1883, was about 44,800,000 lbs., and in the same year nearly 9,000,000 lbs. of hake, pollack, haddock, cusk, and other gadoid fishes were landed at the same port; besides about 2,500,000 lbs. of cod and allied fishes imported from Maine, and more than 3,000,000 from the British provinces.

The exports of dried cod-fish from Newfoundland and Labrador, in the year ending July 31, 1882, were 1,463,439 quintals, of the value of as many pounds sterling. To this must be added 1457 quintals of green cod-fish, 4254 tuns of cod-liver oil, worth about \$597,100, 83 tuns of cod blubber, 10 barrels of cod roes, and 62 packages of cod sounds and tongues. These exports are entirely from the catch of 1881. Mr. Harvey calculates that the local consumption of cod-fish in Newfoundland equals 270,000 quintals.

The cod-fishery of the Pacific coast is insignificant beside that of the Atlantic, but this does not arise from any scarcity of the fish, which is stated to abound among the numerous islands of the north-west coast, but from the want of a sufficiently extensive market. The expense of transcontinental freight, and the smallness of the population between the Sierra Nevada and the Rocky Mountains, practically limit the market to the Pacific States, though small quantities have been sent to South America and Australia. The fishery was commenced about twenty years ago, and at that time the salted fish sold at nine cents per pound. At the present time the best case cod is quoted at from three and a half to four cents per pound. The total catch brought to San Francisco in 1878 was about 1500 tons; in 1879, 1800 tons. During the year 1882, 11,697 packages of cod were exported from San Francisco; of these 8057 went to Australia, and 1486 to the Sandwich Islands.

The principal cod-fishing-grounds on the American Pacific coast are at the Shumagin Islands, to which vessels of 120 tons are sent. Larger vessels, up to 350 tons, are sent to the Sea of Okhotsk, which furnishes rather the larger half of the fish. The vessels which run to the Shumagin Islands occasionally take two trips, but those which go to the Okhotsk Sea make but one, leaving in March or April, and returning from June to October. The full cargo of a vessel of 120 tons is 75,000 fish.

The winter fishery for the capture of the haddock is carried on chiefly from the ports of Gloucester and Portland, though to some extent participated in by vessels from Portsmouth, Swampscott, and Boston. It is of comparatively recent origin, dating back about thirty years. The principal haddock fisheries are located north of Cape Cod, but the fish is taken on all the in-shore ledges and on the nearest of the off-shore

banks, from south of Sable Island Bank to Sandy Hook. The depth at which it is taken varies from 25 to 90 fathoms, but is usually more than 30 fathoms. The vessels of the winter haddock fleet are usually the staunchest and swiftest of those which, in summer, are engaged in the mackerel and cod fisheries. The fish are taken with trawls, which are coiled in tubs, each tub containing about 500 hooks, set $3\frac{1}{2}$ feet apart. The best bait is salted slivers of menhaden, but fresh herring is also used. The haddock vessels never anchor while fishing: the dories are dropped and picked up, then dropped again to haul in their lines, and again picked up with their fish, the vessel all the time keeping under sail. The process of dressing differs entirely from that of dressing cod, as there are no dressing-tables or dressing-tubs, but one set of men rip open the fish, while the rest take out the livers and roes, which they save, and remove the viscera. Most of the haddock is taken into Boston.

During the year 1882 more than 2,000,000 of pounds of pollack were carried into Gloucester.

Cod-fish are abundant around the coasts of Great Britain and Ireland, and the waters of those countries are supplied with a large number of other gadoids. The Dogger Bank, and Rockall, off the Outer Hebrides, are celebrated localities for this fish. On the Norwegian coast are the Loffoden fisheries near the Westfiord, and the Romsdals fisheries between Stat and the Trondhjems Fjord.

The cod come to spawn on the coast-banks, the water of which has been warmed by the Gulf Stream. Along the coasts of Finmarken the cod approach the coast to devour the capelin (a species of trout), and are taken from March to May, during which period about 66,000 persons gather to fish, or buy and prepare the catch. The cod-fishery in Norway seems to have existed from time immemorial, but is subject to great fluctuations. In 1873 the total catch was about 49,500,000 fish, having a value on the fishing-grounds of \$4,240,000. In 1877 the yield was the most abundant of which we have record, amounting to 70,000,000 fish, worth on the spot \$6,300,000. In the year ending March 5, 1881, the total catch of the Norwegian fisheries was only 13,000,000 cod, and in the two succeeding years this amount was further reduced to 5,500,000 and 6,000,000. In 1877, 4567 boats, manned by 21,287 men, were engaged at the Loffoden Islands fishery.

Methods of Fishery.—On the coast of Alaska the cod-fishery is usually carried on at depths of from 10 to 15 fathoms, but in the Sea of Okhotsk, where angle-lines are used exclusively, depths of 40 to 50 fathoms are fished. When the depth is not too great, and there are no rocks, trawl-lines are used in Alaska. These are lines often 600 fathoms long, to which a number of hooks are secured by shorter lines at about a yard apart. Several are paid out, the end of each being indicated by a buoy. An angle-line bears two hooks, kept apart by a piece of wire, and has a heavy weight attached. The fisherman stands erect in the boat, and manages two lines, one on each side. A skilful fisherman will catch from 500 to 1000 a day, when fish are plentiful, and is paid about \$25 per 1000. The fish are headed, split, eviscerated, and stored in "pickle" or salt until they arrive in the Bay of San Francisco, when they are dried in establishments erected for the purpose. Some of the fish are not dried in bulk and then piled, as is done on the Atlantic, but are kept in pickle in tanks of redwood lumber, and dried when required. It is claimed that better results are thus obtained, contrary to what is said of pickle-curing in New England. The largest fish, packed in boxes, are known as "case" fish, the next size are made into bundles, while the smallest are divested of skin, fins, and vertebræ, cut in halves, packed in cases, and sold as "boneless cod-fish." Much of this work is done by boys. Boneless cod is also largely prepared on the Atlantic coast.

The angle-line and trawl or "bultow," the latter varying greatly in length and in the distance apart of the hooks, are the most usual methods employed for the capture of cod. In comparatively shallow water and on an even bottom the trawl yields the best result. The trawls are usually set at evening, with buoys and anchors attached to each end of the line, and are taken up at daybreak. Another engine of destruction, now much used, is the gill-net. Gill-nets were not introduced in Norway before 1685, and it was long before they came into general use, though indispensable when the cod does not bite. A boat when complete carries six men and a boy. Each man has 10 nets, and each net is from 18 to 20 fathoms long, and 10 to 13 feet deep, with meshes 2.8 to 3.2 inches square. They are kept upright with glass balls covered with knotted tarred cord, and are joined in lines of from sixteen to twenty, forming fences 300 to 400 fathoms long. The nets are dropped in the evening, and taken up in the morning.

Cod gill-nets have recently been introduced at Gloucester, Mass., with some advantage in certain conditions. The nets cannot be safely set upon a rocky bottom, but when set upon a clear bottom seem to catch fish that are, on the average, larger than those taken by the trawlers. As there is no bait bill to pay, the profits are larger upon the same quantity. In rough weather the nets are not successful. Seines or bottom nets have been in late years introduced with success in the Loffoden Islands.

The common fishing dory, in use in America, is a flat-bottomed "lap-streak" boat, with sharp projecting bow, V-shaped projecting stern, and flaring sides. It is 13 to 15 feet long on the water-line.

In the Atlantic fishery the fish are weighed as soon as they are caught, and are pitched into a tub; they then pass through the hands of three men—the "header," who severs the head at the gills, and slits the abdomen to the vent; the "gutter," who seizes the fish as it falls into the tub and removes the viscera, putting the livers into a barrel on one side, and the roes into a barrel on the other; and the "splitter," who takes up the fish as they are thrown on a table by the gutter, and dexterously cuts out the back-bone and opens the fish, sliding it into a tub of water, where it is washed.

"Pickle-curing" is done on shore. The fish are placed in butts with salt and brine for two weeks. After this they are dried for a day or two and sent to market. This mode gives inferior results to "kench-curing." In "kenching" the fish are salted in piles, either in the hold of a ship, or on the floor of a fish-house. Each fish is placed back downward, so that the salt as it dissolves will pass through the body. To prepare for market, they are thoroughly washed and scrubbed and placed on the flakes until dry.

Usually 250 to 400 cod-fish give one barrel of liver, but 700 to 1100 are sometimes needed. Two to two and a half barrels of liver yield a barrel of oil in some seasons, but in others four or five barrels are required.

The oil that comes away easily is pale, and is that which is chiefly used in medicine. The purest and best is procured while the livers are fresh. The livers are then put to cook and the pale brown oil first extracted, and then the inferior brown oil, which is principally used by tanners.

The value of the roe has recently declined, so that most of the off-shore fishermen do not save them. The sounds are dried for the manufacture of gelatine, and also for food. In the latter case they are mixed with the tongues.

(W. N. L.)

CODE.—The codification of the laws governing the English-speaking world received its first practical embodiment in the New York State Code of Civil Procedure enacted in 1848. A provision was inserted in the revised Constitution of that State, adopted in 1846, providing for the codification of both the

substantive and remedial law; and legislation to effect the constitutional provision was carried out in 1847, whereby two commissions, called respectively the "Practice" and the "Code" Commission, were constituted. It was known that David Dudley Field was the originator and the chief promoter of the constitutional and legislative movement toward codification, and he became one of the commissioners, having for his associates Arphaxad Loomis, David Graham, William Curtis Noyes, and Alexander Bradford.

The codes of procedure, civil and criminal, were fully completed and reported by 1850, a portion of the Code of Civil Procedure having been adopted, as before stated, in 1848. The Code of Criminal Procedure, although before the legislature and the executive on various occasions, was not finally enacted until 1881. The reforms effectuated by these codes are the abolition of the distinction between legal and equitable practice, and the simplification of procedure in general.

With reference to the codification of the substantive law, there was so much difficulty that it was not until 1865 and 1866 that completed civil and penal codes were reported to the legislature. The civil code, embracing the law of personal and property rights, has been passed by the legislature twice, but met the executive veto. It is (in 1883) still pending, and is vigorously advocated by its promoters. The penal code, embracing the law of crimes and punishments, after repeated failures, went into effect Dec. 1, 1882. The Sunday provisions of the new penal code created much dissatisfaction on account of their strict enforcement in New York city, although similar enactments had been on the statute books for half a century, but not enforced. A more liberal interpretation of the chapter relating to Sunday observance has since prevailed, and no important change in the social conditions of Sunday is observable as attributable to the penal code.

The influence of the New York Codes in law reform and codification throughout the English-speaking world has been so marked as to demand especial notice. Their origination marked the inauguration of a reform in jurisprudence which has extended to England, India, Australia, and more than half of the United States of America. By the Judicature Act of 1873 the jurisdiction of courts in law and equity was united upon the principles of the New York Code of Procedure of 1848. The provisions of this code have been substantially adopted in the following States and Territories: Missouri, Ohio, Kentucky, Indiana, Wisconsin, Iowa, Minnesota, Kansas, Nebraska, Nevada, California, Oregon, Mississippi, North Carolina, South Carolina, Arkansas, Connecticut, Washington, Arizona, Utah, Idaho, Montana, Wyoming, and Dakota. The code of criminal procedure has been adopted substantially by Indiana, Wisconsin, Iowa, Minnesota, Kansas, Nebraska, Nevada, California, Oregon, Kentucky, Arkansas, Washington, Arizona, Utah, Idaho, Montana, Wyoming, and Dakota. The code of civil rights and the penal code, with slight modifications, have been adopted in California. The tendency of modern jurisprudence in England and America seems to be strongly in favor of the complete codification of the law, such as prevails in Continental Europe.

(A. P. S.)

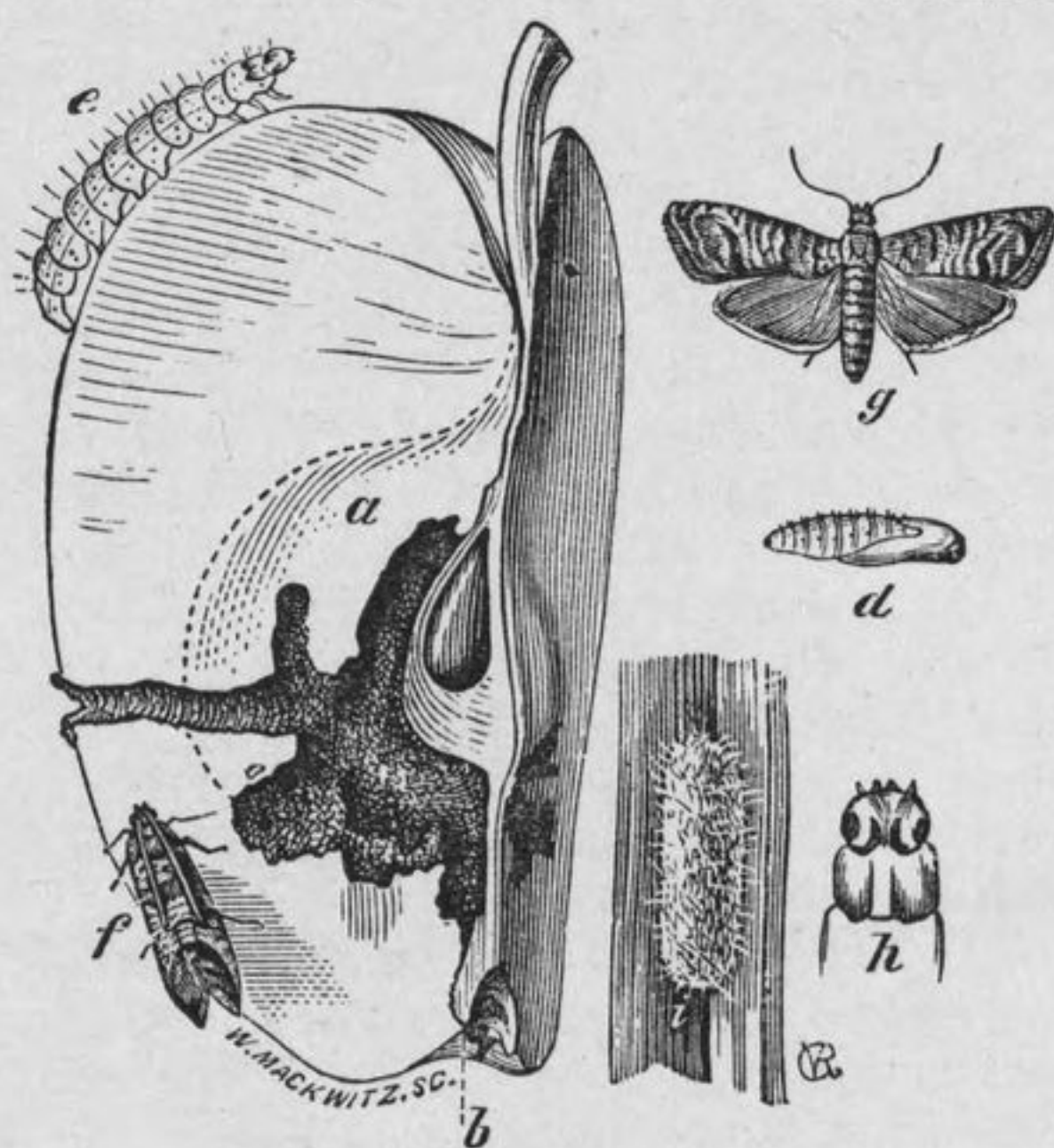
CODICIL, in law, a supplement or addition to a will, either changing the dispositions of the will, partly revoking the same, or making new provisions regarding the testator's estate.

In order to be valid and effectual a codicil must be executed with the same formalities required in the case of a will. When so executed a codicil will be deemed part of a will, and will be construed with it as one instrument. When a duly-executed codicil is attached or refers to a paper defectively executed as a will, the effect will be to give operation to the whole as one instrument. The effect of a codicil to a will is also to

republish the will as of the same date of the codicil. There may be numerous codicils to the same will. The effect of each of them upon prior codicils either attached or referred to is the same as upon the will itself. Such prior codicils will be validated if defectively executed, and will be considered as republished.

It is not competent for a will executed in due form to provide for the payment of such legacies as may thereafter be bequeathed by codicils informally executed, since all such papers are testamentary, and must be so treated, thus referring their operation to the effect of the probate. See WILL. (L. L., JR.)

CODLIN MOTH (*Carpocapsa pomonella*, L.).—The codlin moth is the most important of the fruit enemies of this country. It is not indigenous, but was imported from Europe, and during the last fifty years has been gradually spreading west, until of late years it has been doing most damage in California. The moth belongs to the Tortricidæ or leaf-rollers, and lays its eggs in the spring, near the blossom end of the fruit, as soon as this has well set. The



Carpocapsa pomonella; a, section of infested apple; b, point of entrance; c, larva; d, chrysalis; f, g, moth at rest and with wings expanded; i, cocoon, natural size; h, head and first joint of larva, enlarged.

larva, hatching, works its way directly to the core, and lives near the heart of the fruit, making the large cavity, partially filled with excremental pellets, so familiar to fruit-eaters. The larva state lasts from four to five weeks, and the worm bores directly out, cutting through the skin, and, if the fruit has fallen to the ground, crawling to the trunk of the tree and spinning a slight silken cocoon under the shelter of bark scales, or in other convenient crevices. If, however, as is frequently the case, the apple has not fallen, the larva crawls part-way down the trunk, and pupates in a similar manner. In mid-summer, the pupa state lasts only two weeks, more or less, and the moths, after pairing, lay the eggs for a second generation of worms, which issue from the fruit and spin up all through the fall, remaining in the cocoons as larvæ, however, throughout the winter, and only transforming to pupæ in the spring. It seems to be pretty well settled by recent investigations that the worms often migrate from one apple to another, especially with the early brood, and that the wind-falls are in the majority of instances deserted before the fruit falls. This diminishes the value of the old remedy of turning swine into the orchard to devour the fallen apples. The codlin moth is not confined to the apple, but breeds freely in the pear, the quince, and the crab-apple, and it has even been bred from peaches and plums, and also from the pulp of a screw bean (*Strombocarpa monoica*).

Remedies.—Wherever the subject of remedies has been extensively discussed, concert of action in the thorough use of woollen or paper bands has been

recommended. These bands are tacked around the trunk, two to a tree, one near the base, one near the crotch, the object being to afford an artificial place for the worms to spin up, where they can be easily reached and destroyed. One tack to a band through the two ends is sufficient, and where rags are used they can be soaked in hot water, or passed through a clothes-wringer. The cost of thus protecting an orchard has been placed at 2 cents a tree for the paper bands, and 4 cents for the woollen ones, and the result is very satisfactory.

The bands should be placed on the tree by the middle of May and examined weekly throughout the summer. Syringing the trees about the time the first moths are laying their eggs, or when the fruit is setting, with a very weak solution of Paris green, or London purple, has been found effectual as a preventive, and may be practised against the first brood of worms with little risk of the poison adhering to the fruit. The less dangerous methods are, however, preferable under ordinary circumstances. The loose bark should be scraped off old trees and burned, while the larvæ that have spun up under barrel-hoops, or in other shelter in rooms where apples have been stored, should be destroyed in early spring by scalding with hot water.

Several birds, especially the creepers (*Certhiidae*) and the downy woodpecker, seek the cocoons and devour their contents, while various predaceous insects and a few parasites attack it while in the apple. *Chauliognathus Pennsylvanicus*, *Telephorus bilineatus* among the former, and *Pimpla annulipes* and *Macrocentrus delicatus* among the latter, are figured in the 4th and 5th Entomological Report of the State of Missouri.

Fires and lights and bottles of sweetened water hung up in the trees are repeatedly recommended by inexact people, who mistake other moths for this one. Experiment shows that the codlin moth is not appreciably attracted by these means, but that on the contrary many of its natural enemies are thus attracted and destroyed.

The pasturing of sheep in an infested orchard is to be recommended. (C. V. R.)

COERCION (Lat. *coercere*, from *con* and *arcere*, to press together; to restrain). It seems to have originally referred only to force employed to restrain a person from doing anything, but as used at present it also includes compulsion to do an act. It is nearly synonymous with *duress*.

Coercion may be positive or presumed. Positive or direct coercion takes place when a man is, by physical force, compelled to do or to refrain from doing some act or thing; as, for instance, if he falls into the hands of his country's enemies and is compelled, by a just fear of death, to serve against it. Presumed coercion takes place when any person, legally under subjection to another, is induced, in consequence of such subjection, to do an act contrary to his will; as when a married woman in company with her husband commits an offence not *malum in se*. In such case the law presumes that she acted under her husband's coercion, and not of her own free will.

As free will, or rather the free exercise of will, is necessary to the commission of a crime or the completion of a contract, a person coerced into either has no will on the subject, and is therefore not held as responsible.

CEREVIDÆ, the honey-creepers, a family of oscine passerine birds of the warmer parts of America, especially the West Indies. They are small birds, usually four or five inches long, of varied bright colors, with pointed wings, short tail, and very acute bill about as long as the head, usually decurved; the tongue fitted for honey-sucking, cleft, or brushy at the end; the primaries nine. The family is scarcely distinguished from the *Dacnidae*, and is also related to the American *Sylviolidae*. There are about 40 species,

principally of the genera *Cæreba*, *Diglossa*, and *Certhiola*; one of the last (*C. bahamensis*) occurs in Florida. This is 4½ inches long, dark brown above, white below, with a white line over the eye, and white spots on the wings and tail; the breast and rump and edge of the wings bright yellow; the bill and feet black, the eyes blue. (E. C.)

COFFEE TREE, KENTUCKY COFFEE, is in botany *Gymnocladus Canadensis*—*Gymnocladus* being derived from two Greek words signifying naked branches, the tree being peculiar in making coarse leading shoots, but very few side-branches. The leading bud does not mature, and the next spring two buds below push into growth, and thus in a geometrical ratio the subsequent head is made. It is singular that very little more has been added to our knowledge of the tree than was given by Michaux in his *North American Sylva*, issued in the early part of the century. So recent a work as Dr. Peyre Porcher's *Resources of the Southern Fields and Forests* passes it wholly without notice. It is a leguminose plant, not far removed from the honey locust, growing in Canada, where, from its stumpy appearance, the early French settlers called it *chicot*, extending down through the whole district bounded by the Ohio and Illinois Rivers. It is most at home in Kentucky, where forced attempts to use it when coffee could not be had led to its common name. Michaux says the timber is used in housebuilding and cabinetmaking. It appears to be hard and solid, and to have good qualities, but attention has not been directed to it. It grows very rapidly, and some have recommended it for planting in sandy places near the sea-coast. The bark is very bitter, but it does not appear to have been made of use in the arts. As an ornamental tree it is in some degree of popularity with cultivators. When planted so as not to be interfered with by other trees, it will make a trunk often 10 feet in circumference, and 40 feet high before branching, then making a dense round head of striking beauty in park scenery. In its native woods it rarely reaches more than half these proportions. It is remarkable as having no close relatives and as being confined to so small a district of country in the United States. (T. M.)

COFFIN, SIR ISAAC, Bart. (1759–1839), a British admiral, was born in Boston, Mass., May 16, 1759, the son of the collector of the port, a loyalist gentleman of a Nantucket family. In 1773 young Coffin entered the British navy as a midshipman, serving under his patron, Admiral Montague, and under Admiral Arbuthnot. In 1778 he was made a lieutenant, and in 1781 he took part in an action off Cape Henry against the French fleet. He was, in that year, promoted to be a commander, and in 1782, under Admiral Hood, he was engaged in the battle between Rodney and De Grasse. In 1788 he was deprived of his commission, and went to Brabant, where he took service on the popular side, but was soon restored to his former rank in the British navy, his sentence being reversed. In 1790 he was made post-captain. Disabled by an injury received in trying to rescue a drowning man, he was put in charge of a naval depot at Leith, and afterwards performed similar duties in Corsica, at Lisbon and at Port Mahon. In 1804 he was made a rear-admiral of the blue, and a baronet; in 1808 a vice-admiral, in 1814 admiral of the blue, and in 1830 admiral of the white. He sat in parliament for Ilchester, 1818–26. In 1826 he visited Nantucket and founded the "Coffin school," which he afterwards endowed. The Magdalen Islands, in the Gulf of St. Lawrence, were granted to him, and are now the property of his heirs. He died at Cheltenham, England, July 23, 1839.

COGALNICEANU, MICHAEL, a Roumanian statesman and historian, was born in 1806. At an early age he was appointed to a newly founded professorship of national history at Jassy. In 1834 he travelled through Germany and France, gathering material for his *Histoire de la Valachie et de la Moldavie*, which appeared

in 1837. On his return to Moldavia he founded the review *La Dacie littéraire*, and assisted in establishing a national drama. He also published a collection of historical documents under the title *Archiva romanesca* (1841), and gathered from the monasteries of the country ancient Roumanian chronicles, which he edited under the title *Letopisitz* (1845; 2d ed. Bucharest, 1872). He was also the founder of several journals, the most important of which, *Le Progrès*, forced the government to the emancipation of the gypsy serfs. In Sept., 1857, he was a member of the divan *ad hoc*, ordered by the treaty of Paris. He was an active promoter of the union of Moldavia and Wallachia, and when this was accomplished, in 1859, by the election of his friend, Alexander Couza, as prince of both states, Cogalniceanu took part in all the important acts of the new administration. He reduced the laws, both civil and criminal, to uniformity, introduced a system of education, and founded the University of Jassy. In 1864 he was made president of the cabinet, but the discontent produced by the radical changes he had introduced into the usages of the country compelled him to retire a year later. Under Prince Charles he was again a member of the cabinet, as minister of internal affairs, from Nov., 1868, to Jan., 1870. In 1876, when the liberal party again returned to power, Cogalniceanu was made minister of foreign affairs, which post he held during the Russo-Turkish war. He was afterwards for a short time ambassador to France, and he attended the sessions of the Congress of Berlin, but was unable to prevent the cession of Bessarabia to Russia. He was elected senator by the liberal party in May, 1879. In the discussions of the Danube question he has resisted the policy of Austria. Besides his literary and political labors, in behalf of his country, he has endeavored to promote domestic manufactures in Moldavia.

COGNOVIT, in law, a written confession of an action at law signed by the defendant or his attorney, and given to the plaintiff, after receiving his declaration and before plea, acknowledging in substance the demand to be just, and authorizing the plaintiff to enter judgment for a sum named, either absolutely or upon specified conditions. In full, *cognovit actionem*. A cognovit differs from a warrant of attorney to confess judgment in that the latter is invariably under seal and is given before suit brought.

COHN, FERDINAND JULIUS, a German botanist, was born at Breslau, Jan. 24, 1828. He was educated at Breslau and Berlin, and in 1850 he became a *Privat-docent* of botany in the Breslau University. In 1859 he was made extraordinary and in 1872 full professor. In 1866 he founded the institute of vegetable physiology of the university. He has made special studies in regard to microscopic vegetation. Among his books and noteworthy scientific papers are *Zur Naturgeschichte des Protococcus pluvialis* (1851); *Untersuchungen über die Entwicklungsgeschichte der mikroskopischen Algen und Pilze* (1854); *Neue Untersuchungen über Bakterien* (1872–75); and *Die Pflanze* (1882), an elaborate popular work on botany. Since 1875 he has edited *Beiträge zur Biologie der Pflanzen*. His work on *Bacteria*, translated by Dolley, has appeared in English (1881).

COHNHEIM, JULIUS FRIEDRICH, a German pathologist, born July 20, 1839, at Demmin, Pomerania. He studied in the Prenzlaugymnasium, and in the Universities of Berlin, Würzburg, Greifswald, and Prague. He followed the medical profession in Berlin for a short time; became, in 1864, assistant to Virchow in his pathological institute connected with the Berlin Charity Hospital. In 1868 he was appointed ordinary professor of pathology and pathological anatomy in the University of Kiel. In 1872 he took a corresponding professorship at Breslau, and in 1878 at Leipsic, becoming also director of the Leipsic Institute of Pathology. He has made many original researches regarding the boundary lines between normal and

pathological anatomy and histology, and in the field of experimental pathology. He discovered the origin of pus-corpuscles from the white cells of the blood, transmitted through the capillaries, and made great discoveries in the pathology of inflammatory processes. Among his writings are *Untersuchungen über die embolischen Prozesse* (1872); *Neue Untersuchungen über die Entzündung* (1873); *Die Tuberkulose vom Standpunkte der Infectionslehre* (2d ed., 1881); *Vorlesungen über allgemeine Pathologie* (1877-80; 2d ed., 1882).

COHOES, a city of Albany co., N. Y., on the W. bank of the Hudson River, and on the S. bank of its affluent, the Mohawk, 9 m. N. of Albany and 3 m. N. W. of Troy. The town of West Troy lies just S. E. of Cohoes; and that of Green Island is joined to Cohoes by bridges across an arm of the Mohawk. Cohoes has extensive water-power; the Mohawk has a fall of 70 feet just above the city. A horse railway connects it with the adjacent towns; and it is on a branch of the N. Y. Central Railroad, and on the Rensselaer and Saratoga Railroad. The Erie and the Champlain canals both accommodate shipments. There is a series of local water-power canals. Cohoes has extensive cotton-mills, many factories for hosiery and knit goods, large iron-works, and manufactures of knitting needles, pins, paper, axes, machinery, and a great variety of other goods; it has several handsome churches, also high and graded schools, three daily and two weekly newspapers (one in French), convents, Catholic academies, and parish schools. A large element of the population is French Canadian. Population in 1870, 15,357; in 1880, 19,416.

COHOSH, BLUE COHOSH, WHITE COHOSH. Cohosh is an Indian name which, according to Rafinesque, was originally attached to *Caulophyllum thalictroides*, *Leontice thalictroides* of Linnæus. It belongs to the natural order *Berberidaceæ*, and derives its name *Caulophyllum* from the appearance of the inflorescence, which seems to arise out of a leaf-stalk of what might appear to be a leaf of *Thalictrum* or "meadow-rue." In modern times it is known as "blue cohosh," from its blue berries. The rhizome was a popular Indian remedy for snake-bites, and was used in many disorders. Cohosh is now applied to *Cimicifuga racemosa*, formerly *Actæa racemosa*, also known as black snake-root, which has also a good reputation in pharmacy. White cohosh is *Actæa alba*. (For full accounts of their medicinal uses see Griffith's *Medical Botany* and Dr. Peyre Porcher's *Resources of the Southern Fields and Forests*.) (T. M.)

COKE.—The immense areas of bituminous coal beds in the United States and the rapid development of manufactures have made the production of coke an important and extensive industry. Its superiority as a fuel for metallurgical purposes has been a prominent factor in encouraging its manufacture on such large scale. The Census report for 1880 upon the Iron and Steel industries shows that in the preceding year, 2,277,545 tons of coke were consumed in the blast-furnaces, steel-works, rolling-mills, and other manufactories. If the consumption of foundries, etc., were added, the aggregate would probably exceed 3,000,000 tons, or 150,000,000 bushels, of coke annually employed in the production and manufacture of iron, and this quantity is constantly being augmented.

As a fuel for the blast-furnace, coke is second only to charcoal, its open cellular structure permitting of more rapid oxidation than denser fuels. Hence where anthracite coal or non-coking bituminous coals are abundant, coke is mixed with the charge to reduce the resistance in the furnace and encourage a greater intensity of combustion. The four conditions regarded as essential for coke to be used in blast-furnaces are given by Mr. John Fulton, M. E., as—

I. *Hardness of Body or Cell Walls*—not density.—Hardness and full cellular structure are correlated; softness or punkiness may be associated with density.

II. *Well-Developed Cell Structure*, for, other things being equal, the calorific energy of a fuel is in proportion to the surface exposed to the oxygen.

III. *Purity*.—Other things being equal, the less ash in the coke, the less risk of sulphur or phosphorus in dangerous volumes in the resultant pig-iron from the furnace. In many cases, there is danger of injuring the physical condition of coke by the operation of washing the coal to reduce its slate. The washing of some coals improves the coke; in others, it injures it. Washing coal carries out in the operation valuable hydrogenous matter which aids in developing cell structure. The coke made from it would be more dense; in other words, in many cases, the loss in calorific energy by the density in the coke for washed coal would more than overtop the advantage of a reduction of ash, except in cases where the ash is excessive.

IV. *Uniformity of Quality in Coke*.—The "black-ends," which are sometimes made in coking, are worse than useless in a blast-furnace; hence, a carefully prepared coke, alike all through, is most desirable for regular work. This result can be best obtained from coal inheriting a liberal ratio of hydrogenous matter to assure full oven heat and thorough coking in every part of the charge. This is one of the distinguishing features of Connellsville coke.

Coke is also employed largely in steel-works, foundries, and for manufacturing purposes. At present it is used but little on railroads or steamboats; but where the former pass through cities, coke is sometimes used as producing less smoke than other bituminous fuel. The demand for coke in the reduction of the ores and the manufacture of lead, copper and more precious metals is rapidly increasing.

Its manufacture is carried on extensively in several States, but Pennsylvania ranks first in production. Comparatively few bituminous coals produce a good quality of coke, the reason for which our present knowledge has not determined. In all processes employed the object is to expel gaseous elements and retain carbon, but the property of coking does not seem to depend on the quantity of volatile matter, nor does it appear to increase with the amount of hydrogen and oxygen.

The most careful analyses of coals show the relative proportions of carbon, ash, sulphur, etc., but do not determine whether they will make good cokes. Actual experiment is the only reliable test. Theoretically, coking coals should yield coke equivalent in weight to the carbon and ash, but, in actual coking, some hydrocarbons are produced and dispersed, and a part of the carbon is consumed. In analyses of bituminous coals the per cent. of ash, fixed carbon and two-thirds of the sulphur are usually added together and given as the percentage of coke: this theoretical yield, however, is generally considerably in excess of the actual results obtained in practice.

Coke made in retorts, in which bituminous coal is placed for the production of illuminating gas, is considered a by-product, and is generally used for domestic purposes or by comparatively small consumers, but that produced for metallurgical processes is made either in open ricks, bee-hive ovens, or Belgian ovens.

There are of course modifications of the various methods, but typical forms may be described as follows:

Open Ricks.—The coal is piled in long heaps about 5 feet in height, the top being 4 feet in width, and the sides sloping 1 to 1. At one-third of the height longitudinal and transverse flues are constructed of lump-coal and wood, and from these vertical flues, similarly formed, connect with the top of the pile. The pile is fired through these vertical flues and the progress of coking is carefully watched. In from 5 to 8 days the process is complete and from 55 to 60 per cent. of the coal piled is obtained as coke. Owing to

swelling in coking from 100 to 110 bushels of coke are obtained from 100 bushels of coal.

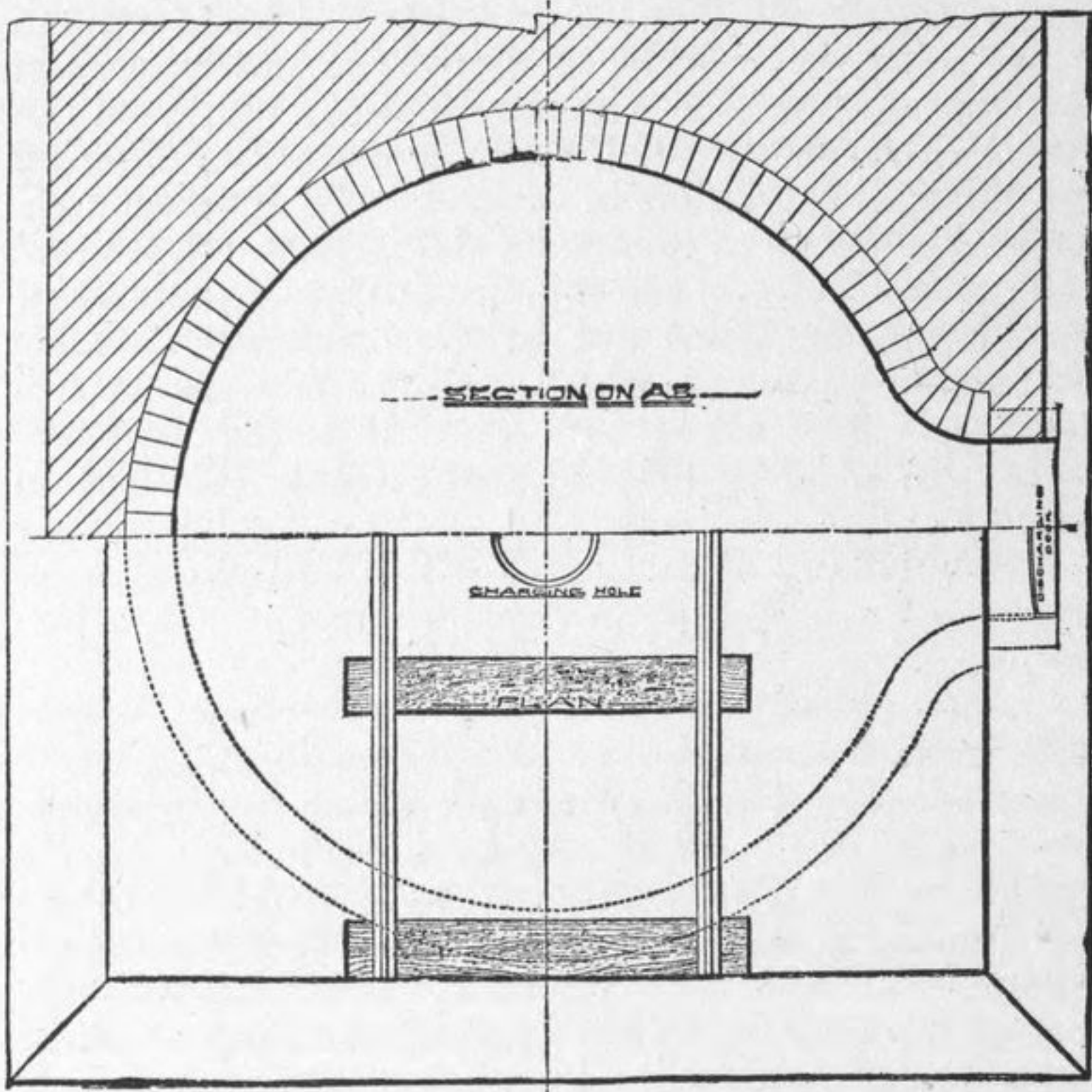


FIG. 1.—American Bee-hive Oven.—Cross Section.

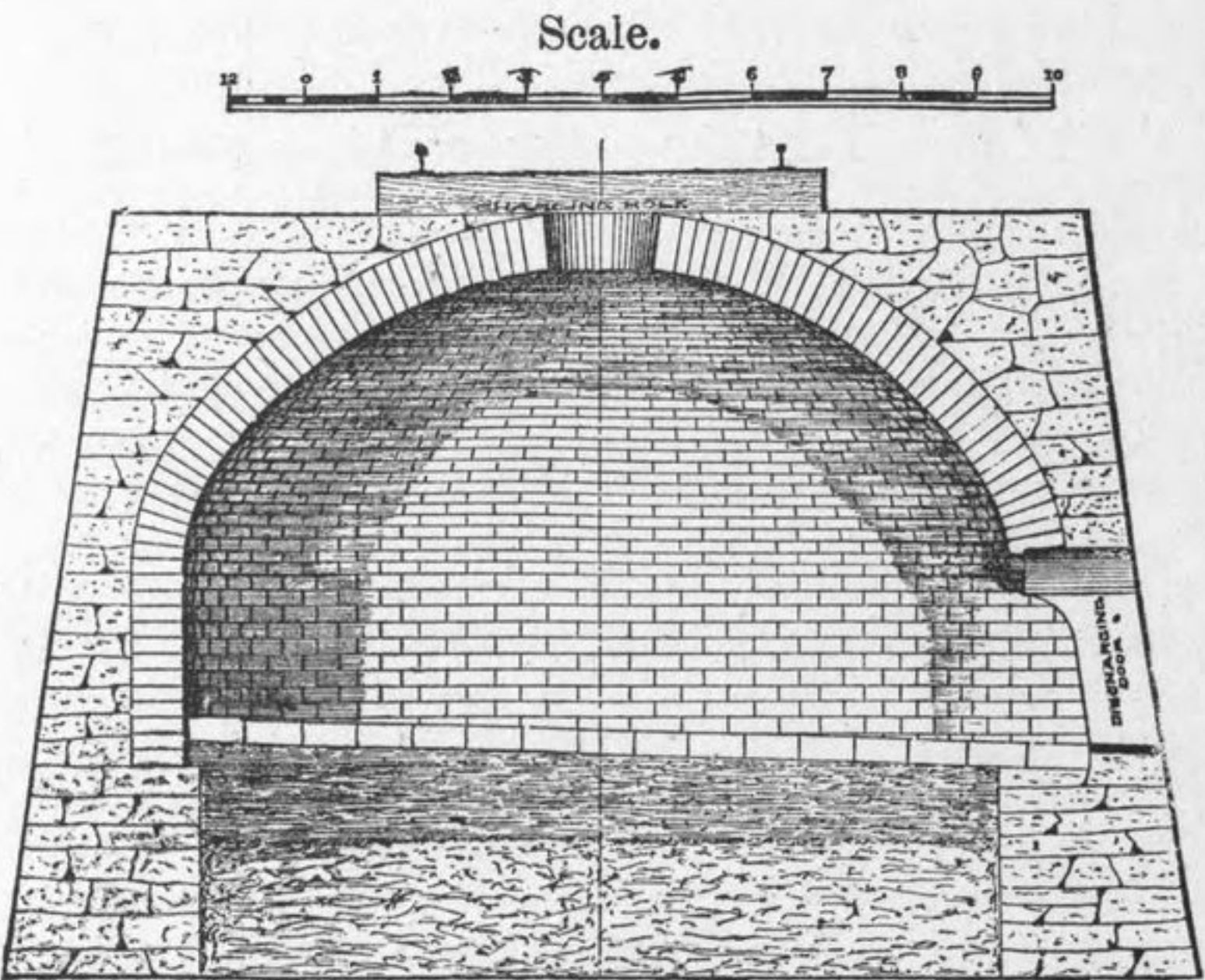


FIG. 2.—American Bee-hive Oven.—Vertical Section.

Bee-hive Ovens are made of various sizes, but one much approved is 11 feet in diameter with vertical sides for 26 inches, covered by an arch having a rise of 4 feet, as shown in Fig. 2. These ovens are charged with 100 bushels (7600 pounds) of coal, and in 48 hours produce 120 bushels of coke (4800 pounds), or 63 per cent. of the weight of coal. Sometimes coke is made in 24 hours, and generally to avoid Sabbath work larger charges are placed in the ovens Friday and coked for 72 hours. In but few of these bee-hive ovens is any attempt made, so far as is known, to utilize the gaseous product.

The *Belgian Ovens* are rectangular in cross section. For one improved form of these ovens see article COKE, in *ENCYCLOPÆDIA BRITANNICA*. In these the resultant gases are employed to heat the ovens, so that the yield is increased and coke amounting to 70 per cent. of the coal charged is obtained. In all oven-coking deep charges give the best yield, but shallow charges produce a superior and far more desirable coke for metallurgical purposes.

Coke as ordinarily produced contains from $\frac{1}{2}$ to 12 per cent. of water.

Each method of manufacture has its adherents. The Belgian ovens are most expensive, and give the largest yield; but since the coke is generally quenched outside of the oven it carries an excess of water. A plant of

Bee-hive ovens will cost from 50 to 60 per cent. of the outlay required for Belgian ovens of equal capacity, but the coke while drier is less in quantity than the Belgian ovens give. Open rick coke is more free from water than any other, on account of the water for quenching being applied in small quantities in the vertical flues in connection with a covering of fine dust to smother the fire.

A comparison of the various methods by the Geological Survey of Pennsylvania gives the following results:

	Open Ricks.	Bee-hive Ovens.	Belgian Ovens.
Yield of Coke in per cent. of Coal.....	59	63	70
Loss of fixed Carbon in Coking—per cent.....	24	9 to 22½	10 to 13
Coal required to make 1 ton of Coke	1.67	1.58 to 1.60	1.42
Cost of making 1 ton of Coke (Coal being \$1.00 per ton delivered)	\$2.37	\$2.18 to \$2.21	\$1.87
Cost (including interest on plant)—per ton.....	\$2.37	\$2.33	\$2.06

A hard resonant coke with large cells and silvery lustre is most approved for metallurgical purposes; and the following table, compiled from the same authority, gives a comparison of the Pennsylvania Cokes, and we have appended a similar table of other Cokes, as well as the results of chemical analysis:

Physical Properties of Pennsylvania Cokes.

Where Ma de.	Grammes per cub. in.		Pounds per cub. ft.		Per cent. of Coke.	Compressive Strength. Pounds.	Height of Furnace Charge. Feet.
	Dry.	Wet.	Dry.	Wet.			
I. Bennington—Cambria Iron Co.....	13.36	19.74	50.90	75.20	67.68	281	112
I. Broad Top.....	12.	19.59	45.72	74.52	61.25	220	88
I. Rockhill C. & I. Co.(Washed Coal)	10.11	17.89	38.52	68.16	56.51	200	80
	11.66	20.22	44.42	77.04	57.66		
	11.79	19.05	44.92	72.59	61.89		
	11.18	19.05	42.59	72.58	58.69		
II. Connellsville—72 hours....	12.46	20.25	47.47	77.15	61.53	284	114
“ “ 48 “	14.02	20.95	53.41	79.81	62.92	249	100
II. Broad Top—Kemble C. & I. Co.....	11.76	20.18	44.81	76.88	58.27	240	96
III. Hollidaysburg —CambriaIronCo.	13.19	20.80	50.25	79.25	63.41	259	104
	14.22	20.61	54.18	78.52	69.		
	16.92	22.87	64.46	86.13	73.98		
	14.77	21.42	56.29	81.30	68.80		
III. Johnstown— Cambria Iron Co. 24 hours.....	8.42	17.95	32.08	68.39	46.91	245	99
	12.96	21.	49.38	80.	61.71		
	13.12	21.22	50.	80.85	61.78		
	11.50	20.06	43.82	76.41	56.80		
III. Gap Furnace, near Hollidays- burg.....	13.22	20.72	50.37	78.93	63.80	248	100
	13.54	20.67	51.60	78.76	65.50		
	16.92	21.17	64.46	92.09	70.42		
	14.56	21.85	55.47	83.26	66.57		

NOTE.—In the foregoing table I denotes that the coke was made in open pits, II in Bee-hive ovens, and III in Belgian ovens. The per cent. of coke has reference to the bulk or space occupied, and the per cent. of cells is the difference between these numbers and 100. The compressive strength is computed in pounds per cubic inch, and is one-fourth the ultimate strength. The height of the furnace charge is the calculated maximum that can be supported without crushing.

Physical Properties of Various Cokes.

Locality.	Pounds in 1 cub. ft.		Per cent. of Coke.	Compressive Strength. Pounds.	Height of Furnace Charge. Feet.	Hardness.	Specific Gravity.
	Dry.	Wet.					
West Virginia.....	52.44	81.56	64.32	258	103	3.15	1.560
Clearfield, Pa.....	56.35	76.69	74.43	319	128	3.60	
Cumberland, Md.....	48.61	82.41	58.99	215	86	3.00	
Alabama.....	50.70	69.01	73.17	225	87	3.50	
Illinois.....	42.02	65.09	63.79	180	70	3.20	

Chemical Analyses of Cokes.

Locality.	Fixed Carbon.	Moisture.	Ash.	Sulphur.	Phosphorus.	Volatile Matter.	Analyst.
Connellsville, Pa.	89.57	0.30	9.11	.820	.014	.460	A. S. McCreath.
West Virginia.....	92.18	0.11	6.68	.618	.027	.350	J. B. Britton.
Broad Top, Pa....	89.28	.....	8.66	1.060	.....	.....	T. T. Morrell.
Clearfield, Pa.....	89.86	0.54	9.41	.....	.....	.667	Booth, Garrett & Blair.
Illinois.	89.77	0.12	9.58	0.930	.033	.....	T. T. Morrell.

The coke held in best repute is known as Connellsville coke, obtained from a district in Western Pennsylvania, covering an area of about 70 square miles; several other cokes, however, are probably equally as good.

The favor in which the various methods of manufacture are held is fairly shown by the census of 1880, which exhibits the number of coke ovens in the United States May 31, 1880, as follows: 9728 Bee-hive ovens; 286 Belgian ovens; 60 of other forms, chiefly modified Bee-hive; 42 pits or mounds; total, 10,116. There were building at that time 2083 Bee-hive; no Belgian; 80 other forms, chiefly modified Bee-hive; no pits; total, 2163. Grand total, 12,279. In the Connellsville region above referred to there were at the close of 1883 over 10,000 ovens, all of the Bee-hive form; in 1872 there were 2000 ovens in this district. The annual capacity of the coke ovens in the United States, allowing 10 per cent. as inactive, is not less than 5,000,000 tons, or 250,000,000 bushels.

The price of coke varies with the current wages paid labor, and with the demand, the extremes being from ninety cents to four dollars per ton. Coke is usually sold by the ton of 2000 pounds, or by the bushel of 40 pounds.

In Great Britain, as early as 1589, a patent was granted for making iron with "cooked" coal, and during the 17th century quite a number for "charring" or "charking" sea-coal for use in iron smelting, or "to burne out the sulphur and render it sweete," but all attempts to use the "cooked" coal, or coke, in accordance with these patents, were complete failures.

Early in the 18th century, whether about 1713 or 1735 seems in doubt, Abraham Darby used coke successfully in the manufacture of pig-iron in the Colebrookdale furnaces. From this dates the later history of iron-making.

The total consumption of coke in Great Britain is fully 10,000,000 tons per annum. Of this quantity very nearly one-half is produced in the county of Durham, where 14,000 to 15,000 ovens, chiefly Bee-hive, are built for its manufacture. The average yield per oven throughout the country over the whole year may be taken at about 330 tons, which would give a total of 30,300 ovens, and represents a total capital expenditure of over £2,000,000.

From 1870 to 1882 the variation in price of Durham coke was from 9 shillings to £2 5s. per ton.

As sulphur exists in all bituminous coals and but a portion of it (from $\frac{1}{3}$ to $\frac{1}{2}$) is eliminated in the coking process, coals containing small percentages of this element are preferred. Satisfactory results have been attained by washing "slack" (fine coal), or crushing and washing coal containing considerable iron pyrites. The coal, being lighter than the slate and pyrites, floats in water while the latter sinks. This fine coal agglutinates in the ovens and produces a very fair coke. Phosphorus also is generally found in our coking coals, and analyses of 93 specimens showed that this element existed from a mere trace to 0.1667 per cent. The cokes from these coals contained phosphorus from a trace to 0.2818 per cent.; the average approximating 0.2 per cent.

With the exception of the employment of gaseous products in heating the Belgian ovens, there has been until lately little attention given to their utilization.

Efforts are now being made, however, to collect and distil the tar and ammonia resulting from the coking process. Among other plans for this purpose, that of Jameson is noteworthy.

The difference between a Jameson oven and one of the ordinary type consists principally in providing the oven with a false bottom made of perforated quarles, under which are a number of passages connecting with a pipe to which a gentle suction is applied by coupling to an exhauster. By this means the oily and ammoniacal products, instead of rising to the upper part of the oven and being there burned and consequently wasted, are drawn downward through the passages and collected by condensation in a suitable receiver.

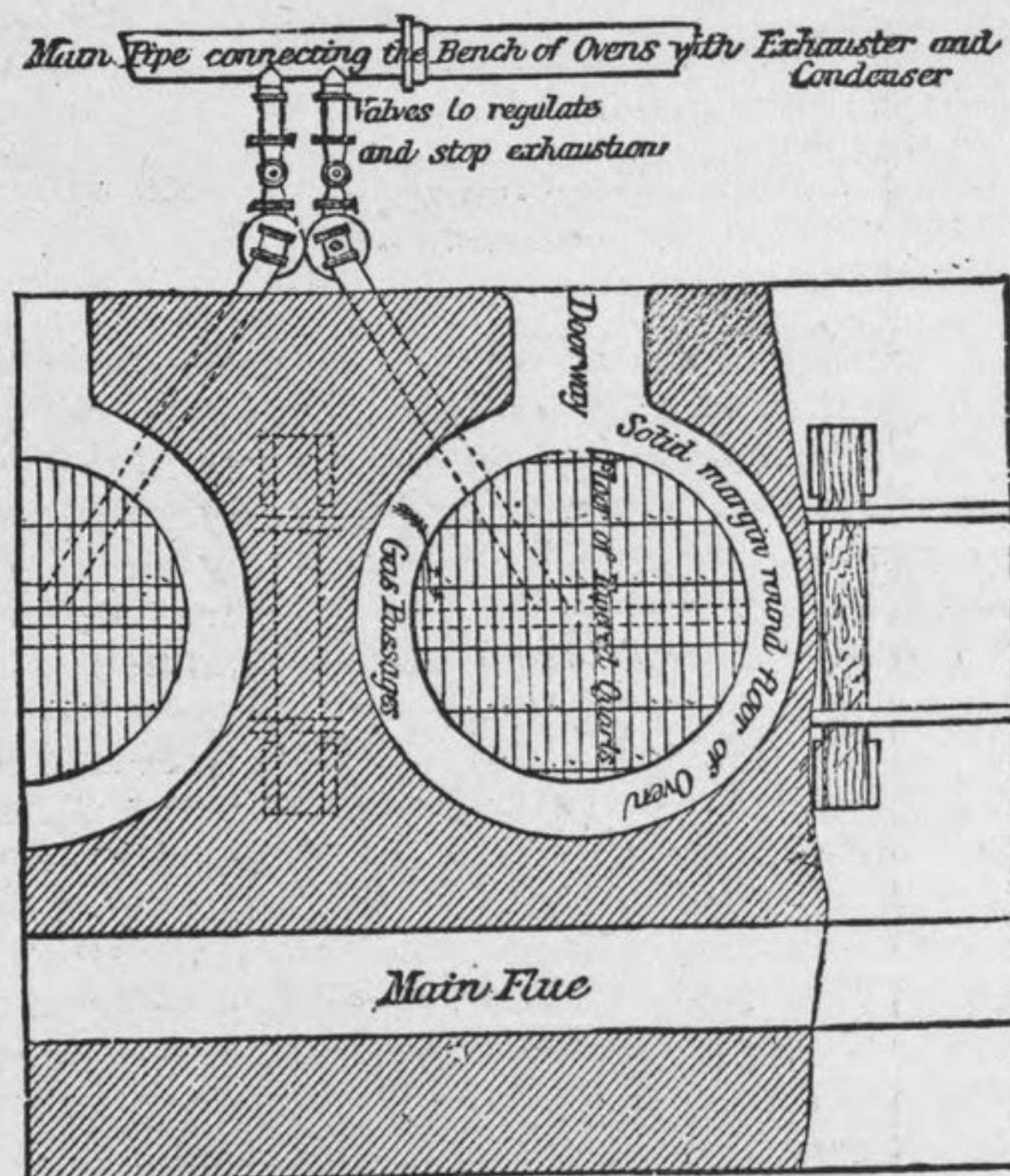


FIG. 3.—Jameson Coke Oven—Sectional Plan.

Fig. 3 is a sectional view of a Bee-hive coke oven as adapted to the Jameson improvements. A vertical section of the same is given in Fig. 4, and shows the method of arranging the false bottom, and the way in which the exhaust is effected, the pipe at the bottom being connected with the main exhaust-pipe, as may be seen in Fig. 3.

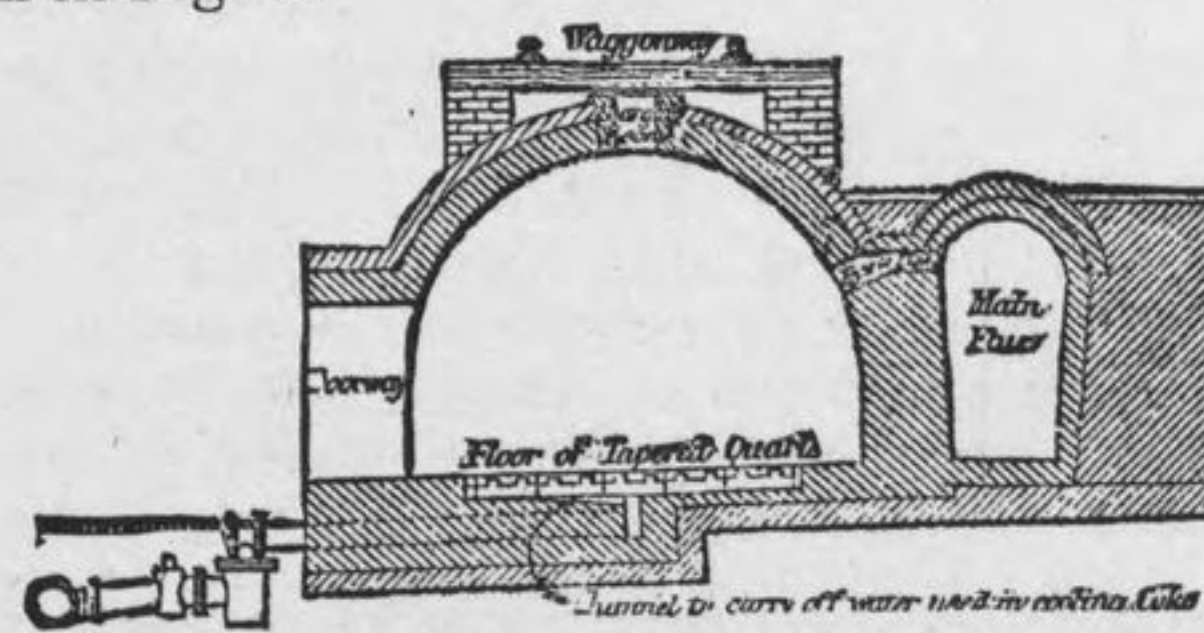


FIG. 4.—Jameson Coke Oven—Vertical Section.

The system known as "Simon-Carré" requires the building of an oven of the Belgian plan or a flue-oven, and it is claimed to produce a quality of coke which is fully equal, as a blast-furnace fuel, to that made in the ordinary Bee-hive oven, without any attempt at the recovery of the by-products. In addition to this, the yield of the coal in coke is 75 per cent., as against 60 to 65 per cent. in the ordinary Bee-hive oven, and there are also saved in addition 30 gallons of ammoniacal liquor per ton of coal, and 7 gallons of tar, while the extra cost is only about 30 cents per ton.

In Germany a coke oven has been patented, in which, in case of interruption of the operation, some coke shafts may be thrown out, and each separate shaft utilized as a generator. The coke shafts are surrounded by the heating shafts, so as to isolate the former. Generators are placed on the outside of the plant, and enclose between them a channel which carries off the products of combustion. The heating

gases passing through the generator are mixed with air, enter the heating chambers, and finally escape through proper funnels. The vapors and products of distillation developed in the coke chambers pass into a condenser, while the lighter non-condensable gases pass into a main gas channel, and may again be utilized for heating the coke chamber.

Natural Coke is reported as being found in Virginia, New Mexico, and other localities. That in Chesterfield Co., Va., is technically known as "carbonite," and its character as a true coke is disputed. A proximate analysis of dull and lustrous samples, by Dr. Drown, shows

	Dull Portion.	Lustrous Portion.
Specific gravity.....	1.375	1.350
Loss at 100° C.....	2.00	0.69
Volatile matter	15.47	11.10
Ash.....(dark-brown)	3.20 (white)	6.68
Fixed carbon.....	79.33	81.53
Sulphur.....	4.08	1.60

The manufacture of coke is referred to in most of the standard works upon metallurgy or upon fuels, and much valuable information is given in the *Report "L" of the Second Geological Survey of Pennsylvania*, in the special "Report on Coke," by J. D. Weeks, in the *U. S. Census of 1880*, and in the *Transactions of the American Institute of Mining Engineers*.

(J. B.)

COKE, THOMAS, LL.D. (1747-1814), the first bishop of the Methodist Episcopal Church, was born at Brecon, South Wales, Sept. 9, 1747. His father, Bartholomew Coke, was a surgeon, and was several times elected mayor of the town. Thomas was sent to Oxford when sixteen, and entered as gentleman commoner at Jesus College. Many of his fellow-students were infidel in opinions and immoral in conduct, and Coke was for a time influenced by them, but afterwards became a sincere believer in Christianity. Returning to Brecon, he was at the age of twenty-one chosen member of the common council, and at twenty-five was elected mayor. In June, 1775, he received the degree of D. C. L., and soon after took orders in the Established Church. Being made curate at South Petherton, his preaching proved so effectual that increased accommodation became necessary, and he erected a gallery in the church at his own expense. His adopting Methodist views, however, provoked some clergymen to try to have him removed, and though the bishop refused their application, the rector dismissed him. In 1777 he became personally acquainted with Rev. John Wesley, and joined his society, and the next year was stationed in London, where he became very popular. He assisted Wesley in procuring the deed of declaration by which the Wesleyan connection is still maintained in England. After travelling through England for two years under Mr. Wesley's direction, he was appointed to preside in the first Irish conference, held in Dublin in 1782. After the acknowledgment of American independence by England, it seemed necessary to Mr. Wesley to send to this country a superintendent who should be empowered to confer ordination. For this purpose Dr. Coke was selected, and ordained Sept. 2, 1784, by Mr. Wesley and two other presbyters of the Church of England. He reached New York in December, and hastened to consult with Rev. Francis Asbury, who had formerly been appointed Mr. Wesley's assistant in America. A conference of Methodist ministers was speedily called, which fully recognized Dr. Coke's authority, and elected Asbury bishop and joint superintendent. Coke now travelled extensively through the United States, not only laboring as an evangelist, but also urging the promotion of education and collecting funds to establish a college for the training of ministers. Twice, however, the buildings erected for this purpose were destroyed by fire, and the project was abandoned. In June, 1785, Bishop Coke returned to England, and travelled through Great Britain, Ireland, and the Chan-

nel Isles. Having become deeply interested in the destitute condition of the people of Nova Scotia, he embarked in September, 1786, with three missionaries on a vessel for Halifax, but they were driven by storms to the island of Antigua in the West Indies. Here he left one of the missionaries, then visited several other islands, and in February, 1787, reached Charleston, S. C., and travelled, preaching as he went, to Philadelphia. Returning to England, he called the attention of the people of all denominations to the moral condition of the slaves in the West Indies, and succeeded in having three more missionaries sent to them. Bishop Coke accompanied these, and made a tour through the West Indies, establishing mission-stations in several of the islands. Then sailing to South Carolina, he attended several annual conferences in different States with Bishop Asbury, and returned to England in July, 1789. For the next sixteen months he was employed in raising funds to sustain the missions in the West Indies. Having succeeded in this object, he returned thither with two more missionaries, inspected the work there, and sailed to the United States. While travelling in Virginia he heard of the death of Rev. Mr. Wesley, and immediately hastened to England. At the next meeting of the English conference, in 1791, he was elected secretary, and helped in framing the system of government of the Methodist societies. He also endeavored to establish missions in France, but found his design impracticable. Mr. Wesley having designated Mr. Henry Moore, Dr. Coke, and Dr. Whitehead to prepare an account of his life, they accomplished this task in the year 1792. Bishop Coke was then requested by the conference to prepare a commentary on the Scriptures, and to this object devoted much time during the following years, without, however, intermitting his travels and inspection of the churches. He again visited the West Indies in 1793, and afterwards went to Holland to obtain the favor of the Government for missions in the islands under their control, but was unsuccessful. In 1795 he projected a mission to the Foolaahs in Africa, and sent thither a company of mechanics, but the enterprise was a total failure. In 1796 he again visited the United States, and in view of the importance of the work here resolved to make this country his home; but when he went to England to settle his affairs, the conference sent an earnest request to their brethren in America to release him from his engagements, which was afterwards granted. On his voyage to America in 1797 the vessel in which he sailed was captured by a French privateer, and he was plundered of his clothing, though his books were spared. In 1798 he directed the attention of the Wesleyans to Ireland as a mission-field, and in 1800 to Wales, and in the latter the work was specially successful. Having completed his commentary on the Old Testament, he published it in 1802, and in the following year made his ninth and last voyage to America, spending nearly a year in a tour through the States. After his return to England he resumed his labors in behalf of missions, and while soliciting donations secured also a wife, a Miss Smith of Bristol, with whom he lived happily for six years. About a year after her death he married Miss Ann Lexdale of Liverpool, who lived, however, only a short time. During these years he had been earnestly engaged in the mission cause and in preparing for the press a number of works besides his commentary. In 1809 he labored to procure from the Privy Council an order countermanding a law passed in Jamaica which forbade the missionaries to instruct the slaves, and was finally successful. In 1811 he established a mission at Sierra Leone, and in 1813, after a correspondence with Rev. Claudius Buchanan with regard to India as a mission-field, announced to the conference his intention to begin a mission in Ceylon. Seven preachers volunteered to accompany him, and he offered to give £6000, if necessary, for the outfit. The arrangements having been completed, the missionaries sailed from Portsmouth, Dec. 30, 1813, and Bishop Coke spent much time on the voyage in pre-

paring hymns, sermons, and prayers in Portuguese for use in the work. On May 3, 1814, however, he was found dead in his cabin, having been ill only two days. He was buried the same day, near the middle of the Indian Ocean. His plans for the mission in Ceylon were faithfully carried out by the survivors.

Besides the *Life of Wesley*, 1792, and the *Commentary on the Scriptures*, 6 vols., 1802-07, already mentioned, he published a *History of the West Indies*, 3 vols., 1808-11, *History of the Bible*, *Life of Christ*, *Defence of the Doctrine of Justification by Faith and the Witness of the Spirit*, *The Duties of a Minister*, and numerous addresses to the churches.

COLBAN, MARIE SOPHIE, a Norwegian novelist, was born Dec. 18, 1814. Her maiden name was Schmidt, and at an early age she married Mr. Colban, an old gentleman, who had lived much in Paris and thus was able to instruct her in French language and literature. Having become a widow at the age of thirty, she had to seek work in order to support herself and educate her son. She made use of her knowledge of French in translating learned works. This gave her an occasion to go to Paris, where she gained the friendship of a wealthy lady with whom she afterwards corresponded. She was surprised one day at finding her own letters to this lady published in a Paris journal under the title *Lettres d'une barbare*, and thus she became an authoress against her own wishes. She spent her winters in Paris and her summers in Norway until a Paris journal finally sent her to Rome as Italian correspondent, and there she is still domiciled. Her real *début* in literature was *Lærerinden*, a story published in 1870. This was followed by *Tre Noveller* (1873); *Tre nye Noveller* (1875); *En gammel Jomfru* (1879); *Cleopatra* (1880); and *Thyra* (1882). The refinement of the South and the grandeur of the North are admirably blended in her works.

COLBURN, ZERAH (1804-1840), an arithmetical prodigy, was born at Cabot, Vt., Sept. 1, 1804. When six years old he showed such wonderful power of mental computation that his father decided to exhibit him throughout the country. At Boston his talent was subjected to the severest tests by questions involving multiplication by several places of figures, involution, and evolution. These he answered correctly, though not able till some years later to explain the mental process by which he obtained the results. After journeying through several States, Mr. Colburn in 1812 took his son to Europe, and travelled in the same way through England, Scotland, and Ireland. He resided for some time in Paris, and when he returned to England young Colburn was placed in Westminster School. In 1820 he became a teacher, and also assisted Dr. Thomas Young in astronomical calculations. In 1824 he returned to America, taught school, and studied at the University of Vermont. In 1825 he became a Methodist preacher, and served for nine years in the itineracy. In 1835 he was appointed professor of languages in Norwich (Vt.) University. His autobiography, published in 1833, states that his powers of computation failed as he approached manhood. In other respects he displayed no special ability. He died at Norwich, March 2, 1840.

COLBY UNIVERSITY, a Baptist college, is located in Waterville, Me., a beautiful town on the Kennebec, 81 miles by railroad from Portland. It had its origin in the "Maine Literary and Theological Institution," incorporated by the legislature of Massachusetts in 1813. Rev. Jeremiah Chaplin having been elected professor of theology, brought some pupils with him to Waterville in July, 1818, and in Oct., 1819, was joined by Rev. Avery Briggs, who had been elected professor of languages. On a lot containing 179 acres, the trees were felled to make room for the school-building and dwelling-house. When Maine became a separate State in 1820, the legislature granted to the institution collegiate powers, and subsequently changed its name to Waterville College, which it retained

until 1867, when the name was changed to Colby University, in honor of Mr. Gardner Colby, of Newton Centre, Mass.

In 1822 Prof. Chaplin was made President, and the same year the college graduated its first class—of only two—one of whom, George Dana Boardman, became the founder of the remarkably successful Karen Mission, in Burmah. President Chaplin, by his thorough scholarship and his persistency of purpose, was eminently fitted for the work of founding a college under peculiarly difficult conditions. By personal solicitation he raised the necessary funds for the enterprise, and through thirteen years he labored only for the college. In 1842 the Board of Trustees set up in the old chapel a marble tablet to his memory, which has been transferred to the new chapel in the Memorial Hall.

The college building known as South College was erected in 1821. It is of brick, four stories high, with two main entrances, and contains thirty-two rooms, now used for dormitories, but formerly also, in part, for recitation-rooms, chapel, and library. A similar building was erected a few years later for dormitories, the basement of which long served for a Commons Hall, and a chapel.

In 1829 a preparatory school, in charge of the faculty, was opened in a building half a mile from the college. This, with greatly improved facilities, is known as the Waterville Classical Institute, and has been presided over, since 1865, by James H. Hanson, LL. D., an alumnus of the university. The university has recently taken into a similar relation the Hebron, and the Houlton, academies. The college also early erected workshops, putting them in charge of a competent superintendent; but after a trial of twelve years this industrial department was abandoned.

The university now has adequate buildings in good condition, and well furnished; an able and full faculty; and a large body of alumni devoted to its interests. The buildings are as follows: the North and South Colleges, each thoroughly renovated, and the latter being now named Chaplin Hall; Champlin Hall, containing the recitation-rooms; Coburn Hall, devoted to the use of the department of chemistry and natural history, and called after the Hon. Abner Coburn; Memorial Hall, erected to the memory of the alumni who fell in the late civil war, and containing the hall of the alumni, chapel, and library; a Gymnasium, commodious and furnished with the most approved apparatus; the President's house; an observatory on an eminence near by, fairly equipped and used for purposes of instruction. The library has double alcoves and shelves for 30,000 volumes, and now contains over 18,000 volumes and 9000 pamphlets. The present value of buildings, land, etc., is over \$200,000.

The following is the list of the Presidents—the asterisks indicating their death:

1822-1833.	Rev. Jeremiah Chaplin, D. D. *1841.
1833-1836.	Rev. Rufus Babcock, D. D. *1875.
1836-1839.	Rev. Robert E. Pattison, D. D. *1874.
1841-1843.	Eliphaz Fay, A. M. *1854.
1843-1853.	Rev. David N. Sheldon, D. D.
1854-1857.	Rev. Robert E. Pattison, D. D. *1874.
1857-1873.	Rev. James T. Champlin, D. D. *1882.
1873-1882.	Rev. Henry E. Robins, D. D.
1882—	Rev. George D. B. Pepper, D. D., LL. D.

The college has had twenty-one different professors, eight of whom are still in office, three of the latter having already served an average of twenty-eight years each. Of the earlier professors, George W. Keely, LL. D., served twenty-three years, and Charles E. Hamlin, LL. D., now of Harvard University, twenty years. Dr. Champlin also served the college as professor of the Greek and Latin languages and literature for sixteen years prior to his elevation to the Presidency, making his entire service thirty-two years.

The number of the graduating class in 1882 was 33.

and that of 1883 was 34, while the total number of undergraduates (1884) is 132.

The alumni number 730,—clergymen, 219; lawyers, 158; teachers, 120; professors of colleges, 34; presidents of colleges, 7; physicians, 44; journalists, 32; judges, 14; members of Congress, 8; Governors, 3. Over five-sevenths have given themselves to those callings whose chief work is that of mind on mind. Several of its graduates have become presidents of other educational institutions, and many others have filled professorships in our various colleges and seminaries, and some of them have attained high eminence in authorship; still others have attained high rank in civil and military life.

The curriculum of the college has always been of a high order, and its recitation-room drill thorough. The course, however, has been broadened with the general advance and demand of the times, especially in the departments of the natural sciences, art, history, and physical culture.

The college has sixty-nine scholarships, yielding each from \$36 to \$60 per year. Among the prizes is one founded by Hon. J. Warren Merrill, which yields to one student, each year, exceptionally well fitted for college, an annual income of \$182. The ordinary expenses of a student amount to about \$240 a year.

The entire property of the college, including \$120,000, left it by Mr. Gardner Colby, amounts to about \$550,000, the land, buildings, etc., being estimated at \$200,000, and the invested funds being \$334,946.

COLD. The common expression "catching cold" denotes facts and symptoms like the following: a person is exposed to a draught of air, and as a consequence, a few hours afterwards, there ensues a swollen condition of the mucous membrane of the nasal passages, producing more or less obstruction to the breathing, and perhaps attended with slight fever. Twenty-four hours later, or in less time, there is a discharge from the nose, which is at first thin and transparent, but soon becomes turbid and then opaque white or yellow. This catarrh continues two days or even two weeks and then disappears. Such a person is said to have had "a cold in the head;" properly he has had an inflammation of the mucous membrane of the nasal passages. Again a similar exposure or after a wetting of the body or a part of it, as the feet, a cough is acquired. The cold is then said to have settled on the chest. Similarly a hoarseness is produced, or a diarrhoea or a neuralgic pain. Should the cough become a symptom of bronchitis or pneumonia, or the diarrhoea a symptom of inflammation of the bowels, or the pain a symptom of neuritis or rheumatism, the "cold" is gradually lost sight of and the actual condition spoken of.

"Cold" is the cause of a number of morbid states, by a refrigeration as it were of the organism. It is not so much the degree of cold as the changes in temperature which produce the results referred to, these being more serious if the cooler air is in motion, and the consequences are more serious if the surface on which the draft impinges is covered with perspiration. Why it should produce such a state in one person and not in another, or a different state in a third, or in the same person at a different time, is not known. When in the same individual cold always produces a morbid state of the same organ, that organ must have a peculiar susceptibility. In some instances there is a relation between the result of the exposure and the exposed part traceable to proximity. Thus exposure of the head without a covering gives rise to a "cold in the head." It is also said that an exposure of the neck sometimes gives rise to a catarrh of the larynx, and that of the chest to bronchitis. But this succession is doubtful or variable; on the other hand it is well known that coldness of the feet, especially when associated with moisture, produces sore throat (pharyngitis), also derangements of menstruation, especially amenorrhoea, in the female, and

it may produce any one of the affections named as due to cold.

In what way cold operates to produce these morbid states, which are almost always inflammatory, is not certainly known. According to one explanation, the blood is driven from the surface of the body to the internal organ affected. But why is the blood turned to one organ rather than another? To say that the organ affected is more vulnerable to an extra amount of blood is in part to beg the question. It has been suggested that the chilling of the surface causes an arrest of the cutaneous secretion, a retention of effete matters in the blood, and a subsequent deposit of these in the organ affected. But this view is even more speculative than the other, and has not a single fact as a basis. It is true that the cutaneous secretions are partly checked by chilling the surface, but experiment has shown that when they are totally arrested, as by covering the body with a layer of impervious varnish or with gold foil, death promptly results without the intervention of any inflammatory symptoms, but with symptoms of suffocation or such as due to the deprivation of oxygen. The varied phenomena of taking cold have also been attributed to the chilling effect directly upon the terminal nervous filaments and nerve networks of the skin, and the reflex operation of such influence upon the nerves of the internal organs affected. By paralyzing the tonic action of the vaso-motor nerves, which are distributed to the muscular wall of the blood-vessels, they cease to regulate the supply of blood to an organ; there results an excessive flow of blood to the part, which is the most important condition of inflammation. But the latest experiments go to show that nervous influence has very little to do with inflammation. We are therefore compelled to admit that we have but a partial explanation of the phenomena of colds, and must wait for a closer investigation of the facts.

The affections which cold produces are mainly acute inflammations. Indeed if we except chemical and physical irritants, it may be said to be the most frequent cause of these. On the other hand what are known as infectious diseases, including the fevers, the various contagious diseases, etc., are never produced by cold. In the case of malarial affections, though they require heat for their causation, yet it is not unlikely that cold may become the exciting cause of their manifestation.

While acute diseases are the most frequent consequence of refrigeration, it is also true that long continued exposure to cold may cause chronic disease. Here again inflammations are the form of disease engendered, and among these those of the serous membranes covering the lung (pleura) and the heart (pericardium), the peritoneum, the spinal cord, are conspicuous.

In some instances it is easy to trace a given acute inflammatory affection to cold as the cause; as when an uncomfortable condition succeeding cold passes without interruption into that of the more tangible affection; or when a chilly feeling continues until it is succeeded by the diseased conditions, with the first manifestations of which it often alternates; at other times the victim is able to recall the occasion on which he suffered the refrigeration, when the sore throat or catarrh presents itself, though he may in the meantime have forgotten it. But in many cases it is impossible to trace the result to cold. (J. T.)

COLDEN, CADWALLADER (1688-1776), a New York physician, naturalist, and statesman, was born at Dunse, Scotland, Feb. 17, 1688. His father, Rev. Alexander Colden, prepared him for the University of Edinburgh, where he graduated in 1705. He then studied medicine, and in 1706 settled in Philadelphia as a physician. He went to London in 1715, and was received with favor by the Royal Society, but on account of the troubles in Scotland he returned to America after his marriage. In 1718 he removed to New

York at the request of Gov. Hunter, and soon after obtained a patent for land at Coldenham, nine miles from Newburgh. He was appointed the first surveyor-general of the province and master in chancery. He proposed a route for trade from New York to the Mississippi by way of the Susquehanna, Juniata, Allegheny, and Ohio Rivers. In 1720 he was appointed by Gov. Burnet member of the council. In the frequent controversies with the assembly Colden was an earnest supporter of the authority and claims of the royal governors in opposition to the people. In 1760 he was appointed lieutenant-governor, and remained in this office till his death, frequently acting as governor during vacancies. In 1765 he was burnt in effigy by the Sons of Liberty on account of his efforts to enforce the Stamp Act, and was compelled at last to pledge himself not to use the stamps. When the British troops took possession of New York in 1776, a fire broke out which destroyed a large part of the city. Dr. Colden, then eighty-eight years of age, was so much agitated at the sight that he died in a few hours, Sept. 21, 1776. He was the first English writer connected with New York. In 1727 he published a *History of the Five Indian Nations of Canada*, which was afterwards reprinted in London, with additions in 1747, and again in 1755. In this work he called special attention to the advantages which would accrue from English trade and alliance with these tribes. A tract of his on yellow fever in 1743 led to important sanitary regulations in New York City. He was eminent as a naturalist, and besides introducing the Linnæan system of botany into this country, furnished to Linnæus nearly 400 American plants. His description of them, published by the great botanist in the *Acta Upsalensia*, is the first botanical treatise written in North America. Linnæus named an East Indian plant *Coldenia* in his honor. The work on which Colden bestowed most labor was *The Principles of Action in Matter, to which is added a Treatise on Fluxions*. He maintained an extensive correspondence with scientific men in Europe and America. In one of his letters to Franklin he described a process of stereotyping. The Colden papers are part of the valuable manuscript collections of the New York Historical Society. Among them is a long-continued series of daily observations of the thermometer, barometer, and the winds.

COLDEN, CADWALLADER DAVID (1769–1834), a New York lawyer, grandson of Cadwallader Colden, was born at Flushing, N. Y., April 4, 1769. His father, David Colden, excelled in mathematics and natural philosophy. The son completed his education in London, returned to the United States in 1785, and began to study law. He practised in New York, and was for a time district attorney. In 1818 he succeeded De Witt Clinton as mayor, in 1820 was elected to Congress, and in 1824 to the State senate. He took great interest in common-school education, in the reformation of juvenile offenders, and in the internal improvements of New York State. He died at Jersey City, Feb. 7, 1834. He published a *Life of Robert Fulton*, 1817, and an account of the New York canals.

COLD HARBOR, a locality in Hanover co., Va., where five roads meet; 9 miles E. N. E. from Richmond, and about 2 miles north of the Chickahominy River, where was fought one of the bloodiest battles of the civil war in America, June 3, 1864. The name of the place indicates that it was a way-side shelter without fire. The ground on which the battle was fought was very nearly the same as that of the battle of Gaines' Mill (June 27, 1862), only here the positions were reversed. Pursuing his original plan in this campaign, Gen. Grant marched upon the Confederate army under Gen. Lee, attacking in front, and then attempting to turn his right flank, which Lee, sustaining the attacks, constantly refused. Thus the Federal forces were on a more extended line, attacking an entrenched force, while Lee, on an inner line, with fewer troops, could repel, strike counter-blows, fall

back, and contract his defence. After some movements of this character, Grant found it necessary to shift his base of supplies from Port Royal on the Rappahannock to White House on the Pamunkey; while Lee slowly but constantly fell back to cover the defences of Richmond, until his left rested on the Chickahominy. His army, numbering in all 69,000 men, lay north of the river, and had in its front tangled thickets and marshes. It consisted of the commands of Ewell, Longstreet, and A. P. Hill, with a large contingent of cavalry on the wings, portions of which were detached from time to time to make raids upon the Federal communications. The Army of the Potomac was composed of the Sixth corps, under H. G. Wright; the Second, under Hancock; the Fifth, under Warren; the Ninth, under Burnside, and the Eighteenth, under Gen. W. F. Smith, which was temporarily detached from Gen. Butler's Army of the James and joined the Army of the Potomac May 30. These amounted in all to about 150,000 men. Gen. Sheridan commanded the cavalry, and under him were Gens. Torbert and Wilson. To beat up the new quarters of the enemy, Sheridan led the advance with two divisions of cavalry, May 26, followed by Wright with the Sixth corps. They reached the Pamunkey and crossed at Hanover town on the 27th, without opposition. On the next day the whole army having crossed was placed in easy communication with the new base at White House. The new line of Gen. Lee, covering the railroad communications, extended from beyond Mechanicsville towards Hanover Court-House, and faced northeast. Grant made strong reconnoissances, the cavalry leading the way, and frequently fighting dismounted. Following these the corps were advanced, and this led to a preliminary battle. Hancock's (Second) corps, supported by the Ninth and the Sixth, carried the enemy's outer line of rifle-pits, but were debarred from a further advance. Warren's (Fifth) corps encountered equal resistance in the vicinity of Shady Grove church, from Ewell's entire force, which endeavored indeed to turn Warren's left; and other troops were drawn into the struggle. All this proved Lee's position to be exceedingly strong, but Grant persevered in his intention to break the enemy's line. On May 31 Torbert's cavalry had been ordered to occupy Cold Harbor, and to hold it against all odds. The Sixth corps was marched rapidly by the rear and flank to relieve the cavalry in its occupation; the Eighteenth corps under W. F. Smith was ordered to the right of the Sixth, and Hancock was moved to the extreme left of the line. Warren's corps formed a very extended line; and when Burnside moved from the right to close in upon him he was vigorously attacked; the enemy, taking advantage of the delay in closing the gap, routed a portion of Burnside's troops and took 600 prisoners; but soon the formation of the line was completed. In the meantime Smith's (Eighteenth) corps, with the right of Warren's, advanced, and carried the first line of rifle-trenches, but was stopped by the second line, and had to entrench themselves. The two corps lost 2000 men. Such were the movements in coming into position; such the preliminaries to the great battle of COLD HARBOR. On the evening of June 2 the Federal line extended from Cold Harbor to Bethesda Church, six miles, in the following order from left to right: Hancock, Wright, W. F. Smith, Warren, and Burnside. Two divisions of Sheridan's cavalry covered the roads to White House, and held the lower crossings of the Chickahominy. A general assault upon Lee's positions was ordered along the whole line for Friday, June 3, at 4½ A. M.; each command was to move directly to the front without regard to the rest; the sole duty of each was to attack vigorously in front. In all the corps but one the order was obeyed with no appreciable delay; but the enemy was ready at every point. The battle raged along the fronts of the Second, Sixth, Eighteenth, and Fifth corps. Hancock

on the extreme left advanced Barlow's division on the left and Gibbon's on the right, with Birney in support. Barlow's attack was successful, but Gibbon's men found a swamp in their front, which divided and thus weakened and delayed the attack. The enemy being rapidly reinforced in Barlow's front, and finding him unsupported, drove him back by a furious charge. A part of Gibbon's division succeeded in reaching the enemy's parapet, but were soon driven back by numbers. In less than an hour Hancock had lost 3000 men. Similar was the fortune of the Sixth and the Twelfth corps. They reached the enemy's works under a terrible fire, but were driven back, and made haste to entrench themselves quite near to the enemy. Warren's Fifth corps presented so extended and thin a front that he could attempt nothing more than to hold his own, which he succeeded in doing. The Ninth corps under Burnside, forming the extreme right, for reasons not explained, did not join in the general front assault at daybreak, but two divisions were moved round to assail the enemy's right flank, and one brigade was engaged at the Eastern end of the Shady Grove road. The batteries of these divisions were well posted and did good work. While the general engagement was in progress there was also a spirited cavalry combat, beyond the right of the line, between the Federal command of Wilson and the Confederates under Wade Hampton. When by afternoon Burnside was in position to attack in front, the fighting was over, and the movement was suspended. The short but very bloody work of the morning had proved to the men themselves the utter hopelessness of another attack, and when Gen. Meade sent instructions to the corps commanders to renew the attack, and orders were given to the troops, in the words of Swinton "no man stirred, and the immobile lines pronounced a verdict, silent yet emphatic, against further slaughter." There was no attempt to enforce the orders. This deserves notice as a curious and unusual illustration of Marmont's paradox, "Men do not go to war to be killed. . . . Let the moment come when an intelligent mass has before it no probability of victory, no chance of a glorious combat,—from that moment they hesitate to compromise their lives and seek to preserve them for an occasion when they will be able to accomplish the sacrifice more usefully."

The first thought of Grant on the evening after the battle was to entrench in the position he held and begin siege operations. He says: "From the proximity of the enemy to his defences around Richmond it was impossible by any flank movement to interpose between him and the city." He soon altered his views as to entrenchments, and determined on a change of base, and a new line of operations south of the James River; hoping by the sudden capture of Petersburg to cut the southern communications and make a close investment of the capital. The Federal losses at Cold Harbor amounted to over 7000 men; those of the enemy being small in comparison. The entire losses of the Union army from the 1st to the 10th of June, killed, wounded, prisoners, and missing, were 13,153. (H. C.)

COLD SPRING, a village of Putnam co., N. Y., is on the E. bank of the Hudson River, 52 miles N. of New York, on the Hudson River Railroad. It has three hotels, a weekly newspaper, five churches, three schools, and is lighted with gas. It is near West Point, and contains iron-works and a gun-foundry. Population, 2111.

COLD-WATER, the county-seat of Branch co., Mich., is on Coldwater River, 156 miles E. of Chicago, on the Michigan Southern Railroad. It has an opera-house, a public hall, two hotels, two National banks, one weekly and one semi-weekly newspaper, six churches, three schools, besides the State school for indigent children. There is also a fine private art-gallery. The industries comprise three flour-mills,

eight cigar-factories, two foundries, manufactures of staves, chairs, furniture, sashes, fanning-mills, and cigar boxes. The city is lighted with gas and has a park. It was settled in 1830, and incorporated in 1861. Population, 4681.

COLE, SIR HENRY, K. C. B., an English writer, was born at Bath, July 15, 1808. He was educated at Christ's Hospital, and in 1823 entered the civil service, becoming some time later an assistant keeper of the public records. He published *Henry VIII.'s Scheme of Bishopricks*; *Miscellaneous Records of the Exchequer*; *Light, Shade and Color*, etc. Under the pseudonym of "Felix Summerly," he prepared some guide-books, etc. He also edited *The Guide*, the *Historical Register*, and the *Journal of Design*. He took prominent parts in the great Industrial Exhibitions of London and Paris, and was superintendent of the South Kensington Museum from 1860 to 1873. He has devoted much attention to industrial and decorative art, to education, to musical training, to sanitary reforms, especially to the questions of water-supply and river-pollution. He was made a K. C. B. in 1875.

COLE, THOMAS (1801-48), an American landscape painter, was born in Lancashire, England, Feb. 1, 1801. He came to the United States about 1819, with his father, who settled at Steubenville, Ohio. In 1822 he became an itinerant portrait-painter, but he was not very successful, and he afterwards devoted himself to landscape painting in Philadelphia. He removed to New York city in 1825, after he had experienced several years of poverty and adverse fortune. His enthusiasm was excited by the scenery of the Hudson, and he painted autumnal landscapes of the Catskills, which speedily procured for him prosperity and fame. He visited Europe in 1829, passed some time in London and Italy, and returned in 1832, bringing several Italian landscapes. He made a second visit to Europe in 1841. His allegorical pictures were popular, especially a series of four, called *The Voyage of Life*. Among his works are another series of five pictures, called *The Course of Empire*, *A Dream of Arcadia*, *The Expulsion from Paradise*, *Catskill at Sunset*, *The Hunter's Return*, *Home in the Woods*, *The Mountain Ford*, *A View of Mount Etna*, *Il Penseroso*, and *The Angel Appearing to Shepherds*. He died at Catskill, N. Y., Feb. 11, 1848.

COLE, VICAT, an English landscape-painter, who was born at Portsmouth in 1833. His father, George Cole, was a painter of some note in his day, and from him the son received his first instruction. Cole first exhibited in 1851, and he has been a frequent contributor to the exhibitions of the Society of British Artists, the Royal Academy, and so forth. He was elected an associate of the Royal Academy in 1870. Among his notable pictures are *Under the Greenwood Tree*, *Shadows from the Beeches*, *Summer's Golden Crown*, *Floating down to Camelot*, *Sunshine Showers*, *April Skies*, *A Misty Morning*, *Summer Rain*, *The Heart of Surrey*, *The Day's Decline*, *Showery Day*, and *A Surrey Pastoral*. Cole has mainly devoted himself to the delineation of Surrey scenery. His pictures are not marked by imaginative qualities, but they are careful and pains taking renderings of nature.

COLEMAN, LYMAN, D. D. (1796-1882), an American educator and author, was born June 14, 1796, in Middlefield, Mass., where his father was a physician. He graduated at Yale College in 1817, and for three succeeding years was principal of the Latin grammar-school at Hartford, Conn. He then became a tutor at Yale for four years, studying theology at the same time. In 1828 he was ordained pastor of the Congregational church in Belchertown, Mass., and held the charge for seven years. He served as principal of the Burr Seminary, Vermont, for five years, and then as principal of the English department of Phillips Academy for five years. The years 1842-43 he spent in Germany in study and in travel, and on his return was

made professor of German in the College of New Jersey at Princeton, from which he received the degree of S. T. D. He was afterwards connected with literary institutions at Amherst, Mass., and Philadelphia, until 1856, when he went abroad, travelling through Europe and visiting Egypt and the Holy Land. After his return he became professor of ancient languages in Lafayette College at Easton, Pa., where he remained until his death, March 16, 1882. Dr. Coleman was the author of numerous works, the most important of which are—*Antiquities of the Christian Church* (1841); *Apostolical and Primitive Church*, with introductory essay by Dr. Augustus Neander (1844); *Historical Geography of the Bible* (1850); *Ancient Christianity exemplified in the Life of Primitive Christians and the Institutions of the Church* (1852); and *Historical Text-Book and Atlas of Biblical Geography* (1854; revised ed. 1859).

COLENSO, JOHN WILLIAM, D. D. (1814–1883), English colonial bishop of Natal, was born at Austell, Cornwall, Jan. 24, 1814. He was educated at St. John's College, Cambridge, where he was graduated in 1836 as a senior wrangler and Smith prizeman. He at once became a fellow and one of the tutors of his own college. From 1838 to 1842 he was an assistant master at Harrow. In the latter year he returned as an instructor to Cambridge, where he remained until 1846. He was especially proficient in mathematical studies. During these years of instruction he issued treatises on arithmetic and algebra, which were very generally used in the schools and colleges. Later he produced (1848) *Miscellaneous Examples in Algebra*, and *Plane Trigonometry* (1851). In 1846 he was appointed rector of the parish of Fornsett St. Mary in Norfolk, and devoted himself to the interests of the laboring classes; he published a volume of *Village Sermons* in 1853, and in the same year was created bishop of Natal. His first impressions of this colonial see are set forth in his *Ten Weeks in Natal* (1855). With great industry he set to work to learn the Zulu language, and before long prepared a grammar and dictionary and made a translation of the English Prayer-Book and a portion of the Bible, printing them in his own house. The peculiar customs of the natives, and especially the practice of polygamy, caused him to consider how far they should be obliged to conform to English canon law in accepting Christianity. In a memorial to the archbishop of Canterbury, presented in 1860, he took ground against compelling those already having more than one wife to renounce the authorized polygamy as a condition to baptism, finding no warrant for such compulsion in the gospel or in the ancient Church. The attention drawn to him by this memorial was increased by his new *Translation of St. Paul's Epistle to the Romans, Commented on from a Missionary Point of View* (1861), in which objection was made to the doctrine of eternal punishment. But even the feeling excited by this was insignificant, compared with that caused by his next publication. According to his own account, while engaged in the work of translating the Scriptures, he had become convinced of the improbability of many statements of facts and numbers in the historical books, and after ample study of the most recent critics had determined to return to England to publish his views. The First Part of his work on *The Pentateuch and the Book of Joshua, critically examined*, appeared in 1862, and was immediately followed by a storm of remonstrance. The book was written for the people as well as the theologians, and it passed rapidly through several editions. The English bishops entreated him to resign his see, and when he refused, some of them inhibited him from preaching in their dioceses. He bore all meekly, preached where he was invited to do so, and went on steadily with his work, a second part of which appeared in 1863. Upon this the House of Convocation of the province of Canterbury took action, and in 1864, by a majority, voted to censure him; and he was declared to be deposed from his see by Bishop Gray, of Cape-

town, who claimed to be the metropolitan of South Africa. He appealed from this judgment to the Privy Council, who in 1865 declared the deposition to be "null and void in law," on the ground that where a colony had an independent legislature the government had not the power to create a bishopric or act judicially upon it. But the trustees of the Colonial Bishops' Fund, declaring that he could not coerce them, refused to pay him his appointments. On an appeal to the Court of Chancery in October, 1866, they were directed to pay him arrears and interest, the master of the rolls further declaring that the payment must continue unless the bishop should be presented for heresy. In the meantime just previous to his return to his diocese in August, 1865, his friends had presented him with £3300 as a testimonial. By this time he had published five parts of his work; *Part VI.* followed in 1871, and *Part VII.* in 1879. The publication of *Part I.* had great effect on the Biblical scholars of the continent, especially on Kuenen, who was led to make essential modifications in his theory of the composition of the Pentateuch.

Though Bishop Colenso resumed his missionary work in Natal, many members of the Church of England there had become disaffected towards him. In 1866 Bishop Gray publicly excommunicated Colenso, and in 1869 consecrated Dr. W. K. Macrorie as bishop of Maritzburg to rule practically the same diocese. In 1874 Bishop Colenso again visited England and reported the condition of affairs to the archbishop of Canterbury. Throughout his missionary career he had not only sought the conversion of the natives to Christianity, but had contended for their protection from the encroachments of the whites. This course had the effect of greatly reducing the number of his adherents; but still, in spite of the censure of high officials, the bishop and his daughter made constant protest against every public and private oppression of the Africans. The native chiefs Langelibalele and Cetywayo in especial found in them active sympathizers, though their efforts were often baffled. Bishop Colenso died at Durban, Natal, June 20, 1883. Besides his chief work he published *The New Bible Commentary Critically Examined* (1871–74), *Lectures on the Pentateuch and the Moabite Stone* (1873), and a volume of *Sermons* (1873).

COLERIDGE, DERWENT (1800–1883), an English clergyman and educator, son of the poet Samuel T. Coleridge, was born at Keswick, Sept. 14, 1800. He was educated first at a private school, and then at St. John's College, Cambridge, where he contributed to *Knight's Quarterly Magazine*, under the name of "Davenant Cecil." He took orders in 1826, but having already been engaged in education, continued in such work and became in 1841 principal of St. Mark's College, Chelsea. While holding this position he was made a prebendary of St. Paul's cathedral, and afterwards rector of Hamwell, Middlesex. In 1864 he resigned his principalship, but continued to receive some private pupils. He died at Chelsea, September, 1883. He collected and published the scattered writings and correspondence of his father, and edited the works of his brother Hartley Coleridge, whose life he wrote. He also wrote a biography of W. Mackworth Praed. His principal original work is *The Scriptural Character of the English Church* (1839). He was highly esteemed for his genial disposition, and was noted for his extensive linguistic acquirements, being able to converse in fourteen languages.

COLERIDGE, JOHN DUKE, BARON, an English jurist, a son of Sir John Taylor Coleridge, was born Dec. 3, 1821. He was educated at Eton, and Balliol College, Oxford, where he graduated B. A. in 1842 and M. A. in 1846. Having been called to the bar at the Middle Temple in November, 1846, he became the leader of the Western Circuit. He was appointed recorder of Portsmouth in 1855, and was created a Queen's counsel in 1861. In July, 1865, he was

elected to parliament for Exeter, which he continued to represent till 1873. In December, 1868, he was appointed solicitor-general, and received the honor of knighthood. He became attorney-general in November, 1871, and Chief-Justice of the Court of Common Pleas, Nov. 19, 1873. In the following month he was raised to the peerage. In 1880 he was made Lord Chief-Justice of England. In 1883 he made an extended visit to the United States, where he was received with great cordiality, especially by the judiciary and bar. He has contributed to the *Edinburgh Review* and other periodicals. He is one of the foremost speakers on the English bench, and in readiness probably has no superior.

COLES, EDWARD (1786-1868), second governor of Illinois, was born in Albemarle co., Va., Dec. 15, 1786. His father, John Coles, a wealthy planter, had been a colonel in the Revolutionary war, and, though not in public life, was intimately associated with the distinguished Virginians of his time. Edward was educated at Hampden-Sidney College, and afterwards at William and Mary College, leaving the latter in 1807 on account of an accident. He became private secretary to President Madison in 1809. Impressed with the evils of slavery, he wrote to Jefferson in 1814, urging him to use his influence for the emancipation of the slaves in Virginia, but the veteran statesman, while commending the object, declined to lead the movement. In 1815, Mr. Coles, resigning his position as secretary, travelled through the North-west Territory to St. Louis, and upon his return was sent by the President on a special mission to St. Petersburg, which gave him an opportunity for travel in Europe. In 1810 he again visited the Territory of Illinois, and attended the convention held at Kaskaskia to form a State constitution. The following April he removed to Edwardsville, Ill., with all his negroes, setting them free and giving every head of a family 160 acres of land. President Monroe appointed Mr. Coles registrar of the land-office at Edwardsville. Having thus become well known to the people, he was brought forward in 1822 as an anti-slavery candidate for governor, and owing to a division among his opponents was elected, while the legislature had a pro-slavery majority, and by unscrupulous measures called a convention to alter the constitution so as to legalize slavery. Gov. Coles exerted himself to prevent this change, and by arduous labor succeeded in having the convention voted down, but was bitterly persecuted by its advocates. Throughout his administration Gov. Coles conducted himself with dignity and firmness, attending personally to all the details of his office and making judicious recommendations to the legislature for the improvement of the State and the welfare of the people. He specially urged that every remnant of slavery should be abolished, and that provision should be made for the security and protection of free colored persons. In May, 1825, he had the pleasure of bidding welcome to La Fayette on his tour through the United States, having made his acquaintance while in Europe. After the expiration of his term he continued to live at Edwardsville, cultivating his farm, and was the founder of the first agricultural society in Illinois. In 1831 he was a candidate for Congress, but on account of his well-known opposition to President Jackson was defeated. About the end of 1832 he removed to Philadelphia, where he was married Nov. 28, 1833, to Miss Sally L. Roberts. Here he resided the rest of his life, taking interest in public affairs and corresponding with distinguished men, but holding no office. In 1856 he read before the Historical Society of Pennsylvania a *History of the Ordinance of 1787*. He died at Philadelphia, July 7, 1868. Hon. E. B. Washburne has published a *Sketch of Edward Coles and of the Slavery Struggle of 1823-24* (Chicago, 1882).

COLEUS, a genus of plants of the labiate order, embracing some fifty species, mostly herbaceous, or half-shrubby, though some of the kinds are of a

clearly shrubby habit of growth. These plants are natives of Africa, Arabia, India, the Malay Archipelago, the Solomon Islands, and other regions near that range. Two of the species, *C. barbatus* of Egypt and Arabia, and *C. aromaticus* of India, are used in those countries as deobstruents and remedies for cough, cramps, and asthma. Several species, such as *C. macragi* and *C. blumei*, and many varieties, are popular "foliage plants," their brilliantly colored leaves rendering them favorite plants for massing in beds or borders. The various kinds of Coleus are nearly all of very easy culture, and they are among the readiest of plants to propagate themselves by cuttings, even with very little attention on the part of the gardener. In Java the *Coleus tuberosus* is cultivated for the food its tubers supply.

COLFAX, SCHUYLER, an American statesman, seventeenth Vice-President of the United States, was born in New York, March 23, 1823. His grandfather, Gen. William Colfax, of New Jersey, was, at the close of the Revolutionary war, in command of Washington's famous Life-guards. In 1836 Schuyler removed with his mother and step-father, Mr. Matthews, to St. Joseph co., Ind., where he has ever since resided. In 1845 he established, at South Bend, the *St. Joseph Valley Register*, of which he was editor and proprietor till 1863. In 1847 he was chief secretary of the River and Harbor Convention at Chicago, and in 1848 was secretary of the Whig National Convention. In 1850 he was a member of the State Convention which formed a new Constitution for Indiana, and actively but unsuccessfully opposed the clause in it prohibiting colored persons from settling in the State. He was a Whig candidate for Congress in 1851, but was defeated; in 1852 he was again secretary of the Whig National Convention. He joined the Republican party at its formation in 1854, and was immediately elected to Congress, and continued by successive elections to represent his district until 1869. His speech on the "Conflict between Slavery and Freedom in Kansas," delivered in 1856, was circulated to the extent of a million copies. He was chosen Speaker of the House of Representatives in December, 1863, and during the civil war, and period of Southern reconstruction, exercised considerable influence on legislation. In 1865 he crossed the continent in a stage-coach, in company with some friends, in order to report to the public on the feasibility of a railroad to the Pacific, and to study the needs of the Pacific coast. He afterwards lectured on this subject throughout the country. While still Speaker of the House, he was in 1868 nominated and elected Vice-President on the ticket with Gen. Grant. He presided over the Senate until March, 1873, being the only person ever elected to preside over both branches of the American Congress. Towards the close of his term as Vice-President, the House of Representatives appointed a committee to investigate charges of corruption against members of the House in connection with the Credit Mobilier of America, a company which had constructed the Union Pacific Railroad. The report of the committee implicated several members in having received stock of the company under circumstances of impropriety. Among these was Mr. Colfax, who, however, strenuously denied having been involved in the business. The committee recommended no action in his case, as he was not then subject to the jurisdiction of the House, and none was taken. In 1873 Mr. Colfax retired from political life, and has since been prominent as a public lecturer.

COLLATERAL SECURITY is a term often used in modern commerce. Collateral security is a separate obligation like a bond, or negotiable bill of exchange, delivered by a debtor to his creditor to secure the payment of his own obligation, which is represented by an independent instrument. It stands by the side of the principal promise as an additional means for securing the payment of the debt. A great variety of obligations are given for this purpose. Obviously, such se-

curity means something beside an additional promise of the debtor. In the ordinary course of banking, when a customer pledges collateral, it is usual for the pledgor in his principal note to state what collateral securities have been deposited and the terms on which they may be sold and made otherwise available on default. Such a pledging of them does not affect the negotiability of the principal note. A great variety of instruments are pledged as collateral security, the chief of which are bonds, stocks, mortgages, notes, bills of exchange, bills of lading, and warehouse receipts. A very considerable body of law has grown up relating to these securities.

COLLEGES OF AMERICA. Of the colleges now existing in the United States 2 were founded in the seventeenth century, and 22 in the eighteenth. In the present century their multiplication has been rapid. Three were organized in the first decade, 7 in the second, 12 in the third, 25 in the fourth, 31 in the fifth, 71 in the sixth, 75 in the seventh, and 48 (estimate) in the eighth. The larger number of those established in this century are found west of the Hudson River.

For more than fifty years after its foundation, in 1636, Harvard was the only college in America. In it, therefore, is the history of the earliest period of collegiate education represented. It was established by a vote of the General Court of Massachusetts Bay, which agreed to give £400 towards its endowment. In 1638 this endowment was more than doubled by the bequest of John Harvard, who left half of his whole property and his entire library (about 300 volumes) to the college. The action of the General Court was only the representative action of the colonists. Of the 20,000 persons who landed in New England before 1643, it is estimated that more than 100 were graduates of either Oxford or Cambridge University. The large proportion of the 100 were residents of Massachusetts Bay. They were scattered through the score of towns among a population of perhaps 9000, from Hingham on the south to Down on the north, and to Springfield on the west. Although their poverty was great and their hardships severe, yet, possessed themselves of a liberal education, they determined that their children should enjoy a like privilege. The college they founded was similar to that with which they had been acquainted. It was unlike the University of Scotland, or of the continent. It was the college of the English university endowed with the rights of the university. It conferred degrees as well as gave instruction. The name college is, in general, according to American usage, synonymous with university. A university is usually only a college; but in certain cases the term university is more properly used to include the college and other schools, as professional, which are associated.

Colleges or universities are incorporated institutions.

The legal body bears different names, in different institutions, as trustees, overseers, fellows. It is a self-perpetuating body. It has to do with all the affairs of the institution, administrative and scholastic. In the government of many colleges is also associated another body, which is specially concerned with the election and dismissal of the officers of instruction. This body is chosen either by the alumni or by other electors representing those interested in the management. In certain colleges also, the governor, or other officers of the State, are *ex-officio* members of the governing boards. The relations of the State to the colleges in general is becoming less intimate. In not less than seventeen States, however, is established a university which is under the immediate supervision of public officers, and forms a part of the system of education.

The history of the course of study shows a constantly increasing number of subjects taught. Each college, with but few if any exceptions, demands either an examination or its equivalent, for admission. The conditions of admission in the seventeenth century were few. Latin was the chief requisite. To matriculate at Harvard it was necessary to know "so much Latin as was sufficient to understand Tully, or any classical author, and to make and speak true Latin, in prose and verse"—a knowledge which is at the present day not common even with graduates. The student was also required to be able to decline "perfectly the paradigms of the Greek nouns and verbs"—a smattering which the first year's course in the preparatory school may now give. The studies of the course, which at first covered only three years, remained substantially the same throughout the seventeenth century. In the first year they comprised "logic, physics, etymology, syntax, and practice on the principles of grammar;" in the second, "ethics, politics, prosody, and dialectics, practice of poesy and Chaldee;" and in the third, "arithmetic, geometry, astronomy, exercises in style, composition, epitome, both in prose and verse, Hebrew, and Syriac." History was also studied in the winter, and botany—such a science as then existed—in the summer. Rhetoric was also taught by lectures in every year, and each student was required to declaim once a month. Other exercises there were both of a literary and religious character. In the service of public prayer, conducted twice daily by the president, it was the rule that in the morning students should translate a portion of the Hebrew of the Old Testament into the Greek, and in the evening that they should render a portion of the English of the New Testament also into its original language. Each class was also required to study theology in a form probably not unlike that of the Westminster Catechism. The following tabular view represents the nature, and, to a degree, the method of conducting the studies of the college of the seventeenth century:

	CLASS.	8-9.	9-10.	10-11.	1-2.	2-3.	3-4.
Mon.	Freshmen	Logic & Physics.	.....	.....	Disputations.	.....	.....
	Junior-Sophisters .....	.....	Ethics, & Politics.	.....	.....	Disputations.	.....
	Senior-Sophisters .....	.....	.....	Arith. & Geom.	.....	.....	Disputations.
Tues.	Freshmen	Logic & Physics.	.....	.....	Disputations.	.....	.....
	Junior-Sophisters .....	.....	Ethics, Politics.	.....	.....	Disputations.	.....
	Senior-Sophisters .....	.....	.....	Arith. & Geom.	.....	.....	Disputations.
Wed.	Freshmen	{ Gr. Etymology	.....	.....	Gr. Grammar.	.....	.....
	Junior-Sophisters	{ and Syntax...	{ Gr. Prosody	.....	.....	{ Greek Poesy,	{ Gr. Compos'n,
	Senior-Sophisters .....	.....	{ and Dialects.	Greek Theory.	.....	{ Disputations.	{ Prose & Verse.
Thu.	Freshmen	Heb. Grammar...	.....	.....	Bible.	.....	.....
	Junior-Sophisters .....	.....	Chaldee.....	.....	.....	Ezra & Daniel.	.....
	Senior-Sophisters .....	.....	.....	Syriac.....	.....	.....	{ Trostius,
Fri.	Freshmen	Rhetoric.....	Declamations.	.....	.....	.....	{ New Test'm't.
	Junior-Sophisters .....	.....	"	.....	.....	.....	.....
	Senior-Sophisters .....	.....	"	.....	Vacant.....	Rhetoric.	.....
Sat.	Freshmen	{ Divinity Cate-	Commonplaces.	.....	History in	.....	.....
	Junior-Sophisters	{ chetical.	"	.....	Winter.	.....	.....
	Senior-Sophisters .....	.....	"	.....	Botany in	.....	.....
					Summer.		

In the first quarter of the eighteenth century the course of study was both enlarged and improved. Although the practice of speaking Latin had ceased, Virgil and Cicero had been introduced into the curriculum. The seniors were admitted to the study of astronomy, but had not advanced beyond the need of the arithmetic and geometry of the earlier period. At Harvard, also, Cæsar and Horace were not included in the course till about the middle of the century, and Terence and Homer came to form a part of it yet later. About the same time, the middle of the century, the officers of Yale College altered the relative importance of studies. Logic was made to give way to natural philosophy and mathematics. Conic sections, fluxions, surveying and navigation began to be taught. The most comprehensive scheme of study of any college of this century was that of the University of Pennsylvania. From its foundation in 1755 the scheme was most liberal. The course in mathematics was as extended as is now found in many institutions, and physics and chemistry occupied a large part of the last two years. In Greek the Iliad, Pindar, Thucydides, Epictetus and Plato; and in Latin Juvenal, Horace, Quintilian, Cicero's philosophical works, as well as his orations, formed the principal text-books. Toward the close of the century the course was in all colleges made yet more comprehensive, and assumed a form which with a few additions and improvements was retained the next forty years. Classical studies mainly occupied the first three years, and metaphysical the fourth. Arithmetic was a freshman study; algebra and other branches of mathematics were taught in the sophomore year. Much attention was paid to elocution. French began to be taught. In 1803 the conditions for admission to Harvard College had been so far increased that an examination in Dalzel's *Collectanea Græca Minora*, the Greek Testament, Sallust, Virgil, and Cicero's *Select Orations* was required. The grammar of the Latin and Greek, geography and arithmetic were also included among the requisites for entrance. For fifty years the changes in these requirements were slight. Since 1870, however, these requirements have been greatly raised, and in most colleges the candidate for the freshman class is examined in six or eight orations of Cicero, six books of the *Æneid*, three or four books of Xenophon's *Anabasis*, two or three books of the Iliad, in arithmetic, algebra, and plane geometry, besides the grammar of the Latin and the Greek, and several English studies. In a few institutions a knowledge of either elementary French or German, and of some science, as well as of some other minor subjects, is required; in other institutions the knowledge demanded covers a smaller field.

The expansion of the curriculum has kept pace with the expansion of the subjects of the entrance examinations. The enlargement of the course of instruction is the result to a considerable degree of the system of elective studies. The so-called elective system is a method by which a student is allowed to choose, to some extent, the subjects he pursues, yet is required to choose certain subjects. Perhaps the first institution to introduce the system was the University of Virginia, founded by Jefferson in 1819. Through the efforts chiefly of George Ticknor, Harvard in 1825-26 and 1826-27 permitted the student to elect about one-quarter of his work, with the exception of the first third of the freshman year. The range of electives indicates the breadth of the curriculum. In the first year it embraced Latin, Greek, and modern languages; in the second, these subjects and mathematics; in the third it was enlarged by the addition of Hebrew; and in the fourth, Greek, Latin, mathematics, chemistry, mineralogy, geology, and modern languages. The elective system continued for somewhat more than a score of years, and in 1856, after a gradual lessening of the number of optional studies, the order of required studies was restored. Since the year 1867, when the elective system was again introduced at Harvard, the

method has been adopted by many of the larger and more important colleges. The progress made in all departments of study, especially the physical sciences and philosophy, has seemed to render this expansion of the curriculum necessary. The system of required studies still prevails, however, in most institutions.

Many of the well-endowed colleges have since 1872 offered courses of study for graduates, and have recognized the pursuit of these studies with the granting of degrees. The degree of Master of Arts (A. M.) and of Doctor of Philosophy (Ph. D.) are thus conferred, although the former is still granted by some colleges in course three years after graduation, and the latter is given also as an honorary title. Instruction is given both to graduates and undergraduates by text-books and lectures. Examinations, either oral or written, are held frequently; examinations in writing have been generally introduced since 1860. Examinations for a degree were quite unknown before the first quarter of the present century.

The promotion of learning was not the only motive which influenced the founders of the early colleges. The Puritan college was a religious institution. Learning was fostered, remarks the author of *New England's First Fruits* (London, 1643), because we dreaded "to leave an illiterate ministry to the churches when our present ministers shall lie in the dust." And for the half century that America had only one college it was conducted as a school of theology. Its primary purpose was to train men for the ministry. A similar reason occasioned the foundation of William and Mary College, in Virginia, by the Episcopalians, in 1693. Yale, whose charter bears date 1701, was established by ten ministers, and the ecclesiastical motive was prominent. A chief design in the organization of the College of New Jersey (1746) was "to supply the church with learned and able ministers of the word." Many of the colleges founded in the present century were started as religious institutions. One purpose of the planting of Amherst in 1825 was the training of foreign missionaries. The ecclesiastical motive has been influential in the formation of Western colleges. Missionaries in the new States regard a college an essential instrument in their labor. Colleges in Ohio, Illinois, Iowa, Minnesota, and other States have been established with a design similar to that which ruled in the foundation of the early institutions. The State universities exhibit less of the ecclesiastical influence. Being a part of the public system of education, they adhere, in common with all other public institutions, only to the general principles of Christianity. From a selected list of American colleges it is seen that 76 are non-sectarian, 49 belong to the Methodist Church, 37 each to the Baptist and Roman Catholic, 33 to the Presbyterian, 15 each to the Congregational and Lutheran, 11 to the Christian, 9 to the Episcopal, 7 to the United Brethren, 6 to the Reformed, 5 to the Friends, 4 to the Universalist, and 1 each to the Seventh Day Advent and the New Church. The relation between the colleges and the denomination of the church they represent varies. In the case of certain denominations, especially those whose government is hierarchical, the college is a part of the denominational machinery, and is therefore directly controlled by the church. In the case of other bodies, as the Baptist and Congregational, the relation is one of general superintendency. Although most of the instructors are members of that branch of the church which the college peculiarly represents, religious tests are seldom exacted of professors. The president of a prominent college says that although we demand no creed of professors, "we should no more think of appointing to a post of instruction here an irreligious than we should an immoral man, or one ignorant of the topic he would have to teach." In the case of many State universities, too, the large majority of the instructors are communicant members of the churches.

The part that religion occupies in the general life of

a college also greatly varies. Religious societies of the students, holding devotional and literary meetings, exist in most institutions. A church is frequently connected with the college whose Sabbath services students are usually required to attend. Daily public prayers are customary, attendance on which is obligatory. The religious influence in many colleges is strong. More than one-half of all students are professing Christians, and the proportion of church members is much larger than at the opening of the century. "Revivals" are not infrequent. Yale College in its history has experienced thirty-six, resulting in at least twelve hundred conversions; Dartmouth nine, with two hundred and fifty conversions; and Amherst and Middlebury at least twelve each, which have in the case of the former resulted in four hundred conversions.

Being institutions for literary and religious culture, the discipline required in colleges is usually, in comparison with the penalties of the civil law, of a mild order. The discipline, however, prevailing for at least a hundred years after the establishment of the first college was severe. Corporal punishment was inflicted till near the middle of the eighteenth century. Professors exercised authority over the details of their scholars' conduct. The manner of speech and of behavior was prescribed. The relation of the students to each other was indicated with precision. The social distinctions of the community were introduced into the college. Freshmen were, in accordance with the English university custom, "fags" for their superiors. The history of colleges is marked by a constant lessening of the restrictions governing students. Offences most commonly prevailing against college law are absence from lectures, failure to maintain a certain grade of scholarship, and insults to lower classmen usually embraced under "hazing." The penalties are of various degrees of severity, the extreme being expulsion. Offences committed by students against public law are also usually punished by the college. Offences of any sort, however, are no more common in the college than in the general community.

For their pecuniary support colleges depend on investments and tuition fees. In 1881 the value of the grounds, buildings, and apparatus of three hundred and sixty-two colleges reporting to the Commissioner of Education was \$40,255,976. The amount of their productive funds was \$43,786,877, and the income from these funds \$2,618,008. The receipts from tuition aggregated \$2,080,450. The property possessed by colleges is usually the result of the gift of individuals. Some institutions have received funds from the States in which they are located, and all the older colleges have been thus aided. The State universities are mainly supported from the public chest, and tuition is free to residents of the State. The endowments of the early colleges were small. In the seventeenth century Harvard received in donations of money less than \$40,000, and the largest individual gift (excluding Harvard's) was only \$5,000.

Up to the date of the Revolution William and Mary was the wealthiest institution in America. It was more an English than an American college, its chancellors being the bishops of London, and its presidents the representatives of those bishops in Virginia; and "the king, lords and commons," as well as the colony itself, were generous in their offerings. Indeed, throughout the period that America was a British province, its colleges were the recipients of British aid. The University of Pennsylvania, Columbia (King's College), Brown University and the College of New Jersey received large donations. Dartmouth College, or its predecessor, "Moor's Indian Charity School," received from England near the time of its foundation about \$50,000. Scarcely a college established before the nineteenth century and now in successful operation failed to gain help from the mother-country. The reasons are plain. The colonists were poor. Englishmen were comparatively rich. The colleges were

founded to promote learning, and the desire for its promotion in America was strong among English scholars. They were founded to educate ministers, and churchman and non-conformist were anxious that clergymen should be well trained in the new world.

The wealth of colleges was largely increased between 1850 and 1882. In 1847, when Abbott Lawrence gave \$50,000 to Harvard, it was said to be "the largest amount ever given at any one time during the lifetime of the donor to any public institution in this country." Since 1860 the colleges have gained in wealth an amount more than equal to their entire valuation in that year. Over \$50,000,000 have been bestowed on educational institutions in the United States, and more than \$35,000,000 were donated between the years 1870 and 1880. In 1871 \$8,435,990 were given for all educational purposes; in 1872, to universities and colleges, \$6,282,461; in 1873, \$8,238,141; in 1874, \$1,845,354; in 1875, \$2,703,650; in 1876, \$2,743,248; in 1877, \$1,273,991; in 1878, \$1,389,633; in 1879, \$3,878,648; in 1880, \$2,666,571; and in 1881, \$4,601,069. The separate contributions varied from a few dollars to millions.

Gifts are made either for general purposes or for the endowment of professorships, the foundation of scholarships, and in aid of libraries and museums. The income attached to a professorship varies in annual value from perhaps a thousand to eight thousand dollars. Twenty-five hundred dollars is an average. Scholarships assigned to undergraduates are designed either as a reward for proficiency in college studies or as a means of pecuniary support; most frequently they are purposed to effect both objects. They seldom exceed three hundred dollars in value a year, and are usually between one hundred and two hundred. Nearly all colleges also offer pecuniary assistance to students in need. Scholarships or fellowships for graduates are designed to support the student while pursuing studies under the patronage of the college. They are similar to the foundations of the English universities bearing the same name. A few of them permit residence in Europe. They are held at the pleasure of the institution granting them, but seldom for more than three years.

For their support the colleges derive, in addition to the income from invested property, about two million dollars yearly from the fees for tuition. These fees do not exceed two hundred dollars for each student, and on average fall perhaps between fifty and seventy-five. In all colleges the income of the tuition-fees fails to meet the expenses of instruction and administration. Endowment is essential to their existence.

Among the most munificent benefactors of American colleges are George Peabody, Johns Hopkins, of Baltimore, who endowed the university bearing his name with three millions; Mrs. Valeria G. Stone, of Massachusetts, who distributed more than a million of dollars among various institutions; Asa Packer, the founder of Lehigh University; Ezra Cornell, the founder of Cornell University; Ario Pardee, who endowed certain departments of Lafayette College; John C. Green, who gave liberally to Princeton College; and Joseph E. Sheffield, who endowed the scientific school of Yale College. Large contributions and bequests to colleges were also made by Samuel Williston, of Amherst, Mass., W. H. Vanderbilt, of New York, Henry W. Towne, of Philadelphia, Amasa Stone and H. W. Case, of Cleveland, George I. Seney, of New York, Nathaniel Thayer, of Boston, and Alexander Agassiz. Matthew Vassar, Sophia Smith, and Henry F. Durant each founded a college for women, and Henry W. Sage made provision for the instruction of women in Cornell University.

Notwithstanding the endeavors of such benefactors, most colleges are compelled to struggle with inadequate endowment. In comparison, also, with the University of Oxford and that of Cambridge American colleges are poor. The Report of the Parliamentary Commissioners, published in 1874, the first comprehensive statement

of the property of these ancient corporations, showed that in 1871 their entire income was £754,000. The value of their property can hardly be estimated; a principal item is 319,718 acres of land. Trinity College, Cambridge, had in 1871 an income of £60,000, St. John's of £50,000, New of Oxford of £30,000, Merton of £17,500, and All Souls' of £18,000. The English universities depend for their income mainly on property, the American colleges on both property and tuition fees in about equal proportions.

Libraries and laboratories are regarded as essential to the equipment of the college. The increase of their number and size has kept pace with the increase of the number of volumes published and with the progress of the natural sciences.

John Harvard's bequest of his library of three hundred volumes is the foundation of the Harvard College Library—the largest of the class in the country—of two hundred thousand volumes and of two hundred thousand pamphlets. In 1732 Dean Berkeley sent to Yale College a thousand volumes, which, in the opinion of President Clap, formed "the finest collection of books which had ever been brought to America at one time." The number of volumes in all the college libraries in 1879 was 2,301,991. The increase in that year was 69,963. The libraries of students' societies contained 395,846 volumes. The use of books on the part of students has within ten years greatly increased. In some colleges professors specially reserve books for students. Independent investigation and study are thus promoted. Chemical laboratories, of greater or less completeness, have been established since the science of chemistry came to form a part of the curriculum. Physical laboratories are found in only a few institutions. It may be added that within the last score of years many colleges have built and equipped gymnasiums, affording opportunity for physical exercise.

The first women who received a college degree in this country were three graduates of Oberlin College in 1841. The majority of the colleges established since that time have admitted both sexes on equal terms. Nearly two-thirds of all colleges now admit both men and women. Colleges for women only, although few in number, have been founded and well endowed, of which Vassar at Poughkeepsie, N. Y.,

chartered in 1861, and Smith at Northampton, Mass., organized in 1875, are prominent. Strenuous efforts are being made to open institutions to women originally designed for men.

Among those who have had great influence upon college education are Clap, president of Yale College, 1739-66; Dwight, president, 1795-1817; Kirkland, president of Harvard, 1810-28; Quincy, president, 1829-45; Nott, president of Union College, N. Y., for sixty-two years, 1804-66; Wayland, president of Brown University, 1827-55; and Stearns, president of Amherst, 1854-76.

The proportion of graduates to the whole population has slightly decreased. In 1879 there were 31,555 students in 364 colleges, taught by 3506 instructors. About one-sixth of these students were women. The number of graduates entering the different professions has greatly changed in the nearly two and a half centuries since the first college was founded. More than half of the graduates of the early colleges became clergymen. Of the same colleges hardly ten per cent. of graduates now choose the clerical profession. The legal profession is adopted by more graduates of the colleges of New England and the Middle States than any other. A large proportion of the graduates of the denominational institutions of the West, however, become ministers.

The age of admission to the college has constantly risen throughout the century. It is a rule in most institutions that no student shall be admitted to the freshman class under fourteen years, and to no other class without an additional increase of one year for each class. At Harvard College the average age of admission is now slightly more than eighteen and one-half years. Since 1856 it has risen nearly one year.

To form a correct list of American colleges has been often attempted. The difficulty lies in the constant changes of birth and dissolution affecting many institutions bearing the name. The following table, composed of selections from various tables in the last Report of the Commissioner of Education, presents a select list of colleges, with the most important facts concerning each. Colleges marked with an asterisk (*) are open to both sexes, those with a dagger (†) to women only, and the rest to men only.

Name.	Location.	Date of Charter.	Denomination.	Students.	Teachers.	Volumes in Library.	Value of Grounds, etc.	Income from Productive Funds.
Southern University.....	Greensboro, Ala.....	1856	Meth. Epis. South.....	62	6	1,000	\$50,000	
Spring Hill College.....	Near Mobile, Ala.....	1836	Roman Catholic.....	111	28			
University of Alabama*.....	Tuscaloosa, Ala.....	1820	Non-sectarian.....	158	16	7,000	250,000	\$24,000
Arkansas College*.....	Batesville, Ark.....	1872	Presbyterian.....	34	5	700	12,000	400
Arkansas Industrial University*.....	Fayetteville, Ark.....	1871	Non-sectarian.....	161	17	800		
Judson University*.....	Judsonia, Ark.....	1871	Baptist.....	64	5	460	50,000	
St. John's College of Arkansas*.....	Little Rock, Ark.....	1850	Non-sectarian.....	53	11	250	75,000	2,500
Missionary College of St. Augustine.....	Benicia, Cal.....	1868	Prot. Episcopal.....	45	5	650	40,000	
University of California*.....	Berkeley, Cal.....	1868	Non-sectarian.....	189	38	15,624	695,000	102,688
Pierce Christian College*.....	College City, Cal.....	1871	Christian.....	77	6		10,000	
St. Ignatius College.....	San Francisco, Cal.....	1859	Roman Catholic.....	62	24	10,000		
St. Mary's College.....	San Francisco, Cal.....	1872	Roman Catholic.....	119	25	1,000	250,000	
Santa Clara College.....	Santa Clara, Cal.....	1851	Roman Catholic.....	57	10	10,000	57,200	
University of the Pacific*.....	Santa Clara, Cal.....	1851	Meth. Episcopal.....	68	12	2,000	75,000	3,000
California College*.....	Vacaville, Cal.....	1870	Baptist.....	59	4			
Washington College*.....	Washington, Cal.....	1871	Non-sectarian.....	79	6			
Hesperian College*.....	Woodland, Cal.....	1869	Christian.....	73	5		20,000	2,500
University of Colorado*.....	Boulder, Col.....	1875	Non-sectarian.....	10	5	2,000	75,000	15,000
Colorado College*.....	Colorado Springs, Col.....	1874	Congregational.....	39	8	200	30,000	
Trinity College.....	Hartford, Conn.....	1824	Prot. Episcopal.....	101	8	18,275		
Wesleyan University*.....	Middletown, Conn.....	1830	Meth. Episcopal.....	164	16	30,000	450,000	
Yale College.....	New Haven, Conn.....	1701	Non-sectarian.....	695	30	93,000		77,580
Delaware College.....	Newark, Del.....	1867	Non-sectarian.....	50	5	6,500	75,000	4,980
University of Georgia*.....	Athens, Ga.....	1785	Non-sectarian.....	176	9	14,000	173,000	11,396
Atlanta University*.....	Atlanta, Ga.....	1867	Non-sectarian.....	26	6	4,000	100,000	300
Bowdon College*.....	Bowdon, Ga.....	1857	Non-sectarian.....	78	4		8,000	
Gainesville College*.....	Gainesville, Ga.....	1873	Non-sectarian.....	34	8	213	10,000	
Mercer University†.....	Macon, Ga.....	1837	Baptist.....	107	6	6,000	150,000	7,000
Pio Nono College†.....	Macon, Ga.....	1876	Roman Catholic.....	45	4	1,100	50,000	
Emory College.....	Oxford, Ga.....	1836	Meth. Epis. South.....	136	8	3,500	100,000	
Abingdon College*.....	Abingdon, Ill.....	1855	Christian.....	11		300	40,000	500
Hedding College.....	Bloomington, Ill.....	1873	Meth. Episcopal.....	56	12	3,000	75,000	
Illinois Wesleyan University*.....	Bourbonnais Grove, Ill.....	1850	Methodist.....	94	9		100,000	5,000
St. Viator's College.....	Carlinville, Ill.....	1874	Roman Catholic.....	53	12	2,500	60,000	800
Blackburn University*.....	Carthage, Ill.....	1857	Presbyterian.....	69	7	3,000	90,000	8,000
Carthage College*.....	Chicago, Ill.....	1870	Lutheran.....	83	6		40,000	3,200
St. Ignatius College.....	Chicago, Ill.....	1870	Roman Catholic.....	38	7	12,000		

	Location.	Date of Charter.	Denomination.	Students.	Teachers.	Volumes in Library.	Value of Grounds, etc.	Income from Productive Funds.
University of Chicago*	Chicago, Ill.	1859	Baptist.....	157	10	6,000	\$255,000	\$60
Eureka College*	Eureka, Ill.	1855	Christian.....	96	6	1,000	50,000	1,500
Northwestern University*	Evanston, Ill.	1851	Methodist Episcopal..	173	10	30,000	300,000	20,000
Ewing College*	Ewing, Ill.	1874	Baptist.....	32	6	25	10,000	100
Knox College*	Galesburg, Ill.	1837	Non-sectarian.....	92	15	4,000	121,900	10,000
Lombard University*	Galesburg, Ill.	1851	Universalist.....	23	5	3,835	40,000	8,000
Illinois College.....	Jacksonville, Ill.	1835	Non-sectarian.....	87	9	8,000	100,000	8,000
Lake Forest University*	Lake Forest, Ill.	1856	Presbyterian.....	63	8	4,000	150,000	14,000
McKendree College*	Lebanon, Ill.	1834	Methodist Episcopal..	89	8	7,500	54,000	2,500
Lincoln University*	Lincoln, Ill.	1865	Cumberland Presb....	199	11	16,000	180,000	30,000
Evangelisch-Lutherisches Collegium..	Mendota, Ill.	.....	Lutheran.....	17	4	300	2,400	
Monmouth College*	Monmouth, Ill.	1857	United Presbyterian..	152	8	2,000	55,000	4,000
Mt. Morris College*	Mt. Morris, Ill.	.....	Brethren.....	205	7	28,000	40,000	
Northwestern College*	Naperville, Ill.	1865	Evangelical.....	72	6	.....	50,000	7,000
Augustana College.....	Rock Island, Ill.	1865	Evang. Lutheran.....	63	.....	6,460	50,600	
Shurtleff College*	Upper Alton, Ill.	1832	Baptist.....	58	8	5,000	40,000	6,000
Westfield College*	Westfield, Ill.	1865	United Brethren.....	12	5	9,500	45,000	2,000
Wheaton College*	Wheaton, Ill.	1861	Non-sectarian.....	44	12	2,500	84,250	3,370
Bedford College*	Bedford, Ind.	1872	Christian.....	15	5	250	15,000	
Indiana University*	Bloomington, Ind.	1828	Non-sectarian.....	162	10	7,250	100,000	8,000
Wabash College.....	Crawfordsville, Ind.	1834	Presbyterian.....	96	11	18,300	150,000	17,000
Concordia College.....	Fort Wayne, Ind.	1850	Evang. Lutheran.....	135	7	3,000	100,000	
Franklin College*	Franklin, Ind.	1844	Baptist.....	28	7	3,100	40,000	4,000
Indiana Asbury University*	Greencastle, Ind.	1837	Methodist Episcopal..	185	14	10,000	200,000	12,000
Hanover College.....	Hanover, Ind.	1833	Presbyterian.....	57	7	5,000		
Hartsville University*	Hartsville, Ind.	1851	United Brethren.....	81	6	900	30,000	1,200
Butler University*	Irvington, Ind.	1850	Christian.....	82	12	2,000	150,000	12,000
Union Christian College*	Merom, Ind.	1859	Christian.....	24	8	725	50,000	4,800
Moore's Hill College*	Moore's Hill, Ind.	1856	Methodist Episcopal..	47	6	500	30,000	1,200
Earlham College*	Richmond, Ind.	1859	Friends.....	41	5	2,370	76,000	4,200
Ridgeville College*	Ridgeville, Ind.	1867	Free-Will Baptist.....	14	5	.....	30,000	1,500
St. Meinrad's College.....	St. Meinrad, Ind.	1867	Roman Catholic.....	72	15	5,000	15,000	6,750
Amity College*	College Springs, Iowa.	1853	Non-sectarian.....	175	5	500	10,000	2,000
Griswold College.....	Davenport, Iowa.	1859	Protestant Episcopal..	22	7	6,000	127,000	
Norwegian Lutheran College.....	Decorah, Iowa.	1866	Lutheran.....	88	8	3,200	100,000	
University of Des Moines*	Des Moines, Iowa.	1865	Baptist.....	13	4	2,000	.....	2,000
Parsons College*	Fairfield, Iowa.	1875	Presbyterian.....	37	8	1,000	27,000	2,500
Upper Iowa University*	Fayette, Iowa.	1860	Methodist Episcopal..	30	7	1,500	35,000	600
Iowa College*	Grimnell, Iowa.	1847	Congregational.....	.....	.....	.....	78,900	7,768
Simpson Centenary College*	Indianola, Iowa.	1867	Methodist Episcopal..	58	5	1,000	20,000	3,000
State University of Iowa*	Iowa City, Iowa.	1847	Non-sectarian.....	247	16	13,000	400,000	20,000
German College*	Mt. Pleasant, Iowa.	1873	Methodist Episcopal..	17	5	300	17,000	1,500
Iowa Wesleyan University*	Mt. Pleasant, Iowa.	1855	Methodist.....	87	10	1,500	41,000	4,000
Cornell College*	Mt. Vernon, Iowa.	1857	Methodist Episcopal..	91	9	4,600	100,000	4,000
Oskaloosa College*	Oskaloosa, Iowa.	1857	Christian.....	26	7	1,200	50,000	1,600
Penn College*	Oskaloosa, Iowa.	1873	Friends.....	36	5	1,500	33,000	400
Central University of Iowa*	Pella, Iowa.	1853	Baptist.....	42	11	2,000	40,000	
Whittier College.....	Salem, Iowa.	1867	Friends.....	21	.....	600		
Tabor College*	Tabor, Iowa.	1866	Congregational.....	73	8	4,000	20,000	2,500
Western College*	Western, Iowa.	1856	United Brethren.....	41	5	1,100	3,500	1,200
St. Benedict's College.....	Atchison, Iowa.	1868	Roman Catholic.....	25	7	3,075		
Baker University*	Baldwin City, Iowa.	1858	Methodist Episcopal..	34	8	1,000		
Highland University*	Highland, Kan.	1858	Presbyterian.....	12	5	5,000	25,000	
University of Kansas*	Lawrence, Kan.	1863	Non-sectarian.....	197	14	3,800	395,500	7,000
Lane University*	Lecompton, Kan.	1862	United Brethren.....	26	4	200	10,000	1,000
St. Mary's College.....	St. Mary's, Kan.	1869	Roman Catholic.....	63	16	5,000	75,000	
Washburn College*	Topeka, Kan.	1865	Congregational.....	16	4	4,000	60,000	4,000
St. Joseph's College.....	Bardstown, Ky.	1824	Roman Catholic.....	84	17			
Berea College*	Berea, Ky.	1865	Non-sectarian.....	42	12	2,000	120,000	
Cecilian College.....	Cecilian, Ky.	1867	Roman Catholic.....	6	10	500	20,000	
Centre College.....	Danville, Ky.	1819	Presbyterian.....	92	6	4,296	70,500	8,830
Eminence College*	Eminence, Ky.	1856	Christian.....	83	10	1,600	20,000	
Kentucky Military Institute.....	Farmdale, Ky.	1845	Non-sectarian.....	163	7	4,000	100,000	
Georgetown College.....	Georgetown, Ky.	1829	Baptist.....	97	6	8,000	50,000	
Kentucky University.....	Lexington, Ky.	1858	.....	66	3	11,400	130,000	10,000
Kentucky Wesleyan College.....	Millersburg, Ky.	1860	Methodist.....	78	5	1,000	50,000	
Murray Male and Female Institute*..	Murray, Ky.	1870	Non-sectarian.....	100	5	.....	16,000	
Concord College*	New Liberty, Ky.	1868	Baptist.....	96	3	200	12,000	
Kentucky Classical and Business Coll.*	North Middletown, Ky.	1878	Christian.....	104	17	.....	20,000	
Bethel College.....	Russellville, Ky.	1856	Baptist.....	90	6	1,000	40,000	3,500
Louisiana State University and Agri- cultural and Mechanical College*..	Baton Rouge, La.	{1853 1874}	Non-sectarian.....	122	4	14,000	278,400	19,488
Jefferson College (St. Mary's).....	Convent, La.	1861	Roman Catholic.....	65	15	30,000	100,000	
St. Charles College.....	Grand Coteau, La.	1852	Roman Catholic.....	15	3	5,000	30,000	
Centenary College of Louisiana.....	Jackson, La.	1825	Meth. Epis., South....	36	3	3,000	80,000	
New Orleans University*	New Orleans, La.	1873	Methodist Episcopal..	23	4	500	7,000	
Straight University*	New Orleans, La.	1869	Congregational.....	16	7	300	23,000	
Bowdoin College.....	Brunswick, Me.	1794	Congregational.....	140	20	19,500	400,000	14,050
Bates College*	Lewiston, Me.	1854	Free-Will Baptist....	143	7	5,537	150,000	7,500
Colby University*	Waterville, Me.	1820	Baptist.....	157	8	15,800	150,000	12,000
St. John's College.....	Annapolis, Md.	1784	Non-sectarian.....	63	9	5,000	65,000	
Baltimore City College.....	Baltimore, Md.	.....	Non-sectarian.....	579	13	.....	150,000	
Johns Hopkins University.....	Baltimore, Md.	1867	Non-sectarian.....	123	.....	7,084	.....	180,000
Loyola College.....	Baltimore, Md.	1853	Roman Catholic.....	85	15	15,000	75,000	
Washington College.....	Chester town, Md.	1782	Non-sectarian.....	41	3	1,400	40,500	1,734
Rock Hill College.....	Ellicott City, Md.	1865	Roman Catholic.....	44	18	4,000		
St. Charles College.....	Ellicott City, Md.	1831	Roman Catholic.....	109	14	5,000		
Frederick College.....	Frederick, Md.	1829	Non-sectarian.....	46	3	3,000	15,000	
Western Maryland College*	Westminster, Md.	1868	Methodist Protestant..	71	12	4,000	35,000	
Amherst College.....	Amherst, Mass.	1825	Congregational.....	350	19	35,660	400,000	20,000
Boston College.....	Boston, Mass.	1863	Roman Catholic.....	238	14	12,000	400,000	
Boston University*	Boston, Mass.	1869	Methodist Episcopal..	127	16	.....	.....	105,569†
Harvard College.....	Cambridge, Mass.	1650	Non-sectarian.....	879	52	182,500	1,020,362	
Tufts College.....	College Hill, Mass.	1852	Universalist.....	92	12	19,000	250,000	37,000
Williams College.....	Williamstown, Mass.	1793	Congregational.....	206	13	19,000	250,000	18,000
Wellesley College†.....	Wellesley, Mass.	.....	Non-sectarian.....	323	31	21,000		
College of the Holy Cross.....	Worcester, Mass.	1865	Roman Catholic.....	91				
Smith College†.....	Northampton, Mass.	1870	Non-sectarian.....	205	22	2,000	300,000	30,000
Adrian College*	Adrian, Mich.	1859	Methodist Protestant..	95	10	400	137,000	6,000
Albion College*	Albion, Mich.	1860	Methodist Protestant..	140	11	2,500	50,000	12,200

† Total receipts, exclusive of those of certain professional schools.

COLLEGES OF AMERICA.

	Location.	Date of Charter.	Denomination.	Students.	Teachers.	Volumes in Library.	Value of Grounds, etc.	Income from Productive Funds.
University of Michigan*	Ann Arbor, Mich.....	1836	Non-sectarian.....	521	35	29,000	\$800,000	\$38,000
Battle Creek College*	Battle Creek, Mich.....	1874	Seventh-Day Advent.	150	11	1,000	80,000	
Hillsdale College*	Hillsdale, Mich.....	1855	Free-Will Baptist....	135	18	7,000	125,000	8,000
Hope College.....	Holland, Mich.....	1866	Reformed.....	50	6	4,500	43,000	4,024
Kalamazoo College*	Kalamazoo, Mich.....	1855	Baptist.....	34	8	3,300	100,000	3,790
Olivet College*	Olivet, Mich.....	1859	Cong. and Presb.....	83	12	7,000	111,700	7,732
St. John's College.....	Collegeville, Minn.....	1857	Roman Catholic.....	76	20			
University of Minnesota*	Minneapolis, Minn.....	1868	Non-sectarian.....	130	18	13,000	200,000	26,998
Carleton College*	Northfield, Minn.....	1866	Congregational.....	52	11	4,024	79,952	7,022
Shaw University*	Holly Springs, Miss.....	1870	Methodist Episcopal..	20	6	600	10,000	
University of Mississippi*	Oxford, Miss.....	1844	Non-sectarian.....	169	11		300,000	32,643
Alcorn University*	Rodney, Miss.....	1871	Non-sectarian.....	20	4	175	60,000	
Christian University*	Canton, Mo.....	1853	Christian.....	98	9			
St. Vincent's College.....	Cape Girardeau, Mo.....	1843	Roman Catholic.....	73	11	3,000	60,000	
University of the State of Missouri*	Columbia, Mo.....	1839	Non-sectarian.....	514	31	11,925		14,567
Central College*	Fayette, Mo.....	1855	Meth. Epis. South.....	155	7	1,200	50,000	4,800
Lincoln College*	Glenwood, Mo.....	1870	United Presbyterian..	15	2	300	2,500	
La Grange College.....	La Grange, Mo.....	1858	Baptist.....	96	8	1,500	20,000	
William Jewell College.....	Liberty, Mo.....	1849	Baptist.....	90	7	3,500	75,000	5,000
College of the Christian Brothers.....	St. Louis, Mo.....	1855	Roman Catholic.....	50	18	30,000	75,000	
St. Louis University.....	St. Louis, Mo.....	1832	Roman Catholic.....	197	26	20,000		
Washington University*	St. Louis, Mo.....	1853	Non-sectarian.....	73	15	6,000	500,000	30,000
Stewartsville College*	Stewartsville, Mo.....	1879	Non-sectarian.....	45	4	150	500	30
Drury College*	Springfield, Mo.....	1873	Congregational.....	91	10	5,000	50,000	
Central Wesleyan College*	Warrenton, Mo.....	1865	Methodist Episcopal..	62	6	2,700	35,000	2,000
Doane College*	Crete, Neb.....	1872	Congregational.....	23	6	1,000	25,000	2,970
University of Nebraska*	Lincoln, Neb.....	1869	Non-sectarian.....	90	10	2,700	150,000	
Dartmouth College.....	Hanover, N. H.....	1769	Congregational.....	215	14	55,000	100,000	25,000
St. Benedict's College.....	Newark, N. J.....		Roman Catholic.....	49	5	900		
Rutgers College.....	New Brunswick, N. J.....	1770	Non-sectarian.....	123	13	7,750	400,000	21,729
College of New Jersey.....	Princeton, N. J.....	1748	Presbyterian.....	417	25	47,000	800,000	60,000
Seton Hall College.....	South Orange, N. J.....	1861	Roman Catholic.....	53	10			
Alfred University*	Alfred, N. Y.....	1857		86	16		111,000	6,384
St. Bonaventure's College.....	Allegany, N. Y.....	1875	Roman Catholic.....	90	10	5,500	192,000	
St. Stephen's College.....	Annandale, N. Y.....	1860	Protestant Episcopal..	52	6	2,500	150,000	
Wells College.....	Aurora, N. Y.....	1868	Presbyterian.....	18	9	2,000	265,000	7,000
Brooklyn Collegiate and Polytechnic Institute.....	Brooklyn, N. Y.....	1854	Non-sectarian.....	154	12	2,122	144,856	646
St. John's College.....	Brooklyn, N. Y.....	1873	Roman Catholic.....	129	10			
Canisius College.....	Buffalo, N. Y.....		Roman Catholic.....	154	14	12,000		
St. Joseph's College.....	Buffalo, N. Y.....		Roman Catholic.....	14	10	2,090	110,000	
St. Lawrence University*	Canton, N. Y.....	1856	Universalist.....	44	7	8,537	37,500	5,309
Hamilton College.....	Clinton, N. Y.....	1812	Presbyterian.....	162	13	12,000	320,000	18,000
Elmira Female College.....	Elmira, N. Y.....	1855	Presbyterian.....	72		1,000	140,000	
St. John's College.....	Fordham, N. Y. (New York City).....	1846	Roman Catholic.....	52	10		375,000	
Hobart College.....	Geneva, N. Y.....	1825	Protestant Episcopal..	67	8	13,000	91,650	15,058
Madison University.....	Hamilton, N. Y.....	1846	Baptist.....	88	10	11,000	150,000	29,340
Cornell University*	Ithaca, N. Y.....	1865	Non-sectarian.....	167	42	36,712	665,952	77,182
College of St. Francis Xavier.....	New York, N. Y.....	1861	Roman Catholic.....	128	8	16,000	228,000	
College of the City of New York.....	New York, N. Y.....	1847	Non-sectarian.....	499	15	19,000	271,147	
Columbia College.....	New York, N. Y.....	1754	Protestant Episcopal..	279	18	19,613	860,000	240,000
Manhattan College.....	New York, N. Y.....	1863	Roman Catholic.....	106	14		173,000	
Rutgers Female College.....	New York, N. Y.....	1867	Non-sectarian.....	32	11			
St. Louis College.....	New York, N. Y.....		Roman Catholic.....	39				
University of the City of New York.....	New York, N. Y.....	1830	Non-sectarian.....	144	63	3,501	328,000	12,350
Vassar College.....	Poughkeepsie, N. Y.....	1861	Non-sectarian.....	222	11	13,103	696,562	19,116
University of Rochester.....	Rochester, N. Y.....	1850	Baptist.....	155	9	16,750	396,279	11,274
Union College.....	Schenectady, N. Y.....	1795	Non-sectarian.....	31	31	24,000	430,000	34,054
Syracuse University*	Syracuse, N. Y.....	1870	Methodist Episcopal..	133	10	7,800	300,000	2,246
University of North Carolina.....	Chapel Hill, N. C.....	1789	Non-sectarian.....	211	12	6,800	250,000	7,750
Biddle University.....	Charlotte, N. C.....	1877	Presbyterian.....	25	4	2,500	18,000	660
Davidson College.....	Davidson College, N. C.....	1837	Presbyterian.....	101	6	2,500	125,000	6,000
Rutherford College*	Happy Home, N. C.....	1871	Non-sectarian.....	250	4	5,000	8,000	
North Carolina College.....	Mt. Pleasant, N. C.....	1859	Evang. Lutheran.....	13	4	1,143	15,000	
Shaw University.....	Raleigh, N. C.....		Baptist.....	75	16	2,000		
Trinity College.....	Trinity College, N. C.....	1851	Meth. Epis. South.....	114	6	2,000	40,000	
Wake Forest College.....	Wake Forest College, N. C.....	1833	Baptist.....	117	7	7,000	50,000	3,000
Buchtel College*	Akron, Ohio.....	1870	Universalist.....	46	6		175,000	2,460
Ashland College*	Ashland, Ohio.....	1878	Brethren.....	98	6	500	75,000	
Ohio University*	Athens, Ohio.....	1804	Non-sectarian.....	48	6		130,000	4,282
Baldwin University*	Berea, Ohio.....	1846	Methodist Episcopal..	125	10	1,500	25,000	2,500
German Wallace College*	Berea, Ohio.....	1864	Methodist Episcopal..	60	6	500	107,000	4,000
St. Joseph's College.....	Cincinnati, Ohio.....	1873	Roman Catholic.....	155	9	1,000	40,000	
St. Xavier College.....	Cincinnati, Ohio.....	1831	Roman Catholic.....	58	15	12,000		
University of Cincinnati*	Cincinnati, Ohio.....	1870	Non-sectarian.....	104	10	146,013		
Farmer's College*	College Hill, Ohio.....	1846	Non-sectarian.....	15	6	800	25,000	4,200
Capital University.....	Columbus, Ohio.....	1850	Evang. Lutheran.....	28	6	3,700	75,000	
Kenyon College.....	Gambier, Ohio.....	1824	Protestant Episcopal..	43	8	22,000		6,300
Denison University.....	Granville, Ohio.....	1832	Baptist.....	39	6	10,000	125,000	12,000
Ohio Wesleyan University*	Delaware, Ohio.....	1842	Methodist Episcopal..	249	19	10,000	252,000	32,889
Rio Grande College*	Rio Grande, Ohio.....	1875	Free-Will Baptist.....	10	4	120	40,000	
Hiram College*	Hiram, Ohio.....	1867	Disciples.....	163	10	1,000	23,586	4,000
Western Reserve College*	Hudson, Ohio.....	1826	Presb. and Cong.....	68	8	11,000	100,000	16,000
Marietta College.....	Marietta, Ohio.....	1835	Non-sectarian.....	71	9	16,500	130,000	
Mt. Union College*	Mt. Union, Ohio.....	1858	Non-sectarian.....	278	19		500,000	
Franklin College*	New Athens, Ohio.....	1825	Presbyterian.....	35	7		10,000	
Muskingum College*	New Concord, Ohio.....	1837	United Presbyterian..	89	8	500	16,000	500
Oberlin College*	Oberlin, Ohio.....	1833	Congregational.....	324	12	15,000	400,000	9,985
Miami Valley College*	Springboro', Ohio.....	1875	Friends.....	11	5		75,000	
Wittenberg College*	Springfield, Ohio.....	1845	Evang. Lutheran.....	81	6	1,300	100,000	7,000
Heidelberg College*	Tiffin, Ohio.....	1851	Reformed.....	80	6	5,000	30,000	4,500
Urbana University.....	Urbana, Ohio.....	1851	New Church.....	8	4	5,000	41,500	4,000
Otterbien University*	Westerville, Ohio.....	1847	United Brethren.....	76	6	2,500	75,000	5,000
Wilberforce University*	Wilberforce, Ohio.....	1863	African Meth. Epis...	4	7	4,000		980
Wilmington College*	Wilmington, Ohio.....	1875	Friends.....	43	5	1,000	12,000	400
University of Wooster*	Wooster, Ohio.....	1866	Presbyterian.....	185	14	5,200	150,000	8,120
University of Oregon*	Eugene City, Oregon.....	1876	Non-sectarian.....	83	5		80,000	4,000
Pacific University and Tualatin Academy*	Forest Grove, Oregon.....	1854	Evangelical.....	12	5	5,000	12,000	6,000
Christian College*	Monmouth, Oregon.....	1865	Christian.....	100	4	200	30,000	1,500
Philomath College*	Philomath, Oregon.....	1865	United Brethren.....	43	2	850	16,000	1,700
Willamette University*	Salem, Oregon.....	1853	Methodist Evang.....	14		2,500	75,000	

	Location.	Date of Charter.	Denomination.	Students.	Teachers.	Volumes in Library.	Value of Grounds, etc.	Income from Productive Funds.
Muhlenberg College.....	Allentown, Pa.....	1867	Evang. Lutheran.....	66	7	2,000	\$75,000	
Lebanon Valley College*.....	Annaville, Pa.....	1866	United Brethren.....	44	5	1,400		
St. Vincent's College.....	Beatty, Pa.....	1870	Roman Catholic.....	113	33	14,000	104,000	
Dickinson College.....	Carlisle, Pa.....	1783	Methodist Episcopal..	66	7	7,974	350,000	12,000
Lafayette College.....	Easton, Pa.....	1826	Presbyterian.....	163	23	18,980	60,000	13,500
Pennsylvania College.....	Gettysburg, Pa.....	1832	Evang. Lutheran.....	87	8	8,000	100,000	6,900
Thiel College*.....	Greenville, Pa.....	1870	Evang. Lutheran.....	38	4	4,000		
Haverford College.....	Haverford College, Pa.....	1832	Friends.....	72	6	8,200	375,000	
Franklin and Marshall College.....	Lancaster, Pa.....	1853	Reformed.....	87	7	5,000	150,000	7,000
Lewisburg University.....	Lewisburg, Pa.....	1846	Baptist.....	44	7	8,000	100,000	6,000
Lincoln University.....	Lincoln Univ., Chester Co., Pa.....	1854	Non-sectarian.....	43	6	4,000	138,000	5,464
St. Francis College.....	Loretto, Pa.....	1858	Roman Catholic.....	53	12		30,000	
Allegheny College*.....	Meadville, Pa.....	1817	Methodist Episcopal..	110	8	10,000	300,000	10,500
Mercersburg College*.....	Mercersburg, Pa.....	1865	Reformed.....	32	7	600	50,000	580
Westminster College*.....	New Wilmington, Pa.....	1852	United Presbyterian..	119	8	3,000	26,500	5,000
La Salle College.....	Philadelphia, Pa.....	1863	Roman Catholic.....	62	10	1,000	80,000	
University of Pennsylvania.....	Philadelphia, Pa.....	1755	Non-sectarian.....	135	33	20,000	500,000	30,500
Pittsburg Catholic College.....	Pittsburg, Pa.....		Roman Catholic.....	100	7			
Western University of Pennsylvania.....	Pittsburg, Pa.....	1819	Non-sectarian.....	66	12	3,500	150,000	11,327
Lehigh University.....	South Bethlehem, Pa.....	1866	Protestant Episcopal..	78	10	14,600	600,000	76,000
Swarthmore College*.....	Swarthmore, Pa.....	1864	Friends.....	118	9	3,521	600,000	4,800
Washington and Jefferson College.....	Washington, Pa.....	1802	Presbyterian.....	138	8		125,000	11,000
Waynesburg College*.....	Waynesburg, Pa.....	1850	Cumberland Presb....	117	6	900	30,000	
Brown University.....	Providence, R. I.....	1764	Non-sectarian.....	271	17	52,000		35,838
College of Charleston.....	Charleston, S. C.....	1785	Non-sectarian.....	31	6	9,000	50,000	
Ersine College.....	Due West, S. C.....	1841	Asso. Ref. Presb.....	53	5	1,500	40,000	4,600
Furman University.....	Greenville, S. C.....	1850	Baptist.....	78	4	1,200	50,000	8,000
Newberry College.....	Newberry, S. C.....	1856	Evang. Lutheran.....	45	7	5,000	25,000	500
Claffin University and South Carolina Agricultural College and Mechanics' Institute.....	Orangeburg, S. C.....	{ 1869 1872 }	Methodist Episcopal..	14	5	1,200	40,000	
Wofford College.....	Spartanburg, S. C.....	1851	Meth. Epis. South....	66	8	5,000		4,500
Adger College.....	Walhalla, S. C.....	1877	Presbyterian.....	41	4		5,000	2,100
East Tennessee Wesleyan University*.....	Athens, Tenn.....	1867	Methodist Episcopal..	118	7	2,000	15,000	
Beech Grove College*.....	Beech Grove, Tenn.....	1869	Non-sectarian.....	20	5	125	6,000	
King College.....	Bristol, Tenn.....	1868	Presbyterian.....	29	4		13,000	1,000
Southwestern Presbyterian University.....	Clarksville, Tenn.....	1875	Presbyterian.....	76	6	1,800		6,000
Hiwassee College.....	Hiwassee College, Tenn.....	1850	Meth. Epis. South....	218	8		25,000	
Southwestern Baptist University.....	Jackson, Tenn.....	1874	Baptist.....	156	9	1,189	60,000	3,200
University of Tennessee and State Agricultural College.....	Knoxville, Tenn.....	{ 1807 1869 }	Non-sectarian.....	125	14	4,460	100,000	24,210
Cumberland University.....	Lebanon, Tenn.....	1842	Cumberland Presb....	40	5	8,000	50,000	
Bethel College*.....	McKenzie, Tenn.....	1850	Cumberland Presb....	106	4	497	15,000	
Manchester College*.....	Manchester, Tenn.....	1856	Non-sectarian.....	27	2		5,000	
Maryville College*.....	Maryville, Tenn.....	1842	Presbyterian.....	21	4	3,000	75,000	318
Christian Brothers' College.....	Memphis, Tenn.....	1872	Roman Catholic.....	62	10	2,500		
Carson College.....	Mossy Creek, Tenn.....	1853	Baptist.....	40	5		15,000	
Central Tennessee College*.....	Nashville, Tenn.....	1866	Methodist Episcopal..	10	9	1,800	95,000	250
Fisk University*.....	Nashville, Tenn.....	1867	Congregational.....	28	6	1,850	175,000	90
Vanderbilt University.....	Nashville, Tenn.....	1872	Meth. Epis. South....	191	15	8,000	500,000	42,000
University of the South.....	Sewanee, Tenn.....	1858	Protestant Episcopal..	114	8	6,500	67,500	1,657
Greeneville and Tusculum College*.....	Tusculum, Tenn.....	1794	Non-sectarian.....	35	4	6,400	10,000	30
Southwestern University.....	Georgetown, Tex.....	1875	Meth. Epis. South....	74	7	1,200	35,000	
Baylor University.....	Independence, Tex.....	1845	Baptist.....	77	8	1,500	70,000	600
Mansfield Male and Female College*.....	Mansfield, Tex.....	1872	Non-sectarian.....	78	4	1,000	25,000	
Solado College*.....	Solado, Tex.....	1869	Non-sectarian.....	22	3	75	16,000	
Austin College.....	Sherman, Tex.....	1849	Presbyterian.....	12	4	5,000	25,000	1,200
Trinity University*.....	Tehuacana, Tex.....	1870	Cumberland Presb....	65	6	1,200	75,000	600
Waco University*.....	Waco, Tex.....	1861	Baptist.....	300	11	3,000	50,000	
Marvin College*.....	Waxahachie, Tex.....	1873	Meth. Epis. South....	98	4		22,000	
University of Vermont*.....	Burlington, Vt.....	1791	Non-sectarian.....	65	9	18,191	243,000	14,366
Middlebury College.....	Middlebury, Vt.....	1800	Congregational.....	55	7	12,000	125,000	10,323
Randolph-Macon College.....	Ashland, Va.....	1830	Meth. Epis. South....	125	9	2,000	35,000	1,182
Emory and Henry College.....	Emory, Va.....	1839	Meth. Epis. South....	80		4,800	100,000	
Hampden-Sidney College.....	Hampden Sidney, Va.....	1783	Presbyterian.....	64	5		50,000	4,800
Washington and Lee University.....	Lexington, Va.....	1782	Non-sectarian.....		9	15,000	150,000	10,000
College of William and Mary.....	Williamsburg, Va.....	1693	Non-sectarian.....	28	1	5,000	75,000	2,090
Roanoke College.....	Salem, Va.....	1853	Lutheran.....	65	7	16,000	75,000	
University of Virginia.....	University of Virginia, Va.....	1819	Non-sectarian.....	328		40,000	800,000	
Bethany College.....	Bethany, W. Va.....	1840	Christian.....	94	6		130,000	2,000
West Virginia University*.....	Morgantown, W. Va.....	1867	Non-sectarian.....	57		6,000	175,000	6,500
Shepherd College*.....	Shepherdstown, W. Va.....	1871	Non-sectarian.....	93	3	155	45,000	
Lawrence University*.....	Appleton, Wis.....	1847	Methodist Episcopal..	96	9	8,570	65,000	3,200
Beloit College.....	Beloit, Wis.....	1846	Presb. and Cong.....	64	8	9,338	85,000	10,000
Galesville University*.....	Galesville, Wis.....	1854	Methodist Episcopal..	158	9	4,000	20,000	1,200
University of Wisconsin*.....	Madison, Wis.....	1848	Non-sectarian.....	209	37	10,000	340,000	30,306
Milton College*.....	Milton, Wis.....	1867	Seventh-Day Baptist..	37	5	1,000	30,000	500
Racine College.....	Racine, Wis.....	1852	Protestant Episcopal..	44	6	7,000	100,000	
Ripon College*.....	Ripon, Wis.....	1850	Congregational.....	55	11	5,000	150,000	6,000
Northwestern University.....	Watertown, Wis.....	1864	Lutheran.....	38	6	1,500	50,000	
Georgetown College.....	Georgetown, D. C.....	1815	Roman Catholic.....	54	12	30,000	325,000	
Columbian University.....	Washington, D. C.....	1821	Non-sectarian.....	47	10	7,000	250,000	
Howard University*.....	Washington, D. C.....	1867	Non-sectarian.....	15	4	7,000	500,000	2,675
University of Washington Territory*.....	Seattle, Wash. Ter.....	1861	Non-sectarian.....	41		300	100,000	700

Canada.—To the foregoing exhibit of the colleges of the United States we add the following statistics of the Universities and Colleges of Canada as given in the census of 1881. In Prince Edward Island there were 3 colleges with 58 inmates; in Nova Scotia, 10 with 79; in New Brunswick, 4 with 289; in Quebec, 32 with 1142; in Ontario, 31 with 1594; in Manitoba, 1 with 10; in British Columbia, 2 with 7; and in the Territories, 1 with 10; making a total of 85 colleges, with 5943 inmates. The most prominent institutions are the University of Toronto, which possesses buildings admirable for architectural effect; McGill

College, in Montreal, among whose schools that of medicine is deservedly celebrated; Dalhousie University, in Halifax, which has also a medical school; and Laval University, a Roman Catholic institution in Quebec, with several affiliated colleges in other places.

No general history of the colleges of the United States has been written, though one is now contemplated. Among the works which serve as the material for this work are the histories of the individual colleges, Richardson's and Clark's *College Book*, Barnard's *Journal of Education*, and Thwing's *American Colleges: their Students and Work*. (C. F. T.)

COLLEGE POINT, a village of Queens co., N. Y., on the N. shore of Long Island, 2 miles N. of Flushing. It is on a branch of the Long Island Railroad, and has steamboat communication with New York, which is 10 miles distant by rail. College Point has a newspaper, good public and private schools, manufactures of rubber goods and of ribbons, and a population (mostly German) of 4192. St. Paul's College, to which it owes its name, was established by Rev. W. A. Muhlenberg, D. D., in 1838, but has been closed for some years.

COLLETT, JACOBINE CAMILLA, a Norwegian novelist, was born Jan. 23, 1813, in Christiansand, where her father was a priest. She is a sister of the poet Henrik Wergeland. In 1832 she accompanied her father to Paris, and afterwards spent a year in Hamburg, where she studied German literature. In 1841 she was married to Peter Jonas Collett (1813-1851), professor of jurisprudence in the University of Christiania, and distinguished both as jurist and poet. Since the death of her husband, Madame Collett has spent the most of her time in other countries, and she now lives in Paris. Her first novel, *Amtmandens Døttre* (1855, 3d ed. 1877), was published anonymously. It is a powerful portrayal of the wrongs of woman. The author continued to plead the cause of her sex in other novels of considerable merit, the chief of which are: *Fortællinger* (1861); *I de langer Nætter* (1863); *Sidste Blade* (3 vols., 1868-72); *Erindringer og Bekjendelser* (1874); *Fra de Stummes Leir* (1877); *Et Lyst Billede den mørk Ramme* (1878); and *Most Strømmen* (1880). Many useful reforms in the education of girls and in other social problems in Norway may be traced to Madame Collett's influence.

COLLIER, JOHN PAYNE (1789-1883), an English literary historian and Shakespearian critic, was born in London, Jan. 11, 1789. His father had been a merchant, but afterwards became editor of the *Monthly Register* and a contributor to the *Times*. Young Collier studied law in the Middle Temple, and after his admission to the bar in 1809 was a parliamentary reporter. His marriage in 1816 having provided him with a moderate fortune, he devoted his leisure to the study of the old English poets, and published the *Poetical Decameron, or Ten Conversations on English Poets* (2 vols., 1820). This was followed by an allegorical poem in Spenserian verse, called *The Poet's Pilgrimage* (1822). Then he edited and enlarged *Dodsley's Old Plays* (3 vols., 1825-27). His valuable *History of Dramatic Poetry* (3 vols., 1831, new ed., 1879), a series of dissertations on the English stage, gave him a prominent place as a literary historian. The Duke of Devonshire and Lord Francis Gower gave Mr. Collier the use of their valuable libraries, and from these sources he published *New Facts Regarding the Life of Shakespeare* (1835); then *New Particulars Regarding the Works of Shakespeare* (1836), and *Farther Particulars* (1839). After twenty years spent in such literary investigations, Mr. Collier issued his edition of *Shakespeare* (8 vols., 1842-44), but his emendations, derived, as he alleged, strictly from antiquarian sources, did not win the assent of the best critics. In 1847 Mr. Collier was made secretary of the royal commission for the reorganization of the British Museum. His services to literature were acknowledged by an annual pension of £100. Among his publications of this period were *Memoirs of the Principal Actors in the Plays of Shakespeare* (1846), *Book of Roxburgh Ballads* (1847). Great sensation was produced in the literary world by his publication in 1852 of *Notes and Emendations to Shakespeare's Plays*, which were based on manuscript marginal notes in a copy of the second folio edition of Shakespeare. English, German, and American critics fiercely attacked first the value, and finally the authenticity of these notes, and it is now settled that Mr. Collier largely retouched and added to them, if, indeed, any were of earlier origin. The investigation tended also to throw suspicion and discredit

on all the previous discoveries announced by him, and his *Reply* (1860) was not satisfactory. He afterwards published a *Bibliographical Account of Rare Books* (1865); *Illustrations of Old English Literature* (1866), and a series of reprints of the minor poets and prose writers of the sixteenth century. He died at London, September, 1883.

COLLINGWOOD, a town of Canada, in Simcoe co., Ontario, at the S. end of Nottawasago Bay, an inlet of Georgian Bay (Lake Huron), 95 miles by rail N. N. W. of Toronto. It is on the Northern Railway, at the junction of the Northwestern and North Simcoe railways. It is built on low ground, but its situation gives it great advantages for lake commerce. It has a town hall, a collegiate institute, 2 banks, 7 churches, 2 weekly newspapers, 5 steam saw-mills, 3 planing-mills, a foundry, a machine-shop, manufactures of farm-implements, flour, leather, steam-boilers, soap, stoves, furniture, brooms, and other goods, several pork-packing establishments, 2 elevators, and a dry-dock. The harbor is protected by a breakwater, and has a light-house. The property valuation is \$1,100,000; town debt, \$80,000; yearly expenses about \$26,000. Collingwood was settled in 1831, and incorporated in 1858. Population, 4445.

COLLINS, WILLIAM WILKIE, an English novelist, born in London, Jan., 1824. He was the son of William Collins, R. A., an eminent painter of landscape and rural scenes. His mother was also possessed of talent in art. He received his education at a private school, after which he spent two years in Italy. He was then articulated for four years to a firm engaged in the tea-trade. But he left that business to enter Lincoln's Inn, where he was a student of the law when his father died. In 1848 he published *Memoirs of the Life of William Collins* (his father), with selections from his journals and letters, 2 vols., giving very interesting information on the character and condition of English art. Of this work the *London Examiner* said: "The son describes a picture as happily as the father painted it." His first novel (1850) was *Antonina; or, The Fall of Rome, a Romance of the Fifth Century*; it is a narrative of the capture of Rome by Alaric. In 1851 appeared *Rambles Beyond Railways*; in 1852, *Basil*; in 1853, *Mr. Wray's Cash-box*; in 1854, *Hide and Seek*. After *Dark* (1856) and *The Dead Secret* (1858) were first contributed serially to *Household Words*. In 1859 he issued *The Queen of Hearts*; in 1860, *The Woman in White*; and in 1862, *No Name*. The two last appeared serially in *All the Year Round*. *My Miscellanies* appeared in 1863; *Armada* in 1866; *The Moon-Stone* in 1868; *Man and Wife* in 1870; *Poor Miss Finch* in 1872; *Miss or Mrs.? and Other Stories* in 1873, and in the same year *The New Magdalen*; *The Law and the Lady* in 1875; *Two Destinies* in 1876. Later, in the order mentioned, down to 1882, he has published *The Haunted Hotel*, *The Fallen Leaves*, *Jezebel's Daughter*, and *The Black Robe*. He visited the United States in 1873-74, and has expressed himself highly gratified by "the generous reception accorded him by his readers there." He has written a few original plays. One, called *The Lighthouse*, was played in 1855 by Charles Dickens and an amateur company at Tavistock House, Dickens's residence, for the benefit of the Guild of Literature and Art. *The Frozen Deep* had a similar representation in 1857. *Black and White*, in which he had the aid of Fechter, appeared at the Adelphi in the year 1869. Quite a number of his novels were dramatized by himself, and have been played with great success in England and America. Among these are *The Woman in White*, *Man and Wife*, *Armada* (under the name of *Miss Gwilt*), *The Moonstone*, *The New Magdalen* (translated and performed also in Italy and Germany and France). Many of his novels have been translated into French, German, Italian, Dutch, Danish, and Russian. He is the acknowledged master of mystery, and most skilfully reserves the secret of his story to the end. In

spite of ill-health and constant suffering he continues writing, and declares that "the longer he lives the more dear his art is to him." His intimate relations with Dickens should be noted. A long friendship between them was further cemented by the marriage of his brother to Dickens's daughter Kate in 1860. (H. C.)

COLLINSIA, a genus of North American annual herbs, belonging to the order *Scrophulariaceæ*, and interesting as affording several ornamental species for garden culture. Nuttall gave the name to this genus. Among noteworthy species are *C. bicolor* and *multicolor* of California; *C. grandiflora* and *parviflora*, both of Oregon, the latter ranging far eastward; and *C. verna* of the Ohio Valley. The genus was named in honor of Zaccheus Collins of Philadelphia, a meritorious botanist.

COLLINSON, PETER (1693-1768), an English botanist, was born at Hugal Hall, near Windermere, Westmoreland, Jan. 14, 1693. A member of the Society of Friends, he took a great interest in the colony of Pennsylvania, and was a benefactor of the Philadelphia Library. He was a correspondent of Franklin and Cadwallader Colden, and assisted the former in his earlier experiments in electricity. He caused large collections of American and other foreign trees and shrubs to be planted in Europe, and sent to America in return many European species. Linnæus named for him the genus *Collinsonia*, embracing certain labiate herbs, popularly known as stone-root, richweed, horse-balm, etc. He published various scientific and antiquarian papers. He died Aug. 11, 1768. Collinson was a friend of Linnæus, Sir Hans Sloane, and nearly all the eminent naturalists of his time.

COLLINSVILLE, a city of Madison co., Ill., is on high rolling land, 10 miles E. of St. Louis. The St. Louis, Vandalia, and Terre Haute Railroad passes through the town. There are 4 hotels, 2 weekly newspapers, 7 churches, 4 schools 2 flour-mills, 2 factories manufacturing small bells. In the vicinity are 2 zinc factories and 11 coal mines, which send daily to St. Louis about 37,000 bushels of bituminous coal. Collinsville was settled in 1816, incorporated as a town in 1850, and as a city in 1870. Pop. 2887.

COLLISION, IN MARITIME LAW (Latin *con*, together, and *lædo*, to strike so as to injure), takes place when one vessel strikes another, or causes another vessel or thing to strike her, or causes her to strike another vessel or thing. The simplest form is direct contact; but there are many cases, especially in inland navigation, of what may be called constructive collision: as where one vessel by careless navigation puts another into such a position that to avoid a greater danger she runs into a wharf, or river-wall, or another vessel, or as where a steamer passes so close to flat-boats, or to a tug and tow, that her swell causes them to injure each other.

There were from the earliest times certain rules of the road understood by all navigators, but it was not until after the introduction of steam-vessels that they were formulated in law with a view to the prevention of collision. In 1838 Congress required all steam-vessels to "carry one or more signal lights" between sunset and sunrise. In 1846, and 1851, and 1852 the English Parliament passed very brief acts regulating the rule of the road, which were all repealed by the Merchant Shipping Act of 1862, empowering Her Majesty to make regulations to prevent collisions. The first series was made by an order in Council, Jan. 9, 1863, and has been adopted by all the maritime nations of the world, either expressly or by making identical regulations a part of their municipal law, as in the case of the United States by an act of Congress, April 29, 1864. The regulations of 1863 were repealed by an order of Council of Aug. 14, 1879, and others substituted to go into effect on and after Sept. 1, 1880, which are said by the order to apply to vessels of the United States whether within British jurisdiction or not. Inland navigation is subject to additional special local

regulations, which generally depart no further than necessity requires from the rules of navigation at sea.

The danger of collision being caused by fog, darkness, or interfering courses, the object of the regulations is to show, in darkness and fog, whether a vessel is a steam or sailing vessel, whether she is at rest or under way, and if under way what her course is, and to determine both by day and night which vessel has the right to hold and which the duty to alter her course. These objects are accomplished in the following very simple way:

Every vessel at anchor is required to carry a globular lantern, throwing a white light all around the horizon, and fixed where it can best be seen, but not over twenty feet above the hull, and visible for at least one mile. This is called an anchor or riding-light. Every vessel under way is required to carry a red light on her port and a green light on her starboard side, so screened as to throw the light from right ahead to two points abaft the beam, and visible at least two miles. A steam-vessel must carry in addition a bright white light at her foremast head, so fixed as to throw an arc of light ahead and around each side to two points abaft the beam, and visible at least five miles. These are called the running-lights. Sailing-vessels are required to exhibit a torch or flare-up light to approaching steam-vessels; their side-lights in many cases not being visible to the latter, especially when overtaking. A steam-vessel towing another is required to show an additional white light not less than three feet above her mast-head-light. Pilot-boats are not allowed to carry the side-lights, but are required to carry a white light at the mast, visible all around the horizon, and to display a flare-up light every fifteen minutes. In fog, whether by day or night, vessels at anchor are required to ring bells at intervals of five minutes by the rules of 1863, and two minutes by those of 1880. And when under way a steam-ship is required to blow her whistle and a sailing-ship her fog-horn at the same intervals.

The steering and sailing-rules are too technical to be profitably discussed in this article. Some of the leading features are that an overtaking is bound to keep out of the way of the overtaken vessel; that a steam-vessel is in all cases bound to keep out of the way of a sailing-vessel; that of two sailing-vessels the one running free with the wind shall keep out of the way of the other; that of steam-vessels the one which has the other on the starboard side is bound to keep out of the way; and, finally, the Golden Rule (altered by the rules of 1880 in case of sailing-vessels), that in case of two vessels meeting end-on, or nearly end-on, the helms of each shall be put to port so that each shall go to the right. Wherever, by these rules, one vessel is to keep out of the way it is the duty of the other vessel to hold her course, and she will be held guilty of negligence for not doing so. Special circumstances will justify a departure from these rules to avoid immediate danger. Approaching steam-vessels indicate to each other by a single toot of their whistles that they are going to starboard, and by two toots that they are going to port. Every steam-vessel when approaching another vessel so as to involve a risk of collision shall slacken her speed, or, if necessary, stop and reverse, and when in a fog go at a moderate speed.

Liability for the damage caused by a collision depends upon negligence, and the burden of proving it lies upon the party complaining. Any departure from the foregoing regulations which contributes to the result will make the party at fault liable, and outside of them any lack of ordinary care, diligence, and good seamanship in the equipment and manning of the vessel, the sufficiency of the look-out, or in regulating her speed and manœuvres according to circumstances, will have the same effect. But there is this great difference between the courts of common law and of admiralty, that in the former the plaintiff cannot recover

if he has been guilty of any contributory negligence whatever, while in the latter his own negligence will not defeat his right to recover, unless it was such as to cause or excuse the negligence of the other party, *i. e.*, such that the other party, by the exercise of ordinary care, could have avoided the consequences of it. If a vessel thrown by another into a position of peril fails to make a proper, or actually makes an improper, movement, it will be treated as an error and not charged to her as a fault. Allowance will be made for the excitement caused by the emergency. Where both vessels are in fault the damage is divided. In cases of inevitable accident, *i. e.*, where the collision could not have been prevented by the exercise of ordinary care and maritime skill, the loss lies where it has fallen. Such are cases of *vis major*, collision in a dense fog, great storm, or caused by the machinery or fasts suddenly giving way on account of a latent and undiscoverable defect.

In the admiralty courts vessels are personified and made themselves liable for the contracts and the torts of the master committed within the scope of his employment. In ports and places where the owners do not reside and are not even known, the ordinary personal actions would be very insufficient remedies. Hence any one injured either in his person or property by a collision may sue the owners of the offending vessel, or the charterers, if she were demised so as to make them owners *pro hac vice*, on the ground that they are responsible for her master's acts as their servant, or he may proceed directly against the vessel herself, have her arrested and detained until the case is decided, unless the owners release her by giving security to pay any decree that may be rendered against her. There is a universal exception to the liability of being arrested in favor of the public vessels of every nation. If a decree is rendered against the vessel, the court condemns her to be sold to pay it. This latter course is called proceeding *in rem*, and is the course invariably taken when the offending vessel is not sunk and is within the jurisdiction. It differs from the ordinary personal action, not merely in the form of the remedy, but also in that it asserts a right of property in the offending vessel to the extent of the injury sustained. The vessel is, and continues, subject to the lien of this claim wherever she goes. Where a collision occurs while the vessel at fault is in charge of a pilot whom she is compelled by law to employ, neither the vessel nor the owners are held liable in England, the pilot not being their servant; whereas this is held to make no difference in the United States.

By the general maritime law of the continent of Europe owners were only held personally liable for injury done by their vessel up to the extent of their interest in her and her freight, so that if she were lost by a collision caused by her negligence their liability was at an end, and they could at any time put an end to it by abandoning the vessel and freight to the party complaining. But by the common law the liability of vessel-owners for the acts of their servants within the scope of their employment was, as in other cases, unlimited, and statutes have been passed in England and in the United States limiting it; in the former to an arbitrary sum per ton in all cases, and in the latter to the value of their interest in the ship and freight at the time of collision, to be determined in each case.

The injured party is entitled to recover such a sum of money as is necessary to a *restitutio in integrum*, and if the result of the repairs is to make his vessel more valuable he is entitled to the benefit of it. There is no deduction for new material in favor of the wrongdoer, as there is in insurance cases, of one-third off in favor of underwriters. He is entitled, beside repairs, to recover the expenses of towage, protests, surveys, and port charges made necessary by the collision, together with an allowance for profits lost during the detention. The latter is now usually calculated in England at an arbitrary sum of 4*d.* per registered

ton in case of sailing-vessels; but in case of steam-vessels, and in both cases in the United States, the loss is made a subject of reference and proof. If the injured vessel is a total loss, the owner recovers her market value at the time of the collision, including an allowance for freight. If she is sunk, he is required to use ordinary prudence about raising her. It is generally his duty to raise her if it can be done, and he is entitled to recover the expense of doing so even if it prove greater than her value. But it would generally be unjustifiable to raise a vessel sunk in deep water, because a vessel should be treated as a total loss which it will cost more than her value to raise. When both vessels are found to be in fault, a decree is entered for half damages; *i. e.*, each pays one-half the damage sustained by the other, including damage to cargo, although of course the cargo-owners can recover their loss from either. This is done by each paying half the other's damage, and not, as the rule is frequently stated, by adding the damage and dividing the total, which would result in each paying the other the same sum, *i. e.*, nothing.

As admiralty courts entertain jurisdiction of collisions without reference to the place where they occur or to the nationality of the vessels, questions often arise as to the law which is to regulate the rights of the parties, though much less frequently since all maritime nations have agreed upon the same rules of navigation. The law of the place of collision controls, whatever be the nationality of the vessels, although the courts of the forum have refused to enforce foreign laws against their own vessels. When the place of collision is the high seas and the vessels are of different nationalities, difficult questions sometimes arise which it is not practicable to discuss here. (H. G. W.)

COLLUSION (Lat. *collusio*, from *colludere*, to play together), a deceitful agreement or compact between two or more persons for the purpose of obtaining some unlawful object or bringing about some unlawful result; in particular, an agreement between two or more persons to defraud another by means of the forms of law, or to bring about an unlawful result by lawful means. It is nearly synonymous with the old law-term "*convin*," and also with the ordinary sense of the word "*conspiracy*"—with this difference, however, that the latter always implies a more extensive and important act. Every collusion is a conspiracy, but every conspiracy is not a collusion.

Collusion plays an important part as a plea in bar of divorce (see **DIVORCE**) as when the parties agree that one of them shall commit some unlawful act which may afford the other a ground on which to base an action for divorce. The proof of the collusion invariably bars the divorce. In general, collusion, as a species of fraud, vitiates every act infected by it and renders it void.

COLLYER, ROBERT, an American Unitarian minister and author, was born at Keighley, Yorkshire, England, Dec. 8, 1823. His father was a blacksmith, and soon after removed to Bluhherhauses, a little place about 14 miles north. The son left school at the early age of eight to work in the factory, and when fourteen went to Ilkley to learn the smith's craft from the man that had taught his father. In 1850 he emigrated to America, and got work at hammer-making in Shoemakertown, Montgomery co., Pa., where he remained nine years. From 1849 to 1859 he had been a Methodist local preacher, but finding his views of doctrine changed, he left that body, and was invited to Chicago to take charge of a Unitarian mission among the poor. He became first pastor of Unity Church in Chicago, and remained there till Sept., 1879, when he removed to New York, having accepted a call to the Church of the Messiah, of which he still has charge. He has written a biography of Rev. A. H. Conant, a pioneer preacher and army chaplain, under the title *A Man in Earnest* (1868), and has published volumes of sermons under the titles *Nature and Life* (1867), *The Life that Now is* (1871), and *The Simple Truth* (1880).

COLOCYNTH, or Bitter Cucumber (*Citrullus Colocynthis*), is a native of the warmer portions of Asia, but now is quite commonly found in Northern Africa and Southern Europe. The plant is a representative of the gourd family. Its chief claim to notice is, that it forms a drug of some commercial importance. In proper doses it is a vigorous cathartic, or if given in excessive doses it becomes an emetic and irritant. The portion of the fruit used is the bitter pulp, which, when deprived of the yellow, useless rind, appears as a white or yellowish-white ball from two to four inches in diameter, which is light, spongy, and easily separable into three parts. Only the pulp without the seeds is used, though some allege that the seeds, free from the pulp, may be used as a food. The constituents of colocynth are resin, pectin, gum, colocynthin, and 11 per cent. ash. Colocynthin ($C_{56}H_{84}O_{23}$) is a yellow substance, soluble in water and in alcohol, and exceedingly bitter.

COLOMBIA, THE UNITED STATES OF, a South American federal republic. For several years preceding the election of Aquileo See Vol. VI. p. 137 Am. ed. (p. 152 Edin. ed.). Para to the presidency in 1876, the republic, under successive Liberal administrations, had been at peace externally and internally, except for a few local seditions; but that event gave the signal for revolution. This was brought about needlessly by Recaredo de Villa, governor of Antioquia, a man of inferior ability, who declared war against the federal government. The Conservatives rose in Antioquia, Cauca, and Tolima. Their action was not concerted, and the campaign was brief. The revolutionists were defeated at the battle of Los Cháncos, near Buga, in Cauca, July 14, 1876; Antioquia was crushed, and the Liberal party is now more than ever dominant. Gen. Julian Trujillo, who had commanded the principal federal army during the revolution, was elected president for the term 1878-80. He was succeeded by Dr. Rafael Nuñez, 1880-82, and in April, 1882, Dr. Francisco Xavier Zaldúa became president as the choice of the radical wing of the Liberal party. Dr. Zaldúa died Dec. 21, 1882, and was succeeded by the second vice-president, José E. Otóloro.

The greater part of the gold of Colombia is obtained from alluvial deposits, but a few quartz-mines are worked, chiefly in Antioquia, the principal mining State, where considerable capital is employed by English and French as well as native companies. In 1875 gold to the value of nearly \$2,500,000 was exported from Antioquia, and the mint established at Medellín coined \$500,000. The State government of Antioquia emerged from the contest of 1876 completely prostrated, and its principal industry received a blow from which it has not yet recovered. The silver-mines of Frias and Santa Ana, in the State of Tolima, as well as the mine of Marmato in the Cauca, and that of Titiribi in Antioquia—all in the mountains of the central cordillera, and all but the last belonging to English companies—were formerly very productive; of late years, however, the production has fallen off. The mint at Medellín, and that at Popayan, the capital of Cauca, coin gold money almost exclusively; most of the silver is coined at the mint of Bogotá. Platinum is mined only in small quantities, although, owing to the increased demand for that metal, greater attention is now given to this branch of mining. Iron-smelting-works have been established at Pacho in the savanna of Bogotá, and at Amagá in Antioquia; the product is not very great nor the iron of very good quality. A little copper-ore is mined in the State of Santander. No other metals are mined. Reports of the emeralds of Muzo first incited the Spaniards to the conquest of Bogotá. These are still the only pure emeralds known to commerce. There are several mines situated in the district of Muzo, in Boyacá, within an area of ten square miles, and at Somondoco, near Tunja, are mines of less importance which have not been worked since

the colonial period. The emeralds occur in bands of fluor-spar, but more commonly in "nests," found in beds of quartz resting on deposits of pyrites. Many of these gems are found imprisoned in crystals of quartz. In 1787 the Spanish government ceased to work these mines. Shortly after the establishment of the republic they were leased to a native of Bogotá named Paris, who took a fortune from them. Later a French company obtained possession of them at an annual rental of \$16,000. What gain, if any, accrued to the company has never been known, for every stone found was disposed of in Europe. By a law of May 31, 1876, the monopoly of the mines came to an end. Indications of emeralds have been noted near Cali, in Cauca, and at the mountain of Patiburú, in Antioquia. The working of the mines of rock-salt is monopolized by the federal Government; the prevalence of goitre in the region where this salt is used is supposed to be owing to the want of iodine in the salt. The State of Cauca imports salt from Payta, in Peru; the States of the Caribbean seaboard are supplied from the West Indies. Coal is found at Bogotá, in the coast-region back of Santa Marta, in Antioquia, and near Cali, in the Cauca valley, where an immense deposit exists; but no coal is mined. In Cundinamarca and Boyacá, on the lofty plains, and along the eastern slope of the Sumapaz range, down to the very level of the plains, occur deposits of rock-salt. At Zipaquirá, on the savanna of Bogotá, is the famous mountain of salt, to-day supplying all the interior of the republic, just as for centuries before the conquest it had supplied the Minsca empire. In Antioquia are found springs producing salt in quantities sufficient to supply that State.

The chief industry of Colombia is agriculture, but old methods still prevail. Wheat and potatoes are cultivated in the elevated regions, maize in all parts of the republic. Rice, yams, the yuca, the arracacha, and plantains are produced in the hot country. Cotton is perennial, and extensively cultivated in Santander and in the southern part of Cauca, hammocks and coarse stuffs being manufactured; its cultivation for export was increased in Bolivar and Magdalena, at the time of the civil war in the United States. Cacao is cultivated to a height of 3000 feet above the sea; sugar-cane up to 5000; coffee to 7000—the yield of each being abundant. Great quantities of coffee are shipped down the Meta, from Santander to ports in the Gulf of Maracaibo, and at Buenaventura; the cacao and sugar supply the home market. An excellent quality of tobacco is produced largely about Ambalema, in the upper Magdalena Valley, and in the districts of Carmen, Jiron, and Morales, in the lower valley, as well as near Palmira, in Cauca; it is exported from Barranquilla and Buenaventura. The production of indigo was stopped by the introduction of aniline dyes.

In the eastern and central cordilleras different varieties of cinchona occur, as far north as lat. 5° N., the trees of the eastern slope giving the better quality of bark. This, packed in seroons of raw hide, finds its way to Sabanilla and Buenaventura. The bark from the district of Pitayó, of late years, has been shipped down the Putumayó. Vanilla, ivory nuts, sarsaparilla, and ipecacuanha abound in the hot country. The bamboo is abundant below an altitude of 4000 feet. Strawberries are found everywhere in the higher plateaus.

Vast herds of cattle graze on the llanos, in the Cauca, and on the isthmus. In the district of Pasto, in Southern Cauca, and in the great valley of Tensa, in Boyacá, there are numerous flocks of sheep; of the wool coarse goods are manufactured. The fibre of the indigenous aloe is made into cordage, coarse sacking, and *alpagartes*, or sandals. These stuffs are all manufactured by hand. Hats similar to those known to commerce as "Panama hats" are made of the leaf of the *iraca* palm at Suasa in Cundinamarca, and in

Antioquia, but in quantities too limited for export. The few flour-mills of the interior have primitive horizontal water-wheels; lumber is sawed by hand. Dyeing and tanning are carried on to a very limited extent. The relation between imports and exports in recent years will appear from the following table:

	Imports.	Exports.
1875.....	\$6,849,028	\$9,984,386
1876.....	7,328,928	14,477,897
1877.....	6,709,109	10,049,071
1878.....	8,708,797	11,111,196
1879.....	10,787,654	13,711,511
1880.....	11,522,236	14,802,362
1881.....	12,183,970	15,836,943
1882.....	12,355,555	18,514,116

The transit trade across the Isthmus of Panamá is estimated at nearly \$100,000,000 per annum.

Revenue.—The national income is very small, there being no direct taxation. The annual receipts increase slowly. For the biennial period of 1880–81 they amounted to \$6,519,094, derived from the following sources: customs, \$4,292,835; salt monopoly, \$950,285; Panamá Railway, \$260,000; Sabanilla Railway, \$162,088; stamped paper, \$51,709; postal service, \$45,196; merchandise carried on the Magdalena, \$74,832; imported salt, \$34,206; telegraph, \$43,842; national property, \$2940; sale of ecclesiastical property, \$18,263; mint, \$28,147; passengers on navigable rivers, \$5119; various, \$649,632. The tariff divides articles into classes paying duty per kilogramme; thus, relatively, duties are heavy on inferior goods. Smuggling obtains to a considerable extent, although the evil is less than it has been. The recent reorganization of the custom-houses, and the establishment of a port of entry at Caquetá on the Putumayó, will probably tend to lessen smuggling. The postal service is not good, and the rate of internal postage is high; nor can this be otherwise until a better system of communication exists. In July, 1881, Colombia entered the postal union, and its foreign mail service has greatly improved in efficiency. Some of the States have postal departments for the conveyance of official communications. There is telegraphic communication between Bogotá and the capitals of the several States, and there are subordinate lines in several of these States. In 1881 a line was extended to the Venezuelan frontier, and another line is being constructed toward the frontier of Ecuador. A submarine cable now connects Buenaventura with Panamá, and the Colombian system of telegraph lines with those of the world. There were 400,000 telegraphic messages sent in 1881. The telegraph lines belong to the federal Government, except those of Antioquia, which are the property of that State. The telephone has been introduced in Bogotá. The Panamá Railway is now the property of the Panamá Inter-oceanic Canal Company. The line from Barranquilla to Sabanilla was purchased by the Government in 1876 for \$600,000. On the railway to connect Buenaventura with the Cauca Valley work progresses very slowly; many other lines are projected, and on some of these a small amount of preliminary work has been done.

Until January, 1873, the foreign debt amounted to \$32,927,858. By an agreement of that date made with the foreign creditors this amount was reduced to \$10,000,000, paying an annual interest of $4\frac{3}{4}$ per cent. In 1878 the Government entered into an agreement to apply annually £25,000 for the purpose of extinguishing this debt. In 1873 also an agreement was made with its creditors for the reduction of the internal indebtedness. Aug. 31, 1882, the foreign debt amounted to \$9,570,500, and the internal indebtedness to \$13,383,791. The foreign debt, chiefly held by British creditors, is secured by mortgage on the customs, but the interest is much in arrears.

Colombia has no navy. Congress each year determines the number of men of which the army shall consist. In time of peace this number does not

exceed 1500; in time of war the federal Government may call into service one per cent. of the population of each State.

The constitution authorizes the federal Government and those of the States to act together in all things pertaining to public instruction. Secondary instruction was organized by a law of May 30, 1868; by a law of July 2, 1870, the chief executive was authorized to organize primary public instruction. Normal schools were organized in all the States, and foreign teachers brought to the country, principally from Germany. A portion of the national revenue is devoted to the purposes of public instruction, and the number of schools is increasing. A national university has been established at Bogotá, a mining school at the capital of Antioquia, a nautical school at Cartagena, and a commercial college at Barranquilla. In 1883 there were 437 students at the university. There are no exact official data concerning the primary schools of Panamá and Santander; in 1883, 75,191 pupils attended the 20 normal and 1431 other schools of the nine States. Antioquia has a State university, and other States have established colleges and schools.

Almost all of the not extensive literature possessed by Colombia existed before the War for Independence. The Spanish conqueror of Bogotá, Gonzalo Ximenes de Quesada, wrote an account of the conquest; as late as 1854 this work existed, still in MS., in the National Library at Bogotá, but it has disappeared, together with many other valuable MSS. The celebrated *Elegías de varones ilustres de Indias* were also written in Colombia, their author, Juan de Castellanos, an ex-soldier, being parish priest of Tunja. Many other Spaniards and a few natives of the viceroyalty—these chiefly clergymen—wrote books or published them in Colombia. Toward the close of the last century the celebrated José Celestino Mútis, himself a Spaniard, gave a noteworthy though fleeting impulse to literature at Bogotá. Owing to his example and efforts, and those of Manuel del S. Rodríguez, who came to Bogotá with the best-beloved of all the viceroys, José de Ezpeleta, a small band of youths grew up to give lustre to the last days of Spanish rule. In 1781 the first newspaper appeared at Bogotá. Among these men the names of Zea, Córdas, Nariño, the three Gutierrez, Acevedo, Valenzuela, Pombo, and Padilla are conspicuous. Many of these perished during the revolution, from which struggle the country emerged with its literary faculties paralyzed. Since that epoch there have been very few Colombian authors of note. Restrepo, Mosquera, Acosta, Perez, Groot, Plaza, and Vergara y Vergara are perhaps the only men who have produced works destined to be remembered. There is a good deal of ephemeral journalism in Colombia. The Spanish language lends itself to the making of verse, and the short-lived periodicals are full of poetry. In writing short articles descriptive of life in various parts of the country a few of the present generation of Colombians excel. There is, however, no national literature worthy of the name; what does exist is a poor copy of the French style of writing.

The boundaries of Colombia separating it from Costa Rica and from Venezuela have never been well defined, and the subject is fruitful of dispute. Several imaginary lines have been drawn on the maps as marking the boundary of Colombia on the side of Brazil. These circumstances make it impossible to state with precision the area of Colombia.

Perhaps to a greater extent than any other country on the globe Colombia gives evidence of long-continued and extreme volcanic action. Since the Spanish conquest several periods of severe earthquake-shocks have been recorded. The last great shock was on May 16, 1875, when San José de Cúcuta, a flourishing city in the coffee-producing region of Santander, was completely destroyed, and considerable damage was done in the neighboring States. The occurrence of

lighter shocks on the same day of the following year naturally alarmed the superstitious people. On Sept. 8, 1882, an earthquake threw down the most substantial buildings of Panamá and Colon, and very seriously damaged the superstructures of the Panamá railway: about one-third of the road-bed was rendered unserviceable, the rails being bent, or in places driven into the ground.

Concerning the commercial interests and facilities of the country some facts should be added. On the Caribbean Sea the trade of the ancient port of San Marta, forty miles E. of the mouth of the Magdalena River (the Magdalena is the great commercial highway of the country), has been absorbed by Sabanilla, situated on a bay of the same name, near the western mouth of the Magdalena. This latter is the port of Barranquilla, a thriving town of 25,000 inhabitants, on the left bank of the river near the sea. A railway of seventeen miles connects the two places, and although in 1876 the custom-house was removed to Barranquilla, Sabanilla remains the port of entry. The commodious Bay of Cartagena has also lost its commercial importance, and the *dique*, a waterway by which communication was had with the Magdalena, has fallen into disuse. Of the several good harbors on the isthmian coast (eastern), the so-called lagoon of Chiriqui, near the Costarican frontier, is one of growing importance.

(G. B. G.)

COLONIES, THE AMERICAN.—In 1705, of the thirteen English North American colonies, seven—Virginia, North Carolina, South Carolina, New York, New Jersey, New Hampshire, and Georgia—were governed as royal provinces, and one description will suffice for all, if it be borne in mind that there were many minor local differences not here mentioned. These local peculiarities were due to the fact that, with the exception of New York and New Jersey, which were acquired by conquest, they had all been settled under the charter or proprietary form, although, in the course of time, in one way or another they had come into the king's hands.

In these provinces a governor, appointed by the crown, represented the king, held the chief executive power, summoned, prorogued, and dissolved the assembly, acted as chancellor, and sometimes even as chief-justice. Besides these prerogatives in the colonies, where the English church was established, the governor was the nominal head of the church, and as such had the power of "induction." In the discharge of these duties he was advised by a council of from eight to twelve members, appointed either by himself, or by the king on his nomination, and designed to act as a check upon him. But, as the governor possessed the right of appointment to the lucrative offices, these councillors were generally his creatures. The council sat with the governor as the highest judicial tribunal within the colony, and also formed the upper house of the legislature. The lower house, usually known as the assembly, consisted of a number of representatives—"deputies" or "burgesses"—who were elected by the freemen, possessed of a certain property qualification, of the counties, parishes, or towns, respectively, as the case might be. These assemblies in the early days wielded little power, but in the course of time they had acquired complete control of the colonial finances, and were thus able to oppose the royal officers with every chance of success, especially as in many provinces this control extended not merely to the raising and appropriating money, but even to the disbursement of the funds themselves. A bill, after it had passed the assembly, the council, and had not been vetoed by the governor, became a law in the province, but it might, at any time, be disallowed or repealed by the home authorities.

The main difference between the form of government of these royal provinces and that of the proprietary colonies of Maryland, Pennsylvania, and Delaware was that in the latter the proprietary was inter-

posed between the colonists and the crown. That is, he appointed the governor and other colonial officers, and, theoretically at least, possessed the veto power. In reality the assemblies of these colonies, by their control of the colonial treasuries, were able to oppose successfully not merely the governor, but even the proprietary; especially was this true of Pennsylvania and Delaware, which, although under one executive, had each its own assembly. For in these colonies the council did not sit as an upper house of the legislature, but merely acted as an advisory board to the governor, and the assembly, therefore, possessed much more freedom of action than in the royal provinces, and not only held the purse-strings, but sat on their own adjournment. And again, in these two colonies the governor and council did not act as the highest judicial tribunal in the colony, for an appeal lay directly from a supreme court of four judges to the king in council.

Alone of all the chartered colonies, Connecticut and Rhode Island had retained their charters, under which the government was so completely in the hands of the people that, with the exception of a short bill of rights added in 1776, the charter granted by Charles II. in 1662 remained the fundamental law of Connecticut colony and State until 1818, while Rhode Island was governed under the charter of 1663 until 1842.

Massachusetts had been settled by a trading corporation very similar in apparent design to the Virginia Company; but by the removal of the charter and government of the Company of Massachusetts Bay to this side of the Atlantic; by the subsequent admission of all "church members" to the freedom of the corporation; by the establishment of a representative system and of a judiciary; and by many other usurpations, the charter of a mercantile corporation had been converted into the constitution of a republican commonwealth, which Massachusetts really was until 1684, when the charter was declared forfeited and the "company" dissolved. For a few years the colony was governed for the crown, but after the overthrow of the Stuarts, Massachusetts, to which Plymouth colony and the province of Maine were joined, received what is known as the "Province charter," under which the province was governed until the Revolution. It differed from the old form in that a governor appointed by the crown, assisted by a council chosen by the assembly and approved by himself, appointed all the judges. But as the governor, the councillors, and the judges were all dependent upon the assembly for their salaries, the people ruled the province, although not so openly, perhaps, as before 1684.

As the organic laws of the colonies were very unlike, so were their systems of local government. The various systems may, however, be reduced to two, namely, local government by towns, or by parishes and counties; the one represented in its perfected form by the New England town system, while the other reached its greatest development in Virginia.

The Virginia of an early time seems to have been a collection of little villages occupied by some planter or overseer and his "servants," who labored for him and for the "company," but after the discovery that the cultivation of tobacco was very profitable, these villages, "cities," and "hundreds," as the old records term them, were abandoned. The population dispersed over a wide area, and the county took the place of the "city" or "hundred" as the unit of representation, of the administration of justice, and of the military system; while the county court, consisting of eight or more of the principal men of the county, in addition to rendering justice, had considerable authority in civil matters, as licensing taverns, building and repairing roads, etc., and received the presentments of the church-wardens, as the "ordinary" did at "visitation" in England. All other local or municipal authority was exercised by the vestries of the different parishes into which the country had been divided at an early day. At first the business of these parishes

was transacted by the parishioners in vestry meeting; then the vestry was declared to consist of a certain number of men elected by the freeholders of the parish; but in 1662 the power to fill vacancies in their own bodies was given to the vestries, which thus became close corporations, or *select vestries*. It was their duty to elect church-wardens, to provide churches, glebes, and "parson houses," to present the minister to the governor for induction, and to provide his salary. In addition, they had charge of the processioning the bounds once in four years (the only system of land registration then existing in the colony), assessing the parish levy, and, with the church-wardens, the care of the poor. Of course there were many other minor duties, and it may be truthfully said that the vestry governed the parish as fully as the selectmen did the town.

The founders of Massachusetts emigrated in well-organized groups of persons desirous of living under the spiritual ministrations of some particular person. These groups settled at different places about Boston harbor, and each group managed its own local concerns as it saw fit, all important business being transacted in a meeting of the whole body. After a while a committee of select persons was appointed (five men, ten men, townsmen, or selectmen) to conduct the minor affairs of the town, as it was called, and the meetings of the town became less frequent, but they were always held at least once a year for the ratifying of the action of the selected men, for the selecting of new men for the ensuing year, and for the discussion and decision of such business as it seemed desirable that the consent of the town should be had before entering upon. These town-meetings were held in the meeting-house, as the place of divine worship was called, and all those admitted to the Christian fellowship of the town formed the church, and were called church-members. After a time, none but these church-members were admitted to the freedom of the corporation; that is, to vote for governor and other officers, and for deputies to the general court, as the legislature was named; and, for a brief period, none but church-members had a right to speak and vote in town-meeting. This latter disability was removed in 1647 in favor of those who had taken the "oath of fidelity," and later still, in 1664, was nominally abandoned with regard to all elections. In its place a property qualification was adopted in the "Province charter."

The company guarded very carefully against dispersion of settlements, by adopting the town system as a basis of future colonization, and refusing to grant land to those who could not satisfy the authorities of their ability and intention of founding a town and "gathering a church." The general court also decreed that no house should be built in any town above half a mile from the meeting-house.

These towns then governed themselves in their town-meetings, and through their agents or selectmen, and were beside the unit of the ecclesiastical system, of the judicial system, of the military system, and of the system of representation. In fine, they were in all respects quasi dependent democracies; and though the central authority should be annihilated, government would go on nearly as well as before.

This is better shown by the fact that two collections of such towns confederated and obtained charters after settlement, and took their places in the colonial system as Connecticut and Rhode Island, although in the latter the connection between church and state was sligher than in Massachusetts.

There was an aristocracy in Massachusetts in 1765 as well as in Virginia, but owing to the smaller proportion of lower class whites in the former, and also to the fact that it was an aristocracy of wealth rather than of land, it had much less power in the State and became extinct during the Revolution.

The founders of Massachusetts and Virginia were of purely English birth and education, and their insti-

tutions are but the reproduction, survival or development of the institutions of England of the time of their settlement. The same cannot be said of the institutions of the other colonies in which non-English settlers from the north and south of Ireland, from Holland, Sweden, France, and South Germany formed an important, in some cases the most important, element. Their institutions present no such strongly marked characteristics, and it may be said that Maryland and those to the south of her followed the customs of Virginia, while the middle colonies, owing to the diversity of employments, and the concentration of settlements, resembled New England more than they did the Old Dominion.

(E. CH.)

COLONIZATION SOCIETY.—The process of abolishing negro slavery in the United States falls naturally into two periods: those of gradual and of "immediate" abolition. In the first period, that of gradual abolition, covering the years 1776–1830, very effective work was at first done by societies for the gradual abolition of slavery. Their work resulted in the initiation of the steps which gradually abolished slavery in all the States east of the Mississippi and north of the Ohio river and "Mason and Dixon's line" (between Pennsylvania and Maryland). The last of the "old thirteen" States to begin abolition of slavery was New Jersey (1804), and here the work of the gradual abolition societies came to a close. An opposing influence had appeared—too strong for them to overpower. The invention of the saw-gin by Eli Whitney in 1793 had linked negro slavery to the cotton monopoly of the Gulf States, and had made slave-breeding equally profitable in the Border States. The gradual abolition societies could do no more than mark out the area of the future Free States, and their meetings becoming more infrequent after 1804, soon stopped altogether. Their work had been done.

It was impossible, however, that the long-established abolition sentiment should succumb so suddenly. It had been for years the settled hope of all leaders, North and South, that slavery would find its own euthanasia. The abandonment of the hope of "gradual" abolition in the South left a vacuum, which was filled in 1816 by the organization of the American Colonization Society at Washington, in response to a colonization resolution passed by the Virginia legislature, Dec. 23, 1816. The corporate name of the association was "The American Society for colonizing the free people of color of the United States." Its "exclusive" object was to promote and execute a plan for colonizing, with their consent, the free people of color residing in our country in Africa, or such other place as Congress may direct. Its first President was Bushrod Washington, and for some twenty years most of the distinguished men of the country were connected with the Society as officers, members, or agents. Its meetings were common ground for such ill-assorted associates as Gerrit Smith, the Tappans, Birney, Benjamin Lundy, Frelinghuysen, Clay, Bishop Hopkins, Rives, and Fitzhugh. And for at least fourteen years it was the only organization whose influence had even the faintest tendency to check the expansion of slavery. To appreciate the condition of the sentiment of the country from 1816 until 1830 it is necessary to see how faint was the Society's tendency in opposition.

The exclusive object of the Society was to colonize free negroes; and this, not for the sake of the blacks, but for the sake of the whites. "Of all the descriptions of our population," said Clay, in a public address, "and of either portion of the African race, the free persons of color are the most corrupt, depraved, and abandoned." To get rid of this class was the exclusive object of the Society. It is true that many of its members had a vague idea that voluntary emancipation might be promoted by the existence of an agency prepared to colonize the freedmen. But a little reflection ought to have shown that the more brilliant the success of the Society might become, the more

effectually would this latter object be balked. If the Society could by any means emancipate and colonize so many as one-fourth of the slaves of the country, the only result would be to raise the value and price of the remainder, check emancipation, and drive slave-breeding to a still higher point of intensive industry. As an effort to remove negro slavery the work of the Society was a foredoomed failure.

But, in any respect, the Society had no brilliant success: its work was exasperatingly futile. It bought the territory near Cape Mesurado, now Liberia, in 1821, and made this its colonizing point. Its work there was placed in charge of Rev. Jehudi Ashmun, who remained in Liberia from 1822 to 1828. The society collected large amounts of money by voluntary subscription, which, with \$130,000 voted by Congress, amounted to nearly half a million in 1834. As a result of this expenditure the Society had transported to Liberia, 1816-1834, inclusive, 2122 free negroes and 809 freedmen. Between 1820 and 1830 the free-negro population increased from 233,524 to 319,599, and the slave population from 1,538,038 to 2,009,043. The influence of the Society in simply dealing with the increase may very easily be imagined. When we add that the annual increase of slaves, 1850-60, averaged 75,000, or nearly twenty-five *per cent.*, it is a staggering question whether the work of the Society could, in any number of centuries, have caught up with the mere annual increase of slaves, and begun an attack upon the vastly increased main body.

In fact, the only result of the Society's work was that it persuaded the whole country to "mark time" for fourteen years on the slavery question. It intended to do nothing, and it not only did nothing most efficiently, but brought in multitudes of its natural antagonists to assist it in the work. Its effect on the free-negro class in the South was far worse. It excited hopes and expectations in their white neighbors, which could only be disappointed by the work accomplished. The emigration of the free negroes was to have been altogether voluntary; in reality, moral and physical pressure was applied to the free negroes in every direction to coerce them into emigration. There were about 320,000 free negroes in the United States in 1830, and those of them who lived in the Southern States were pressed on all sides toward an opening a hundred times too small for their passage. Many of them escaped to other States; others were re-enslaved, voluntarily or by process of law; and the percentage of increase of free colored, which had been 36.87 *per cent.*, 1820-30, fell successively to 20.87 *per cent.*, 1830-40, 12.46 *per cent.*, 1840-50, and 10.97 *per cent.*, 1850-60. That this decrease was not due to the Colonization Society's work is apparent from the average number of colonists, 400 *per annum*, sent to Liberia by the Society, 1850-60. From 1820 until 1856 the Society sent to Liberia 9502 emigrants, an average of 264 *per annum*: the free negroes numbered 3676.

The slow work of the "gradual abolition" societies faded out about 1810. From 1816 until 1830 the country was marking time on the slavery question under the leadership of the Colonization Society. In 1830 the sudden demand of William Lloyd Garrison for "immediate" abolition threw the whole parade into confusion, and began a new period in the discussion which is considered elsewhere. (See ABOLITIONISTS.) The first point of attack by the "immediate" abolitionists was naturally the Colonization Society; and the Society's prospects of growth, if it ever had any, ceased and determined with the first attack.

See *The African Repository*, the Society's organ; the Reports of the Society (its address is Secretary of the American Colonization Society, Washington, D. C.); William Jay's *Inquiry into the Character of the Colonization Society* (in his *Miscellaneous Writings on Slavery*); A. Alexander's *History of West African Colonization* (1849); Stockwell's *History of the Republic of Liberia* (1868); *U. S. Census Reports*.
(A. J.)



COLORADO, one of the United States of America, takes its name from the Rio Colorado of the West, some of the main head-streams of which have their sources within its borders. Its area, according to the U. S. census of 1880, is 103,645 square miles. It is situated between the parallels of 37° and 41° N. lat. and between the meridians of 102° and 109° W. long. Its width from N. to S. is about 280 miles, and its length from E. to W. 370 miles. In area it is the third among the States, being exceeded by Texas and California only. Somewhat less than one-half this region came to the United States by the Louisiana purchase in 1804; those parts which lie south of the Arkansas River and west of the main chain of the Rocky Mountains were acquired in 1848 from Mexico, under the treaty of Guadalupe-Hidalgo. The Spanish title to this region took date from 1570, when Vasquez Coronado traversed it with his military force. It afterwards became a part of New Mexico, and early acquired a small Spanish-American population, principally seated in the valley of the Rio Grande.

Surface.—Colorado is by nature divided into several distinct and well-marked sections:

(1.) The *Great Plains*, which occupy over one-third of its eastern half, being the western border of the open and comparatively treeless country which slopes westward, with little break or variety of surface, from the Mississippi River to the foot-hills of the main Cordillera. Along these foot-hills the plain has a general altitude of nearly 5000 feet. (2.) The *Foot-hill Country* crosses the State from north to south, and has a breadth varying from 25 to 50 miles. This belt has some richly metalliferous districts, but is especially adapted to grazing, being well watered, tolerably well timbered, and in general very fertile. Its surface is diversified, and in some parts rocky and broken. (3.) The *Rocky Mountains* occupy a large area, ranging from north to south across the State in a succession of approximately parallel chains, themselves looped together by an intricate plexus of cross ridges, as well as outlying spurs and isolated groups. Indeed all the region lying west of the principal mountain-ridges is in general mountainous. Among the principal peaks as yet named and measured are the following: Blanca Peak, the highest in the State, and one of the highest in the whole country, 14,464 feet; Mt. Harvard, 14,408; Long's Peak, 14,271; Pike's Peak, 14,147; Holy Cross, 14,176; Mt. Æolus, in the S. W., 14,054; Mt. Wilson, 14,280; Uncompahgre Peak, 14,238; Mt. Bowles, 14,106; Mt. La Plata, 14,126; Mt. Elbert, 14,150; Mt. Massive, 14,368; Castle Peak, 14,106; Mt. Ouray, 14,043; Mt. Yale, 14,151; Mt. Lincoln, 14,123. Among the separate ranges there are in the N. W. the Sierra Escalante, the Elkhead Range, and the Boan Mts. farther S.; in the N. E. the great Snowy Range, here the main ridge, and continuous to the N. W. with the Medicine Bow Mts.; in the S. W. quarter the Elk Mts., the San Miguel, the Uncompahgre and the La Plata Ranges and the great Sierra San Juan; and in the S. E. the Raton, the Sangre de Cristo, the Wet, and other ranges. There are said to be probably over a hundred peaks exceeding 13,000 ft. in height, and many which are over 14,000 ft., some of the latter being unmeasured and many unnamed. Of the

Rocky Mountain passes in this State Argentine is the highest, being 13,000 feet above the sea, and can be used only in the summer. There are five others above 12,000 feet high, and seven below 10,000 feet.

Nearly all the towns in Colorado are situated in the mountain region, and the remainder are chiefly in the foot-hills. The mountains are crossed by numerous passes. Kenosha Divide is crossed by the Denver and South Park Railroad at the height of 10,139 ft.; Jefferson and Webster stations on that road have respectively altitudes of 9754 and 9120 ft. The city of Georgetown is 8514 ft. above tide; Raton Pass, on the Atchison, Topeka, and Santa Fé Railroad, 7863 ft.; Denver, the State capital, 5197 ft.; Leadville, a celebrated mining town, 10,247; Present Help mine, 14,000 ft. There are several mining-camps at or near 10,000 ft. high. Over 500 sq. m. of the State's area are above 13,000 ft., and some 10,000 sq. m. are between 9000 and 10,000 ft. The Argentine Pass is 13,100 ft. high. The lowest point in the State is over 3000 ft. The valleys, many of them deep and narrow, but others wide, are very generally timbered and well watered. When these valleys become very spacious they are termed *parks*. The North, Middle, South, and San Luis are the largest. The park lands are level or undulating, forming natural lawns, hill-sides and dells of great beauty, the vegetation in its season being abundant and botanically interesting. These parks are regarded as former lake-basins, some remnant of the former watered area frequently remaining. These beautiful mountain walled parks, with their enclosed lakelets, are among the most attractive features of this grandly featured State. Other interesting characteristics are afforded by the cañons, or deeply ploughed channels, along which flow the rivers, chiefly those of the W. and S. W. The walls of these cañons are often perpendicular, and in some cases they incline inwards. The Gunnison or Black cañon winds its way for miles between walls over 3000 ft. high, and from 300 to 600 ft. asunder. Other remarkable cañons are those of the Arkansas and the Uncompahgre. The former is well known to tourists, being traversed by a line of railway which displays astonishing engineering skill and daring. On the W. side of the main mountain-axis are extensive arid plateaus, or elevated treeless plains. Here are also *mesa* lands, or flat-topped tables of land, bounded entirely or in part by steep scarps, or walls up which it is difficult to climb. These are often well supplied with grass on the top, and are quite frequently of large extent, but water is generally difficult to find. The plateaus and mesa lands generally are from 5000 to 8000 ft. high. A good part of this western versant has been until latterly a reservation for the Ute Indians; and this region is comparatively unpeopled, and some parts are little known to white men.

Rivers and Lakes.—Colorado, like most other regions with many remarkably high mountains, is a grand hydrographic centre. Here rise the South Platte, the Arkansas, the Rio Grande del Norte (all flowing to the Atlantic by way of the Gulf of Mexico, the last named stream directly, the others mediately), and the San Juan, Dolores, Gunnison, White, and Tannah, all principal head-streams of the Colorado of the West, which receives all the waters of the Pacific versant of this State. None of the streams are navigable. Many of the minor streams have cascades of great beauty. The streams of the eastern slope are largely utilized in irrigation works; but many of the rivers and creeks, chiefly in the W., flow in cañons so deep that they can never be diverted into irrigating canals. The presence of lakes or lakelets in many of the mountain valleys has been already noticed. Of these, the lowest is over 7000 ft. high, and Chipayo Lake, the highest, has an altitude of 11,500 ft. The eastern plains are in general but scantily watered.

Climate.—Like all mountain countries this State

has many climates at once. At midsummer the plains and foot-hills sometimes become heated and uncomfortable; but the higher mountain towns have a very agreeable summer climate. The foot-hill country has a mild winter climate, the snow never becoming very deep and seldom lying long. Sharp thermal changes are common, but they do not so readily affect the sensations as in lower and moister regions.

As the climatology of Denver, situate 5197 ft. above sea-level, fairly represents that of both the plains and the foot-hill country, we append its weather record. By this the mean monthly temperature appears to have been nearly as follows: January, 28°; February, 35°; March, 36°; April, 49°; May, 61°; June, 64°; July, 74°; August, 71°; September, 63°; October, 51°; November, 38°; December, 28°; the highest temperature, during this period, 98°, having been reached in the month of July—lowest, 20° below zero, occurring in the month of January; annual average of precipitation, snow and rain, 15 in. of water. There occurred during this time a yearly average of 162 clear days; 135 that were fair or partly clear; 15 that were cloudy but not stormy, and 53 that were more or less stormy, there having been but few entirely stormy days in any year. Not very often, in fact, do either snow or rain fall here continuously for 24 hours. The season of snow-falls reaches from November till March, the most of the rain falling during the later spring and the summer months, and occurring in the form of showers. The line of perpetual snow ranges between 12,000 and 13,000 ft., although in some places, as on the northerly slopes of the mountains and where it drifts into deep cañons, it lies throughout the summer much lower down. It is one of the thermal peculiarities of this region that a strong west wind in the winter, though passing over more than a thousand miles of snowy mountains and elevated deserts, is apt to be dry and warm, the snow disappearing rapidly before it. On the other hand a wind from the east is usually more cold and damp. The climate of Colorado is generally favorable to physical vigor and health, there being here few diseases of an endemic kind. Fever and ague are not common, though rheumatic ailments and mountain fever prevail to some extent. A residence in almost any part of the State is so apt to benefit persons suffering from bronchial and pulmonary complaints that it may be considered a sanitarium for this class of invalids.

There are in Colorado a large number of mineral springs, for which great medicinal virtues are claimed. To some of these springs large numbers of the sick and infirm repair every summer.

Flora and Fauna.—Colorado is tolerably well wooded throughout the mountainous districts, and the country almost everywhere is fairly stocked with animal life. The plains to the east are without trees except belts of cottonwood, aspen, willow, and like inferior timber along the rivers. To supply this deficiency, tree-culture is being practised by the settlers, not yet numerous, in this part of the State. The timber on the foot-hills and mountains consists mostly of pine, spruce, fir, hemlock, and cedar, with a little oak and some other hard woods in the valleys and along the foot-hills. These mountain forests up to an altitude of 9000 or 10,000 ft. are composed mostly of large and stately trees, the growth above this being more sparse and scrubby up to the edge of the timber line, which occurs at a height of about 12,000 ft. Most of the plants and shrubs found elsewhere in the Rocky Mountains or common on the western plains are here indigenous, the country everywhere save in the denser forests being in spring-time covered with wild flowers, bright hued and graceful, but lacking in perfume.

In the zoölogy of Colorado the buffalo or wild bison stands foremost, immense herds of these animals being found on the lowlands of the State, which have ever been one of their principal habitats. Though

destroyed of late by thousands every year, they still swarm over parts of the vast campaign, where they are pursued by the hunter, as a matter of business, and by the pleasure-seeker, for sport. At the rate they are being killed off, the buffalo, as a denizen of the country, must suffer extinction. There are found two or three species of the deer and as many of the wolf family; some hares, with more valuable fur-bearing animals. Prairie dogs by the million inhabit these plains. In the uplands, besides deer, hares, and wolves, bears, panthers, wildcats, beavers, and otters, with much small game, including wild fowl of various kinds, are more or less plentiful. Antelopes of two kinds (one called mountain goat), and the Rocky Mountain sheep, are also found.

Agricultural Resources.—While the more immediate resources of Colorado's wealth lie in her mines, she still possesses a considerable amount of good farming with an immense extent of first-class grazing lands, Colorado ranking 4th as a cattle and 13th as a sheep-raising State. Her standing as regards agricultural products furnishes no just criterion of her capacities in that direction, the most of her population being engaged in mining, stock-raising, and other pursuits. In the several particulars named below her standing among the States and Territories is as follows: in the production of barley, 24; wheat, 27; oats, 32; corn, 37; horses, 36. The great drawback to agricultural pursuits here is the necessity that exists for irrigation, without which no crop, whether of grain, vegetables, or fruits, can be matured; the application of artificial moisture in the case of fruit trees, vines, etc., being necessary only for two or three years at first, until the plantings get well rooted. The more delicate fruits and vegetables cannot well be grown in this State owing to the occurrence of frosts late in the spring and early in the autumn. All the hardier varieties, however, with the aid of irrigation, thrive and mature everywhere except in the higher mountains. The cereal crops with proper care yield well, wheat at the rate of about 20 bushels per acre. The wheat crop of the State amounted in 1883 to a little over 2,500,000 bushels, all of superior quality. The corn crop was 530,000 bushels; oats about 1,200,000; barley, 200,000 bushels; potatoes, 1,000,000 bushels; the hay crop, formerly 50,000 tons yearly, is steadily increasing; value of dairy products, \$400,000; of gardens, \$250,000.

For bringing water on the land for irrigating purposes many ditches have been made, some of these being long and costly structures. The Larimer and Weld Canal, which takes water from the Cache-la-Poudre, has a total length of 54 miles, with a capacity to irrigate 120,000 acres of land. The Greeley colony has nearly 40,000 acres of fertile land under ditch, the most of it in a high state of cultivation, and there are other proprietors, individual and corporate, who have reclaimed large tracts by bringing water upon them. The total amount is nearly 3,000,000 acres.

Besides the unseasonable frosts and the aridity of the climate the Colorado husbandman and horticulturist have a variety of insect pests to contend with. The most formidable of these is the grasshopper, or Rocky Mountain locust, which formerly gave much trouble, devouring every green thing; but of late years these insects have caused less damage, the cultivators of the soil having found means to check their ravages.

Stock-raising has proved a very profitable industry in Colorado, the conditions for conducting this business on a large scale being here exceedingly favorable. With the exception of work animals, neither horses, neat cattle, nor sheep receive winter-shelter or fodder, and yet they keep in good condition for most of the time, not generally becoming very poor, even in winter. If the winter proves very severe, as occasionally happens, much stock is lost through cold and starvation, but the owner, finding it cheaper in the long run to

incur these losses than to make provision against them, leaves the animals to take their chances. Despite these losses, and a general lack of care, domestic animals, feeding on the nutritious grasses so abundant in this country, multiply rapidly. Colorado has nearly 1,500,000 head of neat cattle and nearly 3,000,000 sheep, notwithstanding large numbers of these animals are slaughtered for home use, or sent out of the State every year. The annual shipments of beef cattle east by rail average now nearly 100,000 head; the annual wool product of the State approximating 6,000,000 pounds. The stock of both sheep and neat cattle, which lately consisted for the greater part of the gaunt Mexican breeds, has been much improved by the introduction of blood animals. The values of cultivated lands, including improvements, may be roughly estimated at \$20,000,000; value of horses and mules, \$7,000,000; neat cattle, \$35,000,000; sheep, \$9,000,000. The annual receipts, gains, and profits arising from farming in all its branches, and from sheep and cattle-raising, sales and increase included, may be set down at \$20,000,000 for the whole State. The assessed valuation of all the taxable property in the State amounted in 1878 to \$43,055,419, and in January, 1884, it had risen to \$110,759,756.

Mines and Mining.—Gold placers were first found in Colorado in 1858, the site of this discovery being on the head-waters of the South Platte, a region afterwards known as "Pike's Peak." The reports of this "find" spreading through the East, a heavy emigration set in towards the new diggings the following spring, and for several years was kept up with little abatement. As additional deposits continued to be discovered, giving profitable employment to a large population, a considerable production was made here from the first; the out-put of gold during the ten years following 1859 having averaged about \$3,000,000 per year. The most of this was gathered from the placers, though the contributions of the auriferous quartz veins, which meantime had begun to be worked, amounted to some twenty or thirty per cent. of the whole.

After the more tractable surface deposits had been exhausted and the highly sulphureted or otherwise refractory ores were reached, defeating their successful treatment by the inefficient processes then in use, quartz mining experienced a great set-back, from which it did not so far recover as to become an active factor of bullion production, until about 1870, since which time the business has made steady advancement.

Although argentiferous ores were discovered at an early day silver did not begin to figure much in the bullion returns of the country until 1868, gold in point of value remaining the preponderating metal up till 1873, when silver took the precedence, which it has held ever since, the disproportion of late years having been as 3 to 17. Prior to 1874 most of the richer silver ores were shipped out of the country, only very inefficient means for reducing this class of ore having been provided near the mines. With the erection of smelting works about that time silver and lead began to be turned out, and great quantities of metal have since been produced by the many smelters brought into operation, some of which are of large capacity.

Colorado ranks first among the States and Territories in production of silver, and third in production of gold. While no very accurate statistics have been kept of the bullion production in the earlier years, the total amount approximates \$300,000,000, value of gold and silver. According to the most authentic accounts the annual product during the past twelve years has been in round numbers as follows: 1872, \$3,800,000; 1873, \$4,000,000; 1874, \$5,400,000; 1875, \$5,450,000; 1876, \$6,200,000; 1877, \$7,400,000; 1878, \$10,000,000; 1879, \$19,000,000; 1880, \$20,000,000; 1881, \$21,000,000; 1882, \$26,000,000; and 1883, \$26,306,131. The value of the gold, silver, and lead

turned out during the past five years in the Leadville district has been as follows: 1878, \$3,152,825; 1879, \$10,333,740; 1880, \$15,025,135; 1881, \$13,147,257; 1882, \$26,000,000. Of the above product about twenty per cent. consisted of lead, and the balance nearly all of silver, the value of gold amounting to hardly more than one per cent. of the whole.

As a great number of mines have now been opened and fitted with hoisting and reduction works, and railroads have been built into most of the important mining districts, the metallurgical difficulties that formerly caused so much trouble having, meantime, been pretty well overcome, it may be expected that the bullion product of Colorado will render a marked increase for some time to come. Should an annual increment of ten per cent. be made for the next decade, doubling the present product at the end of that time, it would only fulfil the anticipations of those best acquainted with the resources and the industrial outlook of the State.

Besides gold, silver, and lead, Colorado abounds with deposits of the useful metals; being rich also in nearly every metal of economic value. Some of the more accessible of the deposits of coal and iron have already been extensively and profitably utilized, the iron ore worked being nearly free from sulphur, phosphorus, and other injurious substances, and containing on an average sixty per cent. of metallic iron. These ores are of many varieties: hæmatite and magnetite being the prevailing kinds. The total product for 1882 was valued at \$2,650,000. The total product for 1883 was 47,100 tons. The Bessemer Steel Works, erected by the Colorado Coal and Iron Company, at South Pueblo, have capacity to make 30,000 tons of steel rails per annum. This company owns over 100,000 acres of iron, coal, and other mineral-bearing lands in the State, and has erected large furnaces at different points for smelting its iron ores: one of these works, the Calumet, near Salida, being situated at an elevation of more than ten thousand feet. While the most of the coal deposits owned by this company are of the bituminous variety, extensive beds of anthracite have been opened up in the Gunnison country which contain over ninety per cent. of carbon. As some of this coal can be coked readily, there have been put up at El Moro 250 ovens that are kept constantly employed in the business of coking. Being cheap and of good quality, mineral fuel is entering into extensive use, being employed not only for domestic purposes but also for generating steam on the railroads and in the crushing mills, many of the large smelters also using it. The coal is, however, of triassic origin. In 1883 the total output of all kinds of coal in the State was 1,220,638 tons. The total production of coke was 149,277 tons. Although copper ores of high grade have been found in many parts of the State, but little has been done with them. Common salt is abundant in Colorado, occurring in springs, on surface incrustations, in numerous places. Sulphur and gypsum are also plentiful, while the finding of opals, chrysolites, and other gems has from time to time been reported. Whether precious stones exist in such quantity as to be worth extended search remains to be determined.

Railroad System.—None of the States or Territories west of the Mississippi have been so well supplied with railroads as Colorado: these avenues of travel and traffic penetrating very generally the eastern, southern, and middle portions of the State. The railways completed and in operation within the State aggregate 2954 miles in length, there being several hundred miles of track projected, some parts of which are in course of active construction. One company, the Denver and Rio Grande, own and operate 1317 miles of railway, and are constantly extending their completed roads, or building additional branches for the accommodation of side localities. Into districts known to be rich in minerals, but which, owing to the

difficulty of reaching them have been but little settled, this company has to some extent adopted the policy of building roads in advance of business and population, trusting to the growth which would follow cheap transportation for remunerative returns. Besides short local roads this company has completed a railway reaching west several hundred miles to Salt Lake City, Utah. The most of the country traversed by this work is rough and mountainous, presenting formidable obstacles to railroad construction. Although railroad building in Colorado, except on the plains, has been attended with heavy expense, these enterprises, by reason of the rapid growth of the country, are likely to prove profitable: many of them having already made large net earnings. The total length of track in 1884, including sidings, is 4000 miles, and the assessed value of railroad property is \$20,224,293. Over two-thirds of the mileage consist of the standard broad gauge, the narrow track being confined mostly to the mountainous districts. In the construction of these mountain roads, some of which reach great elevations, approached over steep grades and through rocky cañons, immense engineering difficulties were encountered, which have, however, been boldly met and skilfully overcome.

History.—As early as 1859 movements began in Colorado looking to the framing of a State government. Accordingly a constitution was that year drafted, but on being submitted to the people for adoption it was rejected. In 1861 Congress organized a government for the Territory. William Gilpin, a member of the Society of Friends, was appointed Governor, and H. P. Bennett was elected Delegate to Congress. In 1862 Gilpin was succeeded by John Evans as Governor. In the next year Congress having passed an enabling act, a convention was held and a constitution framed. This constitution on being submitted to the people was also rejected, but by such a small majority that the effort was renewed in the following year, and the same constitution, with some modifications, was adopted. Congress thereupon passed a bill admitting Colorado into the Union. But this bill having been vetoed by President Johnson, the people were still left under the territorial form of government. In 1875, the State movement having meantime been revived, Colorado was authorized by act of Congress to frame a constitution. This was done by a convention, and the result ratified by the people, July 1, 1876. On July 4 of that year Colorado was admitted into the Union, and hence is sometimes called "the Centennial State." In accordance with the requirements of its constitution Colorado has no bonded debt. Its total indebtedness on Nov. 24, 1883, consisted of warrants outstanding, \$524,045; certificates of indebtedness, \$19,833; making a total of \$543,881. The revenue of the State for 1883 amounted to \$583,125. The State warrants bear interest at six per cent.

Population, Leading Cities and Towns.—According to the U. S. Census of 1880 Colorado contained 196,649 inhabitants. This number was ascertained to have increased to 219,850 in 1881. The school census taken in 1884 showed the number of persons between the ages of six and twenty-one to be 53,426, and a total population of not less than 312,000. According to local authorities the number of inhabitants in the leading cities and towns of the State was as follows: Denver, capital of the State, 60,000; Leadville, county-seat of Lake county and metropolis of the carbonate region, 25,000; Pueblo, North and South, 15,000; Georgetown, 7000; Central and Black Hawk, 9000; Greeley, 4000; Kokomo, 3000; Lake City, 2500; Silver Cliff, 2000; Silverton, 1500; Trinidad, 3000; Rosita, 2000; Golden, 4000; El Moro, 1000; Cañon City, 2000; Boulder, 5000, there being a large number of agricultural towns, mining camps, and railroad centres throughout the State containing from two or three hundred to a thousand inhabitants each.

(H. D.)

COLORADO POTATO BEETLE.—This beetle was first described by Thomas Say, from specimens collected in the region of the Upper Missouri, as *Doryphora 10-lineata*. Its original food-plant is *Solanum rostratum*—a common western species. As the cultivation of the potato reached the native home of the beetle, this last gradually acquired the habit of feeding upon it, and then began its historic spread towards the East. In 1859 it had reached a point 100 miles west of Omaha, Neb., and in 1864 and 1865 it crossed the Mississippi River into Illinois. In its eastern spread from this point it was a noticeable fact that the southern columns lagged far behind the northern ones. In 1869 it reached Ohio. In 1871 it was found in New York and Pennsylvania, and in 1873 it had reached the extreme eastern limit of these States. In 1875 it arrived at Boston, and in 1876 spread along the sea-coast of New England, extending as far north as Quebec, and south into Virginia.

Its natural history may be thus summed up: It hibernates in the beetle state beneath the surface of the ground or under rubbish. The eggs, to the number of from 500 to 1000, are laid in spring, mostly on the underside of the leaves. The larvæ hatch in less than a week, attain their full growth in from two to three weeks, pupate under ground, issuing again as beetles in a little more than a month from the time of the hatching of the eggs. There are two or three broods in the course of the season, the number depending upon the latitude. Its food-plants include most of the Solanaceæ, and when hard pressed it will feed for a while on the garden cabbage, the common thistle, and many of our common weeds. Among its natural enemies may be mentioned several species of insectivorous birds, several spiders, a mite, which has been described as *Uropoda Americana*, two or three species of wasps, a number of the useful little Ladybirds (*Coccinellidæ*), many species of Ground-beetles (*Carabidæ*) and Tiger-beetles (*Cicindelidæ*), a species of Rove-beetle (*Philonthus* sp.), many of the soldier-bugs, a Tachina-fly (*Exorista doryphora*, Riley), and an Asilus-fly (*Protocanthus milberti*, Macq.).

Remedies.—Where the "potato-bug" is to be fought in small gardens, many are led, from fear of the poisonous qualities of Paris Green, to prefer the more laborious method of hand-picking. The beetles are crushed with gloved fingers, or are knocked into pans and then destroyed with hot water or kerosene. The use of London Purple or Paris Green, mixed with flour or dissolved in water, will, however, be found the cheapest and most efficacious of all proposed remedies, and it has been repeatedly shown that the danger from the use of these poisons may, with proper care, be reduced to almost nothing, since they do not influence the soil and are not absorbed by the plant. Paris Green may be diluted with from twenty-five to thirty times its weight of flour, and still be efficacious, and, dissolved in water, the proportion is, roughly, one tablespoonful of the Green to a bucketful of water.

(C. V. R.)
COLORADO SPRINGS, the county-seat of El Paso co., Col., is on the Denver and Rio Grande Railroad, 10 miles east of Pike's Peak, and 75 miles south of Denver. It has 3 banks, an opera-house, 2 daily and 3 weekly newspapers, 9 churches, good public schools, and is the seat of Colorado College, and of the State Institution for deaf-mutes and blind. It contains the offices of the Denver and Rio Grande Railroad, and the Colorado Coal and Iron Company. It has water-works, gas-works, a telephone system, a good system of irrigation. It was founded in 1871 by Gen. W. J. Palmer, and, on account of its beauty and

salubrity, has become a fashionable summer resort. Population, 4226.

COLOR-BLINDNESS, that is, inability to distinguish separate colors, must have existed from time immemorial, but no record of a case is found with a description of the failure to distinguish colors until 1777, when Mr. Huddart wrote of a man who demonstrated conclusively that he could distinguish only



Colorado Potato Beetle.

white and black. He could not name nor match any of the various colors placed before him. He could not discern fruit by its color on the trees but only by the shape.

In 1779 a Mr. J. Scott wrote that he was unable to see colors as others see them. In 1794, Dalton, an English chemist, gave a description of his own inability to distinguish red from green, which attracted some attention at that time, so that this chromatic defect was called "Daltonism." Even after this publication the defect was little noticed, being classified as one of the rare anomalies of vision. No attempt was made to examine the mass of the people to see to what extent it could be found. Only two further cases were reported: one in 1816 and the other in 1818. Only within the past few years has proper attention really been drawn to it, and interest enough taken to examine the people for the estimation of the percentage among them of this chromatic defect, and to study its causes and effects in relation to man's dangers and inconveniences therefrom.

This attention arose by the discovery, on investigating the causes of some railroad accidents, that the engineers did not and could not distinguish the signals of danger that were displayed. This caused scientific men to make general examinations of train-hands for the elucidation and explanation of some of the unaccountable accidents that had occurred upon the railroads. The discoveries were so interesting that these examinations soon extended throughout the schools to find out the ratio of defect, as well as grades of defect, among the children. Naturally, from these examinations, some general laws and classification of this peculiar visual condition have been deduced.

Prof. Holmgren, of Upsala, Sweden, was the first to go thoroughly into the examination and physiological study of color-blindness. He accepts the Young-Helmholtz theory of Color-perception (see EYE in the *ENCYCLOPÆDIA BRITANNICA*), "That nerve-fibres in the retina are excited by waves of light, and the development of color arises from the action of longer or shorter waves upon certain fibres, producing the sensation of a color according to the length of the waves. Long waves excite fibres sensitive to red; medium, those sensitive to green, and short, those sensitive to violet." He says, "That color-blindness in each case is a genuine blindness to one of the primary colors, and that therefore three classes of blindness are to be distin-

guished: Red-blindness, Green-blindness, and Violet (blue) blindness.

Red-blindness is due to the absence or paralysis of the nerve fibres or organs perceiving red, leaving but the two fundamental colors, green and violet. According to Helmholtz: "Spectral red feebly excites the perceptive organs of green and less so those of violet, and consequently to a red-blind person red appears a saturate green of feeble intensity into which a sensible portion of the other colors enter. Feebly luminous red does not sufficiently excite the perceptive organs of green in the red-blind, and it seems then black. Spectral yellow seems to them green and intensely luminous, and thus causing them to call all green tints yellow." Holmgren shows that it is clear that a red and green light excite one and the same element in the red-blind, and an object of these colors must appear of the same color.

Green-blindness arises from the absence or paralysis of the perceptive elements of green; leaving but two fundamental colors, red and violet. The spectrum of a green blind is: the red appears as an extremely saturated red, but somewhat less intense than the normal red which is more yellowish, as green forms part of it. Blue is violet, and violet is less intense than normal. The tints most luminous to the green-blind are orange and indigo blue, while red and green are the same color.

Violet-blindness is due to the absence or paralysis of the elements perceiving violet, leaving the two fundamental colors red and green. To such the red is purer than normal; yellow is as a combination of the primitive colors that form white. Green is strongly luminous, but whiter; blue is a green of moderate luminosity, and violet is a feeble green. To the violet-blind red and green are not confused.

Violet-blindness is very rare, while red and green are comparatively common. The greatest number found is that of red-blind.

Holmgren has divided this chromatic defect into three grades of intensity:

1. Total color-blindness (Achromatopsia). A condition in which there is entire absence of the perception of colors. Only black and white and the different degrees of intensity of light can be perceived. Everything looks in black and white like a photograph. This grade is very rarely found congenital, but mostly follows some disease of the brain or optic nerve.

2. Complete color-blindness (Partial Achromatopsia). In which there fails the perception of one of the fundamental colors, red, green, or violet; in this group is classed red-blind, green-blind, violet-blind; and generally the congenital cases can be placed here. One born color-blind will always remain so, no matter how assiduously he attempts to educate his eye. He will not be able to see the colors in the normal way nor with the normal promptness. He does not really see the color, although he may make some kind of a distinguishment by the intensity or luminosity, and this power of distinguishing may sometimes be improved by practice.

3. Incomplete color-blindness (Dyschromatopsia). This is more frequent—this is complete "Daltonism," and consists in a reduced sensitiveness in recognizing some one or more of the fundamental colors, and especially the shades of that color, even when the primitive color may be distinguished. The perception is not so sharp and clear in certain shades as in others. This grade of defect can be very greatly remedied by education.

Magnus, of Breslau, has added a fourth grade of color defect, which he calls "Dullness or sluggishness of color distinction" (Farbenträgheit). This defect is characterized by the person first sorting out colors, by laying many shades of different colors together, just as he would do if color-blind; but, on examining them again to see if correct, the mistake is noticed and they

are re-sorted correctly. In such cases the color perception, though slow, is otherwise normal.

Of the examinations now made throughout the world, in the schools and in the railroads, about 3.5 per cent. of males are born color-blind, while in females only about 1 per cent. has been found.

To the red and green-blind, black, white, yellow, and blue are generally clear and distinct, and seen as others see them. The red-blind person sees lower-tone red shades up to crimson, in yellowish tints; and then a gray or colorless hue presents itself in the brighter or higher tones of crimson. When the red shade runs into a lake, a bluish tint comes on, and increases in value as the red runs into violet. With the green-blind, the green when pure is invisible, and appears gray; but when it is mixed with yellow or blue (as most greens are), the patient sees those elements only.

A violet-blind person will lose the yellow in reds and the blue in greens, according to the shade of the violet, whether on the yellow or bluish order, so that a red-dish-violet will look clear, sharp red, and a bluish-green will be a clear, distinct green. But if the violet is feeble in tone it becomes black.

For the more thorough study of color-perception and color-blindness, consult especially Helmholtz' *Physiologische Optik* (1867), Kaiser, *Compendium des Physiologische Optik* (1872), Holmgren, *De la Cécité des Couleurs*, etc. (1877), *Translation by the Smithsonian Institute* (1878), Jeffries, *Color-blindness, Its Danger and its Detection* (1879), Cohn, *Studien über Farbenblindheit* (1879), etc. (P. D. K.)

COLTON, CALVIN (1789–1857), an American minister and author, was born at Longmeadow, Mass., in 1789. He graduated at Yale College in 1812, studied theology at Andover, and was ordained in 1815 as a Presbyterian minister at Batavia, N. Y. On account of the failure of his voice he gave up preaching in 1826, and became a contributor to the press. In 1831, after having travelled through the United States, he went to England as a newspaper correspondent. During his residence there he published *The Americans, by an American in London*, and other books, to diffuse more correct ideas with reference to the people and institutions of the United States. Returning to New York in 1835, he published *Four Years in Great Britain*, and soon after an anonymous work called *Protestant Jesuitism*, attacking the course of some prominent religious societies. His next work, *Thoughts on the Religious State of the Country, and Reasons for Preferring Episcopacy*, published in 1836, was occasioned by his change of church relation. After 1838, for several years, political subjects chiefly occupied his attention, and his writings were considered a valuable aid to the Whig party. He opposed the abolition of slavery, which then began to be urged by the Liberty party, and favored the colonization movement. His *Life and Times of Henry Clay* was prepared with the sanction and assistance of that great statesman, and published in 1845. In the same year Colton wrote *The Rights of Labor*, and in 1848 a larger work on *Public Economy in the United States*, advocating the protective system. In 1852 he was made professor of political economy in Trinity College, Hartford. He died March 13, 1857, at Savannah, Ga., whither he had gone on account of failing health. His last literary labor was connected with his complete edition of the *Writings and Speeches of Henry Clay*. Mr. Colton also published *The Genius and Mission of the Protestant Episcopal Church in the United States*.

COLUMBIA, the county-seat of Boone co., Mo., is the terminus of the Columbia branch—22 miles long—of the Wabash, St. Louis, and Pacific Railroad, and is 140 miles west of St. Louis and 10 miles north of the Missouri River. It has a court-house, 2 national banks, 3 weekly newspapers, 1 monthly and 2 quarterly reviews, 7 churches, 2 female colleges (Stephens and Christian), public schools for white and for colored children. It is the seat of the University of the State of Missouri, which was founded

in 1840, and has connected with it the State Agricultural College. The university has excellent buildings, grounds, apparatus, and library, while the Agricultural College has a farm, horticultural garden, and green-house, near the town. On the grounds is a fine mineral spring. The industries of the town comprise 2 flour-mills, a wagon-factory, woollen-factory, and a distillery. It is lighted with gas, and has paved and well-shaded streets. Population, 3326.

COLUMBIA, a town of Lancaster co., Pa., is on the east bank of the Susquehanna River, 81 miles west of Philadelphia, on the Pennsylvania Central Railroad, the Reading and Columbia Railroad, and the Columbia and Port Deposit Railroad. The Susquehanna River is here crossed by a bridge more than a mile long. Columbia has an opera-house, 3 banks (1 national), several hotels, 3 weekly newspapers, 14 churches, 16 public and 6 private schools. It has 2 rolling-mills, 3 foundries, 2 factories, a saw-mill, 2 grist-mills, 3 machine-shops, 2 round-houses, a stove-factory, and tannery. It has gas and water-works. It was settled in 1726 by English Quakers, and incorporated in 1814. It was at one time proposed for the national capital. Its property is valued at \$2,688,000, and its public debt is \$140,000. Population, 8312.

COLUMBIA, the capital of South Carolina, and county-seat of Richland co., is on the east bank of the Congaree River, near the centre of the State, in 33° 59' 58" N. lat., and 81° 2' 3" W. long. It stands about 200 feet above the river, which is formed here by the confluence of the Broad and Saluda Rivers, and 336 feet above the sea. The Congaree River is here about 1800 feet wide, and falls 36 feet within the town limits. It is navigable from the lower end of the city for steamboats, but this waterway is neglected. A canal, six miles long, also formerly united the navigation of the Congaree and the Saluda, and a shorter canal extended from the Congaree to the Broad. These canals might be utilized so as to afford great water-power. Four railways enter the city, the Charlotte, Columbia, and Augusta, the South Carolina, the Greenville and Columbia, and the Wilmington, Columbia, and Augusta. The town is two miles square, regularly laid out, with wide and well-shaded streets, the roadways being macadamized and the sidewalks paved. Among the public buildings are the handsome granite State-house, the U. S. Court-house and post-office, also of granite; a handsome city-hall, and opera-house, the court-house and State penitentiary, and the fireproof buildings of the insane asylum. The South Carolina University has fine buildings, enclosed in grounds containing about sixteen acres. This institution, founded as the South Carolina College, in 1802, has had a varied history; it was closed in 1862, and on reopening in 1866 was made a university. In 1877 it was again closed, but in 1880 it was revived, with two branches—the South Carolina Agricultural and Mechanical College, at Columbia, for whites, and Claflin University, at Orangeburg, for blacks. There are also male and female academies and other private schools, 15 in all, and 3 public schools. The Presbyterian Theological Seminary has fine buildings, and has always had a high reputation. Columbia is noted for the beauty of its public and private grounds, squares, and drives. The State Agricultural Society has extensive fair grounds which, each November, are thronged with visitors. The city has 14 churches, 4 daily and 4 weekly newspapers, 2 national and 3 other banks, and fine blocks of business houses. The amount of business transacted annually is estimated at \$2,500,000. By the census of 1880 the industries of the city comprised 52 establishments, with a capital of \$141,000, and employing 293 hands. The value of the products was \$842,732. This statement did not include the railroad shops, gas-works, granite-quarries, and some other industries. Columbia was founded in 1787, in pursuance of an act of the legislature, and became the State capital in 1790. In 1865, at the

time of its occupation by the national army, it suffered greatly from a conflagration. Its population in 1870 was 9298, and in 1880 it was 10,036.

COLUMBIA, the county-seat of Maury co., Tenn., is on the south bank of Duck River, 45 miles south of Nashville, on the Louisville and Great Southern Railroad, and it is a terminus of two other railroads. It has an opera-house, 4 hotels, 2 national banks, 1 other bank, 2 weekly newspapers, 7 churches, 7 schools, and 2 female colleges. Its industries comprise 3 factories, manufacturing trunks, chairs, ploughs, and carriages, and several flour-mills. It is lighted with gas and has water-works. It was settled in 1808. Its property is now valued at \$2,500,000. Its public debt is \$50,000. Population, 3400.

COLUMBIA, BRITISH, has a sea-frontage of 560 miles, without taking account of its minor indentations. To the S. its limit is the parallel of 49° N. lat., which divides it from the United States Territories of Montana, Idaho, and Washington; on the E. lie the new Canadian Territories of Alberta and Athabasca, divided from it, except towards the N., by the eastern ridge and water-shed of the Rocky Mountains; north of it are parts of the old Canadian North-western Territory, the parallel of 60° N. lat. being the N. limit of the province. The western line is the ocean-front, except towards the N., where Alaska occupies a narrow strip of territory for some 350 miles. Its grand shore-line of 560 miles is greatly multiplied by minor convolutions; and it is officially stated to extend to 7181 statute miles, of which 1723 belong to Vancouver's Island, 684 to Queen Charlotte's Islands, 334 to Graham Island, and 250 to Moresby Island. There are off the coast 52 islands noteworthy for their extent. The area of the province is given as 355,999 square miles; that of Vancouver is about 12,000 square miles. Graham Island has some 1500 miles of area, and Moresby about 1000 miles. The climate is very mild on the coast, and though rainy it is remarkably healthful. East of the Cascade Range the climate is much drier, and in some parts the country becomes arid. The high plateaus have an intensely cold winter climate. The interior "Sea of Mountains" has large tracts of excellent grazing land, with fertile and arable valleys; and some sections of the interior promise well for wheat. But in general the arable soils do not occur in large tracts. On the coast the best soils are densely wooded; hence the cutting and shipping of timber form a leading interest. The principal towns are Victoria, the capital, on Vancouver Island; Esquimaux, two miles from Victoria, and with a much better harbor; New Westminster, on Fraser River, 15 miles from its mouth; Langley, on the same stream, 30 miles from its mouth, and accessible to large sea-going vessels; Yale, 80 miles higher up, and at the head of ordinary steam-navigation; Port Moody, with an excellent harbor on Burrard Inlet; Nanaimo, the chief place for mining and shipping coal. (British Columbian coal is of tertiary age, and may be classed as a lignite. Even the anthracites of Queen Charlotte Islands are of late geologic age, but are metamorphosed by heat and pressure.) Kamloops is a new Canadian Pacific railway town on Thompson River, here navigable for steamboats. Here the North Thompson and South Thompson, both navigable rivers, flow into Kamloops Lake. An easily built canal, from Shushwap Lake, at the head of the South Thompson, to the great Lake Okanagan, will add 130 miles to the present 300 miles of river accessible to the Kamloops steamboats. Kamloops is becoming the business centre of South-eastern British Columbia.

Less than one twenty-fourth of Vancouver Island is arable. The Queen Charlotte Islands have an admirable climate, though the rainfall is great. The soil is generally good, the fishery resources extensive, and timber and coal abundant and good. Of the central

plateau only one acre in seventy-five is arable, and summer frosts are severe and frequent. The province imports flour from the U. S., the local supply of grain being inadequate; but that supply is rapidly increasing. Spring wheat, barley, oats, hay, potatoes, apples, turnips, and dairy products are leading articles of farm origin.

The *fisheries* of the colony are still the leading interest. In 1881 eight establishments on Fraser River shipped 142,516 cases of canned salmon. There are also canneries on Alert Bay (Cormorant Island), on River's Inlet, and on the Skeena, Nass, Coquitlan, and other rivers. There is also an immense export of salted salmon in barrels.

The colonial fisheries are said to be worth \$1,540,000 a year. The oolichan, or eulachon (one of the species called candle-fish), is both canned and pickled for market. From this fish 10,000 gallons of oil are made annually on Nass River alone. The oil is reported to sell on the spot for \$1 a gallon. A large herring fishery has been started. Herring-oil is largely shipped, and the scrap is sold in England as fish-guano.

Halibut, sturgeon, and many other fish are exceedingly abundant. One establishment on Skidegate Inlet makes large quantities of oil from the black shark. Crabs, shrimps, prawns, and clams are somewhat largely caught.

In the province 50,000,000 feet of lumber are sawn each year, but the business is yet in its infancy. Some of the largest saw and planing-mills in the world are to be found here. The red fir is an admirable and abundant ship-timber. The tideland spruce is also highly valued.

There are several tanneries and shoe-factories in British Columbia. The native hides are remarkably heavy. Vancouver Island affords a great amount of hemlock bark for tanning. Bear soap and sal soda are also articles of colonial manufacture.

British Columbian fur-seal hunting employs four steam-schooners, and a considerable number of minor vessels, including large Indian canoes. The Hudson's Bay Company still carries on business here, but has no exclusive privileges.

The gold output is stated to be \$1,000,000 a year, or less than half what it was in 1864. Placer-mining is almost the only method of working now followed. A good deal of virgin gold territory remains. Cariboo, the chief mining-place, is in lat. 53°, and is 5000 feet above sea-level. Cassiar is in lat. 59°, and here the lower strata of the soil are always frozen.

On Texada Island, in the Gulf of Georgia, are valuable mines of iron now wrought for export to the U. S. There are extensive iron-foundries, boiler and machine works at Victoria.

The public lands and Pacific railway lands are subject to pre-emption by actual settlers on very liberal terms, but there is no homestead law. Lands are leased, but not sold, to cattle-ranchers, and when leased are subject to pre-emption by actual settlers.

The Canadian Pacific railway, now in construction, is to be owned by a company who received from the Dominion Government those portions of the line already constructed at the time of contract (valued at \$27,000,000), besides \$30,000,000 in money, and some 33,000,000 acres of land. The distance from Port Moody, the W. terminus, to Quebec is 2880 miles. The highest elevation on the line is 3720 feet. About 700 miles of the line will be north of lat. 53° N., and some 350 miles will be north of lat. 54°.

The provincial government is presided over by a lieutenant-governor. There is an executive council, and a legislative assembly of twenty-five members. The civil establishment consists of the president of council, provincial secretary, assistant secretary, minister of finance and agriculture, chief clerk in the treasury, commissioner of lands and works, registrar of titles, school-commissioner and their subordinates.

The judicial establishment consists of a chief justice, four puisne justices, an attorney-general, and a registrar.

The public schools are under a superintendent of education. In 1881 there were 2653 pupils and 68 teachers. There was one public high school. The public annual expenditure for schools was \$58,515. There is a Roman Catholic college at Victoria, and another at New Westminster, besides several academies and other schools.

The population in 1881 was 49,459, of whom 29,503 were males and 19,956 females. In religious denominations the reckoning was as follows: Baptists, 424; Roman Catholics (excluding tribal Indians), 10,043; Episcopalians, 7804; Reformed Episcopalians, 598; Lutherans, 491; Presbyterians, 4095; Methodists, 3516; Pagans, 437; Jews, 104. For 19,131 the religion was not given. The Roman Catholics claim more than 20,000 Indian converts and catechumens. They have two dioceses (Vancouver's Island and British Columbia); the Church of England has three dioceses (British Columbia, Caledonia, and New Westminster).

Of the people, 4350 were Chinese (of whom the number is now much greater); those of English origin numbered 7297 (born in England, 3294); French, 916; Negroes, 274; Germans, 858; Indians, 25,061; Irish, 3172 (born in Ireland, 1285); Italians, 143; Scandinavians, 236; Scotch, 3892 (born in Scotland, 1204); Spanish and Portuguese, 144; Welsh, 299; Franco-Indian half-breeds, 250. Of the people, 32,175 were born in the province, 34,957 in Canada, and 2295 in the United States. Number of land-owners, 2410; land-tenants, 313; acres occupied, 441,255, of which 184,885 were improved; 83,657 being under crops, 98,457 in pasture, and 2771 used for gardens and orchards. Number of horses, 20,172; working oxen, 3334; milch cows, 3848; other neat cattle, 5690; sheep, 346; swine, 2775. Acreage of wheat, 7952; bushels of spring wheat produced, 153,485; winter wheat, 20,168; barley, 78,990; oats, 253,911; rye, 482; pulse, 50,542; buckwheat, 56; grass-seed, 402; maize, 96; potatoes, bushels, 473,831 (acres, 3272); turnips, bushels, 270,525; other roots, 82,249; hay, tons, 43,898 (acres, 28,449); butter, lbs., 343,387; cheese, 33,252; apples, bushels, 28,100; grapes, lbs., 2961; other fruits, 12,347; hops, lbs., 24,898; value of furs sold, \$153,442; white pine timber sawn, cubic feet, 23,348,501; red pine, 232,585; birch and maple, 26,000; other timber, 436,792; unsawn pine logs, number, 798,119; other logs, 2,483,024; fire-wood, cords, 82,277; lath, cords, 6053, besides masts, spars, staves, tan-bark, etc. The fisheries employed 1126 boats and 10 other vessels, and 1034 men, besides 477 shore-men, with 87,695 fathoms of nets, and produced 2380 barrels of herrings, 50,105 of salmon, 1057 of trout, 9975 of other fish, 40 of oysters, and 237,492 gallons of fish-oil. Gold mined, ounces, 52,390; iron-ore, tons, 2560; coal, tons, 268,300. Capital invested in industrial enterprises, \$2,952,835; hands employed, 2871; total yearly wages, \$929,213; value of raw material, \$1,273,816; value of products, \$2,926,787. (C. W. G.)

COLUMBIA CITY, the county-seat of Whitley co., Ind., is on Blue Creek, at the intersection of the Pittsburg, Fort Wayne, and Chicago Railroad, a branch of the Wabash, St. Louis, and Pacific Railway, 20 miles west of Fort Wayne. It has 2 banks, 3 hotels, a high school, an academy and other schools, 8 churches, and 3 weekly newspapers. It has a foundry, flour-mills, 2 woollen-mills, and manufactories of hubs, staves, and furniture. Population, 2244.

COLUMBIA COLLEGE, the oldest, wealthiest, and most important institution of learning in the city of New York, was founded in 1754. The founding and endowing a college in New York appear to have been in contemplation as early as A. D. 1703, but various circumstances delayed the carrying out of the scheme for half a century. In 1754 the charter of King's College,

as it was then called, passed the seals, and in the next year a liberal grant of land was made by Trinity Church. Moneys had been previously raised under the authority of acts of the legislature passed in 1746. In the interval arrangements had been made for the establishment of a college; and on the 17th of July, 1754, the Rev. Dr. Samuel Johnson of Connecticut, who had been invited to be the first president, began the instruction of a class of eight students in the vestry-room of Trinity Church. The existence of the college, however, is properly to be dated from the 31st of October in the same year. On that day the charter was signed. It named as governors the archbishop of Canterbury, the first lord commissioner for trade and plantations, the lieutenant-governor, the judges, and the great officers of the colony, together with four-and-twenty of the principal gentlemen of the city. The college continued under the wise government of these gentlemen until the beginning of the war of the Revolution, when its buildings were taken for a military hospital, its students were dispersed, and its library and apparatus scattered. In 1784 it was, at its own request, erected into a university, but this arrangement continued only for three years. In 1787 the original charter was revived, with such modifications as had been rendered necessary by the change of government; and, with a body of trustees composed, as before, of the first gentlemen of the State, it entered, under the name of Columbia College, upon a new career of usefulness.

The college building was opened in May, 1760. It was thus described by the Rev. Dr. Burnaby, who saw it a year or two before: "The college, when finished, will be exceedingly handsome. It is to be built on three sides of a quadrangle fronting Hudson's or North River, and will be the most beautifully situated of any college, I believe, in the world. At present only one wing is finished, which is of stone." The beauty of the situation is also spoken of in a paper believed to have been written by Dr. Cooper: "The college stands on a dry gravelly soil about one hundred and fifty yards from the banks of the Hudson River, which it overlooks." The laying out of new streets from time to time had brought the college into the very middle of the town, and dwellings and warehouses had surrounded it long before the exigences of commerce had demanded its very site. The building was never completed according to its original plan. The north wing, as it was called, was indeed enlarged about 1818, but in 1857 the removal of the population to the northern part of the island, and the increasing value of the ground on which the college stood, made it necessary for it to seek a new abode. A large piece of ground on Madison avenue, between Forty-ninth and Fiftieth streets, at that time in the outskirts, but now in the very heart of the city, was selected. A new college now stands there.

Dr. Johnson, with competent assistance, carried on the college for several years; but, feeling the approach of age, he wrote to Dr. Secker, the archbishop of Canterbury, to ask him to select a proper person for his successor. Upon the recommendation of the archbishop the Rev. Myles Cooper, a fellow of Queen's College, Oxford, an elegant scholar and a very accomplished man, came to New York in 1762. Mr. Cooper was only twenty-five years old. He was immediately made a fellow and professor in the college; he assisted Dr. Johnson for about a year in his instruction and government, and in 1763 succeeded him as president.

The affairs of the college seem now to have gone on prosperously for several years. The tastes and acquirements of the first two presidents had given it a reputation for classical learning which it has maintained to this day. Logic, metaphysics, and mathematics had also been always taught. Natural philosophy and mathematics were now taught by Dr. Samuel Clossy and Mr. Robert Harpur, the former a Glasgow, the latter a Dublin, scholar. Mr. Harpur, first as professor and afterwards as trustee, rendered good and efficient service for many years. To the suggestions and active

labors of Dr. Clossy the college is indebted for the establishment of its first medical school in 1767. In consequence of the foundation of a College of Physicians and Surgeons in 1813, this school was discontinued; but in 1860 the newer institution was itself adopted as the Medical Department of Columbia College.

At the breaking out of the war Dr. Cooper made himself conspicuous, not only as an ardent loyalist, but as a violent political writer. In the latter capacity he was met and worsted by no less a person than Alexander Hamilton, at that time one of his own students. Dr. Cooper, however, betrayed neither mortification nor resentment, but, on the contrary, uniformly treated his youthful antagonist with good-humor, and even with respect. He was at last obliged to fly by night from the fury of a mob which attacked his lodgings in the college. He sailed for England in 1775, and never returned. Dr. Benjamin Moore, afterwards bishop of New York, was made temporary president.

In 1787, William Samuel Johnson, LL.D., a son of the first president of King's College, was elected president. Upon his resignation in 1800 the Rev. Charles Wharton, D.D., was chosen his successor. It does not appear from the records of the college that this gentleman ever entered upon the duties of his office; it is certain that he resigned it at the end of about seven months. He was succeeded by Bishop Moore. The bishop, however, was not expected to take an active part in the ordinary duties of the college, which consequently devolved upon the professors, Kent, Wilson, and Bowden. These were highly respectable and able men, and the college under their care went on well, increasing in reputation and in numbers. Notwithstanding the fact that in 1810 the requisites for admission were raised much higher than they had ever been before, a hundred and thirty-five students were matriculated for that year.

Bishop Moore resigned his office in 1811 to make room for some one who could devote his whole time to the college, and in the same year Dr. William Harris was made president and Dr. John M. Mason provost. The duty of the latter officer was to assist the president in the government of the college and to conduct the classical studies of the Senior class. This arrangement, however, continued for only three years. Upon the resignation of Dr. Mason in 1813 the whole government of the college again devolved upon the president.

Dr. Harris died in 1829, and in the same year William Alexander Duer, LL.D., was chosen his successor. During his presidency, on the 13th of April, 1837, the semi-centennial anniversary of the reorganization of the college under trustees of its own was celebrated.

President Duer resigned in 1842, and was succeeded by Nathaniel F. Moore, LL.D. The associations of both these gentlemen were with the old colonial families, and their high breeding and polished courtesy of bearing enabled them to make the college a school not only of learning, but of manners. Mr. Moore was an elegant and accomplished classical scholar, and had long served the college as professor of Greek and Latin. Under his kind, wise, and gentle, but at the same time strict and orderly, administration the college prospered. He was not a young man when he was made president, and in 1849 he retired at the age of seventy. He lived, however, more than twenty years longer.

The next president was Charles King, the second son of the Hon. Rufus King, at one time our minister to England. Mr. King had been the editor of *The New York American*, and was thought to be an accomplished literary man rather than a profound scholar like his immediate predecessor. During his administration plans for increasing the usefulness of the college which had been long in contemplation began to be carried out. After the removal of the college in 1857, additional professors were appointed, the course of instruction was enlarged and applied to men who had taken their bachelor's degree, the Law School was established, the

Medical Department added, and the School of Mines begun. For the suggestion of the first two and the last of these the college was indebted to Mr. William Betts, a graduate of the year 1820. In 1840 he was made a trustee, and in 1848 professor of law, and in 1849 was nominated for president, but he withdrew his name in favor of Mr. King. He is still living, but since 1874 he has in a great measure withdrawn from active life. The scheme of post-graduate instruction, wise and liberal as it was, was found to be in advance of the times, and after two or three years was laid aside, and was not revived until 1880. The Law School was successful from the beginning. The fate of the School of Mines was at first doubtful. It owes much of its subsequent success and high reputation to the wise guidance and fostering care of Dr. Barnard, the present president.

Mr. King resigned in 1864, and the Rev. Frederick A. P. Barnard, LL.D., was chosen his successor. Since his appointment the resources of the college have very much increased, and have been employed by the trustees in carrying out plans for enlarging the usefulness of the institution. A new college building, two hundred feet in length by sixty in breadth, was finished in 1879. A School of Mines, built in 1874, is now in process of enlargement, and a large and elegant building for the Law School and Library is rapidly rising between the two.

A School of Political Science, leading to the degree of doctor of philosophy, was founded in 1880. A full account of its design was given by its chief officer, Prof. Burgess, in the *International Review* for April, 1882. At the same time new arrangements were made for post-graduate instruction. The body of professors and instructors was also much enlarged, and new studies were added to the college course. The college now gives instruction not only in the more familiar ancient and modern languages, but also in those which have been heretofore less known, as Sanskrit, Danish, Icelandic. A department of architecture has recently been established.

The library, always an important department of the college, was always celebrated for the high character of its collections, and it has been kept up with liberality and judgment. It now contains about 45,000 volumes. In addition to the regular purchases, collections of books have been bought or given from time to time; for instance, the mathematical libraries of Drs. Kemp and Anderson, the Italian books of Prof. Da Ponte, and the classical library of President Moore, the choice and valuable collection of old English literature made by William Alfred Jones, the late librarian, and two legacies, one consisting chiefly of early New York editions of various books from Bishop Eastburn, and a recent one of about seven thousand volumes from Stephen Whitney Phoenix, an alumnus of the college.

Columbia College now has, including its own trustees and those of the Medical School, a body of about two hundred officers of instruction and government of various ranks, and nearly sixteen hundred students in all departments.

Until the early part of the present century the college was necessarily obliged to seek foreign scholars—Gross, Kunze, Cochran, Rattoone, Wilson, Adrain—for its instructors, but the year 1825 saw its faculty composed for the first time of its own alumni. McVickar, the theologian, the philosopher, and the political economist; Moore and Anthon, classical scholars; Renwick, a thoughtful and industrious natural philosopher; and Anderson, a learned mathematician,—formed for many years a small but very competent body of instructors. Since that time many of the professors—Hackley, Schmidt, Nairne, Joy, Davies, Lieber, Short, Peck, Chandler, Rood, Burgess, Alexander, Eggleston, the founder and first professor of the School of Mines, and the worthy and most capable warden of the Law School, Theodore W. Dwight—have been graduates of other colleges. Drisler and Van Amringe are sons of

Columbia. Of late years the college seems disposed to return to the plan of educating its own instructors. Many of the younger teachers are men who have distinguished themselves as under-graduates. Only two presidents, the two Moores, have been chosen from the alumni.

Long lists might easily be made of alumni of Columbia College, as well as of trustees and professors, who have earned much more than a local reputation. This part of the history of the college, a very creditable part, has been well written by Mr. Verplanck in his *Address before the Literary Societies*, and by Mr. Jones in his *First Century of Columbia College*. An *Historical Sketch of Columbia College* was published by President Moore in 1844. This was reprinted, slightly condensed, with a continuation by the present writer, in the *History of the College*, which was compiled under the direction of Prof. Van Amringe in 1876. (B. R. B.)

COLUMBIA, DISTRICT OF. See DISTRICT OF COLUMBIA.

COLUMBINE. This is the common name by which the various species of *Aquilegia* are known. It belongs to the natural order *Ranunculaceae*. The flower has five sepals, five petals, numerous stamens, and five partially united carpels. The petals are developed into long, generally more or less curved spurs, the curves usually turning inward, so that the flowers when set down with the spurs upward, bear some resemblance to five young doves feeding around a dish, and from which the common name "Columbine," is supposed to be derived (Latin, *Columba*, a dove). It is indigenous to the temperate parts of the northern hemisphere. The number of species is uncertain, as the variations are so great that botanists are scarcely agreed as to the limits. In America eight species are recognized. *Aquilegia Canadensis* is the only species found in the Atlantic States. In the Rocky Mountains *A. cœrulea*, with large bluish-white flowers, is found on almost alpine heights. *A. chrysantha* and *A. flavescens* are found on lower lands south and west of Colorado. *A. Jonesii* is a small species found in Wyoming. *A. truncata* and *A. formosa* are found on the Pacific coast, and *A. brevistyla* in the extreme North-west. They provide excellent food for bees, both by their honeyed secretions and by their pollen. They add very much to the beauty of early spring scenery in America, and are favorites in garden culture, but have little other popular interest.

COLUMBUS, CHRISTOPHER. Within seven years research and discovery have thrown doubt upon the conclusions which had been established concerning two important particulars in regard to Columbus. One of these relates to the identity of the island which was his first discovery in the New World, and the other to the present resting-place of his remains.

To speak, first, of the latter: it is well known that he died in Valladolid, that early in the sixteenth century his remains were removed to Seville, and that between 1537 and 1540, following a request made in his will, they were again removed to the island of Santo Domingo, and placed in a crypt in the great cathedral in Santo Domingo City. In 1795, by the treaty of Basle, Spain ceded to France all her portion of the island, and, upon making the formal transfer, the Spanish officials obtained permission to remove to the cathedral at Havana the dust of the great discoverer. There is reason, however, to believe that the crypt which was then opened and the remains which were transferred were those of the son of Columbus, Don Diego. On the 14th of May, 1877, as some workmen were making alterations on the epistle side of the altar, in the cathedral at Santo Domingo, a crypt was discovered containing a metallic box, in which were human remains. The box bore an inscription interpreted to mean "The Admiral Don Luis Colon, Duke of Veragua, Marquis of Jamaica," and relating to the grandson of Columbus. Further search was then made, under the direction of the archbishop,

Señor Roque Cocchia, and upon the other, or gospel side of the altar, were found two crypts, one empty, from which had been taken the remains sent to Havana, and the other containing a metallic case. This case, to the joy of the searchers, had on the outside the inscription: "*D de la A. Per A^{te},"*" interpreted to mean: "*Descubridor de la America, Primer Almirante.*" The box was then opened, and on the inside of the cover were the words: "*Il^{lre} y Es^{do} Varon, Dⁿ Cristoval Colon,*"—("*Illustrissime y Esclarecido Varon Don Cristoval Colon*"). On the two ends and on the front were the letters, "*C. C. A.*"—("*Cristoval Colon, Almirante*"). The box contained bones and bone-dust, a small bit of the skull, a leaden ball, and a silver plate two inches long. On one side of the plate was inscribed:

*Ua p^{te} de los r^{tos}
del p^{mr} al^{te} Dⁿ
Cristoval Colon Des^r*

("Ultima parte de los restos del primer Almirante Don Cristoval Colon, Descubridor.") On the other side was: "*U. Cristoval Colon.*"

These discoveries have been certified to by the archbishop, Roque Cocchia, and by others of Santo Domingo, including Don Emiliano Tejera, an intelligent and scholarly citizen, who, at the time, in a pamphlet entitled *Los Restos de Colon*, set forth all the particulars. But the Royal Academy of History at Madrid, in an elaborate report, a year and a half after the exhumation, challenged the statements made by the Santo Domingans, and opposed the conclusion that the remains of Columbus were elsewhere than at Havana. Tejera and the archbishop have since published rejoinders maintaining the accuracy of their representations.

As to the identity of the island first seen by Columbus, Captain G. V. Fox, Assistant Secretary of the Navy of the United States, during the civil war, in a paper published by the U. S. Coast Survey, in 1882, reviews the evidence, and draws a different conclusion from any heretofore commonly accepted. His paper is based upon the original journals and log-book of Columbus, published in 1790 by Don M. F. Navarrete, from a manuscript of Bishop Las Casas, the contemporary and companion of Columbus, found in the archives of the Duke del Infanta. In this the exact words of the admiral's diary are reproduced by Las Casas, for the days covering the land-fall, and extending from the 11th to the 29th of October, the landing being on the 12th. From the description which the diary gives, and from a projection of the voyage of Columbus before landing and afterward, Capt. Fox concludes that the island discovered was not either Grand Turk's, Mariguana, Watling's, or Cat Island (Guanahani), but Samana, lat. 23° 05' N., long. 75° 35' W. After a very careful reduction of his data, and a fair projection of all the tracks, from the discovered island to Cuba (whither Columbus next proceeded), Capt. Fox declares the weight of evidence to be greatly in favor of Samana.

COLUMBUS, the county-seat of Muscogee co., Ga., is on the east bank of the River Chattahoochee, opposite Girard and Brownville, Ala., and at the head of steam-navigation from the Gulf of Mexico, 300 miles distant, and 95 miles (136 by rail) S. S. W. of Atlanta. Columbus is on the South-western and Columbus and Rome Railroads, and a railway bridge across the river gives it communication with the Columbus and Western Railroad, and the Mobile and Girard. The rapids in the river afford valuable water-power, which is improved by a dam and is utilized in extensive cotton-factories, flour and grist-mills. The city has also iron and machine-works, engine and boiler-shops, a woollen-mill, foundries, gas and water-works, and other industrial establishments. The streets are wide and regular, and many of the residences in the city

and its environs are handsome structures, with gardens and finely ornamented grounds. The city has 2 banks, 2 daily and 3 weekly newspapers, an opera-house, county-buildings, 7 public school-houses, besides private and parish schools, an academy, and a female college. It is an important point for the reception of cotton, and has a good local trade. Population in 1870, 7401; in 1880, 10,123.

COLUMBUS, the county-seat of Bartholomew co., Ind., is on the east branch of White River, 41 miles south of Indianapolis. It is on the Jeffersonville, Madison, and Indianapolis Railroad, which has here two branches of this road. Another railroad is in construction. Columbus has a good court-house, 4 hotels, 2 banks (1 national), 3 daily and 3 weekly newspapers, 7 churches, 5 schools. It has also a foundry, a plough-factory, flour-mills, planing-mills, and tanneries. It is lighted with gas and has water-works. It was incorporated in 1864. Population, 4813.

COLUMBUS, the county-seat of Lowndes co., Miss., is on the east bank of the Tombigbee River, 228 miles north of Mobile, on a branch of the Mobile and Ohio and the Georgia Pacific Railroad. It has 3 iron and 1 wooden bridge across the Tombigbee and Luxapalila Rivers. It has a court-house, 2 hotels, 2 banks (1 national), 3 weekly and 2 tri-weekly newspapers, 10 churches and 4 schools. It has grist and saw-mills, carriage and wagon-factories, oil-mills and a blanket-factory. It has gas and water-works, and is free of debt. Its property is valued at \$1,560,000, and its yearly expenses are \$15,600. It was settled in 1817, by emigrants from Virginia and Georgia, and incorporated in 1821. Population, 3955.

COLUMBUS, the county-seat of Platte co., Neb., on the north bank of the Platte River and on the Loup Fork, near its mouth, 92 miles by railroad or 80 miles by air-line W. of Omaha. It is on the Union Pacific Railroad at the junction of a branch, and is connected with Lincoln by the Burlington and Missouri River Railroad. It has a court-house, a high-school, an opera-house, 4 hotels, 2 weekly newspapers, a Masonic Hall, a hospital, 8 churches, a national bank, a State bank, a pork-packing house, rope-works and a foundry. Several bridges cross the rivers here. Columbus was settled in 1856, and incorporated as a city of the second class in 1873. Population, 2131.

COLUMBUS, a city of Ohio, capital of the State and of Franklin co., on the Scioto River, 116 miles N. E. of Cincinnati. Lat. 39° 57' N., long. 83° 3' W. It is handsomely and regularly laid out, its site being a portion of the great central plain of Ohio.

The city owes its existence to its position in the centre of the State, which led to its selection in 1812 as the site of the State capital. In 1813 the settlement began, and in 1814 a State-house was built. In 1817 the Legislature was removed to this town; and since that time the growth of the place has been very constant. Among the public buildings are the State-house, a noble building of limestone, in the Doric style; the city hall, the blind asylum, a State hospital for the insane, the deaf-mute institution, the Ohio penitentiary, the asylum for idiots, the State arsenal and the United States arsenal, the county buildings, and other structures, many of them of very fine architecture. Other institutions are the Ohio State University, the State Agricultural College, the Capital University (Lutheran), the Starling Medical College, the Columbus Medical College, a high-school, a children's home, two Catholic orphan asylums, an academy, an opera-house, and an Odd Fellows' Temple; there is also a well-organized system of public schools, besides Catholic parish and conventual schools. The churches are about fifty in number. The largest and finest is St. Joseph's Roman Catholic Cathedral; Trinity Episcopal Church is also noteworthy, and so are the First and Second Presbyterian Churches. The business interests are large, and are accommodated by a branch of the Ohio

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Canal and by nine railways: the Baltimore and Ohio, the Chicago, St. Louis, and Pittsburg; the Cleveland, Columbus, Cincinnati, and Indianapolis; the Cleveland, Mt. Vernon, and Delaware; the Hocking Valley; the Ohio division of the Indianapolis, Bloomington, and Western; the Ohio Central; the Pittsburg, Cincinnati, and St. Louis, and the Scioto Valley. The situation of the city, near the border of one of the richest coal-fields in the State, has greatly conduced to its prosperity. The city has national banks and private banks. Of its newspapers and periodicals 21 are weekly, 2 daily, 6 monthly, and 2 semi-monthly. The manufacturing enterprises of the city are important and varied. Furniture, railway-cars, iron castings, pipes, machinery, edge-tools, hardware, clothing, boots, shoes, farm-implements, saddlery and leather are among the leading articles produced.

The most extensive library in Columbus is the State Library, one of the largest in Ohio. The city has several well-kept squares and parks. The water supply is ample, and is on the Holly system. Population, in 1870, 31,274; in 1880, 51,647.

COLWELL, STEPHEN (1800-1871), an American merchant and economist, was born in Brooke co., Va. (now West Virginia), March 25, 1800. He graduated in 1819 at Jefferson College in Canonsburg, Pa., studied law under Judge Halleck of Steubenville, Ohio, and was admitted to the bar in 1819. After practising for seven years at St. Clairsville in that State, he removed in 1828 to Pittsburg, where he continued the practice of the law until 1836. He now turned his attention to the iron manufacture, and visited Europe to study the methods pursued. He entered upon the business for himself, first at Weymouth, N. J., and then at Conshohocken, on the Schuylkill, and pursued it for a quarter of a century through all the shifts from prosperity to adversity which were consequent upon the changes in our tariff legislation. In 1850 he attended the convention of iron-makers which met to protest against the reduction of the iron duties by the "horizontal tariff" of 1847, which had begun the prostration of this great industry. He prepared the memorial to Congress adopted by the convention, in which he warned our legislators that the price of English iron would be fixed for us by the amount of our demand and the presence or absence of our domestic competition. The prediction was fully justified by the permanent increase in price which followed the general destruction of American furnaces and rolling-mills.

Mr. Colwell had already begun to appear as an author in 1834, when he published a pamphlet on Pres. Jackson's removal of the deposits from the United States Bank. After his return from Europe he contributed articles to the *Princeton Review*, and in 1850 he published a pamphlet on *The Relative Position in our Industry of Foreign Commerce, Domestic Production, and Internal Trade*. In 1857 appeared his *New Themes for the Protestant Clergy; or, Creeds, but not without Charity; Theology, but not without Humanity; Protestantism, but not without Christianity*. In this he censured the neglect of great social questions by the Protestant pulpit, and insisted that the welfare of men in this world is as truly an object of religious interest as is their salvation for the next. The book produced a notable sensation, and reached a second edition in the following year, when he continued the discussion in his *Politics for American Christians*, and also in the supplementary matter of the translation he published of Chastel's *Charity and the Primitive Churches*. Mr. Colwell, although a devout member of the Presbyterian Church (O. S.), showed himself a severe critic of the orthodox clergy, and was answered by Mr. S. A. ALLIBONE (q. v.) among others.

His attention was again devoted to political economy, and in 1856 he procured the translation of Frederick List's great but unfinished work, *The National System of Political Economy*, to which he prefixed an introduction discussing the scope, the spirit, and much of

the literature of the science, and justifying the criticisms of Sismondi and Gioja upon the teachings of the English school. Three years later appeared his own work, *The Ways and Means of Payment, a Full Analysis of the Credit System and its Various Modes of Adjustment*. This was his *opus magnum*. It has not received from economists generally anything like the attention which it merits by the great range of special learning it exhibits and the exhaustive analysis of the phenomena of the money-market. It might be described as the complement of Mr. Tooke's great work, *The History of Prices*, being, like that, largely occupied with the refutation of that mechanical theory of money which the English economists learned from David Hume. It now is out of print and commands a high price. In the years which preceded the war Mr. Colwell published the following pamphlets bearing on the sectional controversy then raging: *The South: the Effects of Disunion on Slavery* (1856), *The Five Cotton States and New York* (1861), *Southern Wealth and Northern Profits* (1861); also several on economic problems: *The Claims of Labor, and their Precedence to the Claims of Free Trade* (1861). In 1865 he was appointed a member of the revenue commission, and prepared for its report, submitted in 1866, several reports on portions of the subject, ably advocating the protective policy. His labors in this commission broke down his health, and obliged him to relinquish literary work, although he lived five years afterwards, and died Jan. 15, 1871. His family, in execution of his unfulfilled purpose, presented his library of political economy to the University of Pennsylvania. Upon this collection Mr. Colwell spent a large amount of money and much of the leisure of his later years. It numbers some 8000 books and pamphlets, and embraces nearly every important work on social and economic subjects which had appeared in English or French, besides many in Italian and a good number in German.

Mr. Colwell was a man of singularly modest and retiring disposition, although always prompt to defend the cause of truth and ready to take part in any work of benevolence or of public utility. He was a member of many associations for such purposes, and took a prominent part in the organized efforts to promote the moral and physical welfare of the soldiers in the War of the Rebellion. He was a devoted patriot, a genuine Christian, and a sincere friend. (R. E. T.)

COMANCHES, or CAMANCHES, a powerful tribe of American Indians, of the Shoshone family, who roamed, when first known, from the head-waters of the Brazos and Colorado to those of the Arkansas and Missouri, whence their excursions extended to Mexico. They are now confined to Texas and the adjoining territories. The Comanches are fierce nomads, brave and warlike, and have proved very troublesome to the whites. They early obtained horses, principally by robbing from Mexico, and became perhaps the most expert horsemen in the world, while they are slow and awkward on foot. When first visited by the French, in 1719, they were very numerous, and dwelt in large villages, one of which consisted of 140 lodges and over 4000 inhabitants. In 1819 their numbers were estimated at from 10,000 to 12,000. Since then they have greatly decreased, and now number about 4000.

Like the Shoshones generally, they are of low stature, with a tendency to corpulency of body. They are ignorant of agriculture, and depend for subsistence entirely on robbery and hunting, living almost solely on flesh-food. Yet they consider fish and birds unclean, and will not eat them. They wear the breech-cloth, leggins and moccasins, covered with a loosely worn buffalo-robe, or occasionally a mantle of red or blue cloth. They are very fond of ornaments, and wear many trinkets of silver. Their lodges are very frail, and their villages are frequently moved from place to place.

They have no marriage ceremony, and display little constancy, yet the ties of consanguinity are strongly felt, and revenge is taken for any injury to a relative. As to their origin they are in utter ignorance, though they claim to have come from the West. Their native name is Na-üni, or live people. Their religion consists in some crude idea of a Great Spirit, to which they add the belief that they were made by a secondary spirit, sent to earth for that purpose. They also believe in future existence, and it is their custom, on the death of a warrior, to kill and bury his horses, and burn his principal effects, for his use hereafter. Formerly his favorite wife was killed, but this custom has ceased. At a burial the females scarify their arms and legs until the blood flows freely.

In war the Comanches are fierce and courageous. They are useless as foot-soldiers, but on horseback they become virtually a part of the animal they bestride. They will swoop on their foes with terrific yells, the whole body concealed behind the horse with the exception of a single foot, and in this position will discharge their arrows over the back or under the neck of the horse with fatal accuracy. They seldom use the rifle on account of its weight, but prefer the bow and the javelin, with which they are wonderfully expert. Men are seldom taken prisoners in battle, but are nearly always killed and scalped. When captives are brought into their villages they are seldom tortured by the men, but are delivered to the women, who are adepts in the art of torment. The prisoners are not killed, but are subjected to three days of painful torments, after which they are made slaves to their captors.

The Comanches are divided into three principal bands: the Comanches proper, the Yamparacks, and the Tenewas; but they roam usually in small divisions. They were for years at war with the Osage, the Pawnee, and other tribes, and with the Mexicans. Their wars with the latter, previous to 1783, were long and bloody, but in that year a severe defeat forced them to conclude peace. They have always been turbulent and dangerous. Their first reservation was in Texas. From this they were expelled, and cherish a bitter enmity against the Texans in consequence. At a later date a portion of them were placed on a reservation on the Staked Plains. Proving unruly here, they were severely chastised in 1872, and taught the necessity of submission to the power of the whites. A considerable portion of the tribe, with some Apaches and Kiowas, is now on a large reservation, embracing some 5800 square miles, in the Indian Territory.

COMET (Gr. *κομήτης*, long-haired), a remarkable heavenly body, differing in every conceivable respect from all others. While the planets and their satellites are dense, solid, and opaque bodies, and move in orbits nearly circular, and in planes nearly coincident and always direct (from west to east), the comets, on the contrary, appear to be but bulky masses of gas, of inconceivable tenuity, possessing no solid, and, probably, no liquid matter, and of a transparency surpassing that of every known terrestrial substance, moving in orbits of every imaginable eccentricity, and in planes inclined at all angles to the ecliptic, and as often moving retrograde (from east to west) as direct.

Cometary astronomy, in whatever light it may be viewed, is the most mysterious and the darkest part of the science of the heavenly bodies. The highest mathematical skill and the profoundest analytical reasoning, assisted by the telescope, polariscope, and especially by the spectroscope, have been brought to bear on it with but partial success, though, with a knowledge of the perturbative effects of the planets, mathematicians, from three observed positions, have been enabled to compute their orbits, and predict their returns, with an exactness not supposed possible by the early astronomers.

If there were no planets, a comet would always arrive at perihelion with a period of undeviating exactness, but in its journeys, both in approaching and receding from the sun, it passes the orbits of all the great planets, and, sometimes, near the planets themselves, some of which exert a retarding and others an accelerating influence, thus perfectly accounting for the inequality of its periods, which vary within rather wide limits, as the following table will show: For instance, between 1531 and 1607 the period of Halley's comet was 27,811 days; between 1607 and 1682 it had 27,352 days; between 1682 and 1759 it had 27,926 days; between 1759 and 1835 it had 28,006 days. Its next perihelion passage is set down for the middle of 1910, with only 27,217 days from 1835, which is less by 26 months than that between 1759 and 1835.

To the popular mind comets are divided into two classes—the bright, with long, flaming trains, and the faint, without tails; but to the astronomer the most natural division appears to be into those that are periodic and those that are not, the former being again divided into those of short and long period, while the latter are classed as parabolic or hyperbolic. It appears, therefore, that a comet, according to the curve of its orbit, may or may not be a permanent member of the solar system. If the orbit be an ellipse, no matter how long a time may elapse between its perihelion passages, the comet belongs to the solar system; but if it be a parabola or hyperbola it cannot, as the two branches of those curves do not meet as in the ellipse. Yet, strictly speaking, a comet moving in an exactly parabolic orbit has never visited our system. Just what proportion of the comets move in ellipses has never been and probably never will be ascertained. Down to 1884 only fourteen are recognized as periodical and proved to be such, not only by a similarity of elements, but by a second return. Every few years a new one is added to the number, which, as the centuries come and go, will undoubtedly be greatly increased. The following is a complete list of all known periodic comets, numbered in the order of their periodic times:

	NAME.	Period in Years.	No. of Apparitions since Discovery.	No. of Observed Apparitions.
1	Encke's.....	3.30	28	22
2	Tempel's II.....	5.20	1	2
3	Swift's.....	5.46	2	2
4	Brorsen's.....	5.56	6	5
5	Winnecke's.....	5.64	11	6
6	Tempel's I.....	6.00	2	3
7	D'Arrest's.....	6.39	4	4
8	Biela's north.....	6.59	15	7 (?)
9	Biela's south.....	6.63		
10	Fay's.....	7.41	7	6
11	Brooks' & Denning's.....	8.00 (?)	0	1
12	Tuttle's.....	13.78	6	3
13	Pons-Brooks'.....	71.37	1	2
14	Halley's.....	76.00	23	24

No. 11, or, comet 1880, VI., though without a doubt elliptical, has not been observed at a second return. The evidences of periodicity are, however, too strongly marked to exclude it from the list.

As no comet, not even the largest and brightest, can be seen except while travelling through but a small part of its orbit, and, unfortunately, in that portion where the three curves, the ellipse, parabola, and hyperbola are very similar, it requires observations of a degree of accuracy seldom attainable to decide in which of the three possible orbits the comet is moving, and, if an ellipse, what is its periodic time.

A similarity of the five elements of two cometary orbits, no matter how dissimilar their physical appearances may be, is proof amounting almost to a certainty that they are different returns of the same comet.

These may or may not be successive returns. The following are two interesting cases in point: in 1786 a comet was discovered by Mechain, but, having been seen for only two days, no orbit could be deduced, three positions being necessary for such a computation. In 1795 Miss Caroline Herschel discovered a comet, which was observed for three weeks, and for which a moderately fair orbit was determined. In 1805 another was discovered, and the elements of its orbit calculated, though no comparison seems to have been made with those computed for that of 1795. In 1818 the celebrated comet-seeker, Pons, found a comet, of which a long series of observations was obtained, which underwent a rigorous computation by Encke, who determined a period for it of only $3\frac{1}{2}$ years. In comparing the elements with those of the comet of 1805, he was struck with their resemblance, which the accompanying table will show:

	1805.	1818.
Longitude of Perihelion.....	147 51	144 15
“ “ Node.....	340 11	329 5
Inclination.....	15 36	14 48
Perihelion distance.....	0 378	0 353
Motion.....	Direct.	Direct.

At this time the only periodic comet known was Halley's, which had a period of about 76 years, and the thought that here was another, and with a period of but $3\frac{1}{2}$ years, awakened the liveliest emotions in the mind of every astronomer. How many times has it returned? was the all-absorbing question. Were Encke's computations correct, it must have returned unobserved 2 times between 1818 and 1805, twice between 1805 and 1795, and twice between 1795 and 1786. The comet was, without hesitation, predicted to return in 1822, which was confirmed.

Another case almost as interesting may be cited. In 1790 a comet was discovered by Mechain, which was not again seen until discovered by Tuttle in 1858, having returned unobserved in 1803-17-30 and -44.

The following tables contain what is known of the 13 periodic comets, derived from the most reliable sources:

No.	Least Distance from Sun. = q .	Greatest Distance from Sun.	Eccentricity. = e .	Inclination. = i .	Longitude of Node. = Ω .	Distance of Perihelion from Node. = $\pi - \Omega$ or ω .
1	0.342	4.10	0.8455	12° 53'	334° 34'	183° 56'
2	1.34	4.66	0.5536	12° 46'	121° 1'	185° 7'
3	1.07	5.14	0.6553	5° 23'	296° 51'	106° 13'
4	0.62	5.66	0.8098	29° 23'	101° 20'	14° 55'
5	0.78	5.50	0.7406	11° 17'	111° 31'	165° 12'
6	1.77	4.82	0.4630	9° 46'	78° 46'	159° 25'
7	1.17	5.72	0.6278	15° 43'	146° 9'	173° 0'
8	0.860	6.19	0.7559	12° 33'	245° 52'	223° 13'
9						
10	1.69	5.92	0.5574	11° 22'	209° 42'	200° 15'
11	0.724	7.50	0.82403	6° 53'	66° 09'	312° 1'
12	1.03	10.51	0.8210	54° 17'	269° 17'	206° 47'
13	0.777	33.41	0.95499	74° 3'	254° 6'	199° 19'
14	0.586	35.3	0.9675	162° 15'	57° 15'	112° 43'

A perfect comet (seldom seen, however) consists of four distinctive characteristics, as follows, enumerated in the order usually observed by the telescope, viz.: coma, nucleus (often called the head), tail, and envelopes. The last three are often wanting, the fourth seldom or never appearing except in very bright comets. The coma (also sometimes called the head) is the only part of a comet never absent. It is that portion first appearing in a telescope as a faint *nebulous* mass in no way distinguishable from a nebula except by its motion, which, in a short time (sometimes in a few minutes), is detected by the telescope. As it approaches the sun it gradually, and sometimes quite suddenly, assumes an oval form, the major axis lying in the direction of the sun. Soon a train of light, which, though not very appropriately named, is called

the tail, is thrown out in a direction opposite the sun, which in some cases, when near perihelion, takes on gigantic proportions, especially in apparent length, and astonishing all beholders, a terror to the ignorant, and an unsolved enigma to the wise. After its perihelion passage the coma, nucleus, and tail rapidly decrease in brightness until in a few months—perhaps in a few weeks, or even days—it becomes invisible even with powerful telescopes. In approaching the sun the coma precedes the tail, but in receding from it, after perihelion, the tail precedes the coma.

The tails of comets, however they may be viewed, whether as regards their immense length, both in degrees and in miles, the separation of some into two or more parts in the direction of their lengths, their great breadth and curvature, the rapidity of their formation, their deviation from the line of the radius vector, frequent formation of a tail towards the sun, the black stripe through the centre of some, and its absence in others, their chemical composition, and, above all, the source and nature of the force that throws back from the sunny side of the coma a train of unimagined extent—in one instance 200,000,000 miles in length and 15,000,000 in breadth—are among the most inscrutable of the marvels which the visible universe presents for our contemplation and study. No explanations have ever been propounded that will satisfactorily account for a single one of these phenomena. The analysis of their light by the spectro-scope, and the detection in their spectra of lines belonging to hydrogen, nitrogen, carbon, sodium, etc., go a long way to prove that they contain ponderable matter. When it is considered how rapid is the rate of their formation (sometimes more than 15,000,000 miles per day), too rapid, it would seem, for the propulsion of matter, and too slow for the movement of electricity, we are instinctively forced to the conclusion that the power, far away as it is, and far-reaching as it must be, lies wholly in the sun, and can emanate from no other source.

Some comets have no tails; indeed, those that are telescopic rarely have them, which also is true of periodic comets of short period. Encke's is generally as round as the full moon, yet occasionally has thrown off a tail visible to the naked eye—from one to three degrees in length. Some have been seen with tails before, but not after, perihelion, and *vice versa*.

The tails of comets, though generally spoken of as being opposite the sun, are, in fact, seldom exactly so except that portion near the head: the remainder being curved, of which the comets of 1811, 1858, and 1881 and 1882 are examples. The great comets of 1843 and 1861 were examples of tails perfectly straight, and of immense apparent length. The latter, though much shorter in miles, was far longer in degrees, having reached the extraordinary length of 118°, an excess of 14° over the next longest on record.

The following table will show the immense length of the tails of some comets, and also the wide difference between their apparent and real length:

Comet.	Degrees.	Miles.
1861 II.	118	24,000,000
1618	104	50,000,000
1811 I.	25	100,000,000
1680	60	100,000,000
1843 I.	65	200,000,000

An inspection of the table indicates that the comet of 1811, with a tail of but twenty-five degrees in length, was more than four times as long in miles as was that of 1861, which more than quadrupled it in degrees. The reason is obvious. The view of the former was much foreshortened, while the latter was seen perpendicular to the line of vision.

Not infrequently comets have been observed with more than one tail, the most recent example being the secondary tail of the great comet of 1881, which, on the evening of June 26, was 55° in length. The principal tail at the time was considerably curved and in marked contrast to its mate, a long, straight, slightly widening beam of light, which could be traced to more than twice the extent of its primary. The succeeding night it was reduced in length one-half.

A curious accompaniment of some comets is a long, narrow, sharply defined black stripe extending from the nucleus to a considerable distance through the centre of the tail, and sometimes erroneously supposed to be a shadow cast by the nucleus. If, as believed by some, comets' tails are hollow, the space within the circumscribed cylinder must be absolutely devoid of matter, and, therefore, even allowing the nucleus to be solid, is incapable of casting a shadow. Moreover, to produce a shadow of uniform size, as was the case through the tail of Donati's comet, it is necessary that the sun and nucleus be of equal diameter. The largest nucleus ever observed in any comet was less than 8000 miles, and that of Donati's, at the time referred to above, was less than 1000 miles. Of course a shadow cast by so insignificant an object, as compared with the immense size of the sun, would quickly come to a point. Such a phenomenon has never yet been witnessed. And, besides, the opacity of the nuclei of comets has never been proven, but, on the contrary, the evidence is strongly in favor of their translucency, if not transparency. Their variation in magnitude conclusively shows that they are not solid. Nothing resembling a sharply defined disk, or its shadow, or even a phase, has ever been observed, and, furthermore, the larger the telescope used, and the higher the power, the smaller they appear. Again, the division into two parts of Biela's comet is convincing evidence of the truth of the position taken, for it is improbable, if not impossible, that a solid, as we understand the term, possessing cohesiveness to any great extent, should be divided into two, and only two parts, for each comet (there are certainly two of them now) exhibited a nucleus, which, by turns, was brighter than its companion.

An interesting history attaches to the great comet of 1880, which burst suddenly and unexpectedly into view in the southern hemisphere in January of that year. Its elements and general appearance so nearly resemble those of the great comet of 1843 I., whose apparition was equally sudden, as to raise the presumption that the two are identical, notwithstanding that the most reliable computation (by Hubbard) made the period of the latter 530 years. These comets, at their perihelion passages, made the nearest approaches to the sun of any yet observed. No comet at all comparable in brilliancy was seen thirty-seven years previous to 1843, and the only rational conclusion is that the comet of 1843 was a comet of long period—reasonably that of 1668, as one of the two sets of elements computed for that comet bore a very strong resemblance to it. The comet of 1843 grazed the sun's surface at the moment of perihelion passage, and its motion was so great (300 miles a second) as to cause it to pass half around the sun in less than two hours, though to complete the other half would, as before stated, require 530 years. When the comet of 1880 came with elements so similar to those of the comet of 1843 as to permit no doubt of their identity, the question arose what brought it back in 37 instead of 530 years. The answer that in 1843 it had met with great resistance in passing through the solar atmosphere, and thereby was retarded, was readily and almost universally conceded to be the true solution of a problem with which science had never had to deal. As it must have met a like resistance in 1880, it was with great plausibility argued that it would make its next appearance in much less time than 37 years—probably in 15 or 20, when it would, in like manner, suffer another

retardation and another shortening of its period, and so on until, after a few returns, it must inevitably fall into the sun and cease to exist as a comet, a phenomenon without a known parallel in astronomy.

If the foregoing conclusions be true it is reasonable to suppose that the great comet of 1680, having grazed the sun almost as closely, may have met with a similar resistance, though in a less degree, and may reappear long before the assigned period of 575 years is reached.

The constant shortening of about two hours at every successive return of the periodic time of Encke's comet has been ascribed to resistance, but of the hypothetical all-pervading ether rather than of the solar atmosphere. If this decrease in its period is to continue indefinitely, then it must ultimately find a grave in the sun.

For brevity and convenience in computation the orbit of a comet is assumed to be a parabola, and a provisional set of elements is computed from the best three positions attainable, with as long time intervals as possible. A search is then made through a list of all comets mentioned in history, to find any whose elements bear resemblance to those of the new comet. If none are found, then it is presumably visiting our system for the first time, but should there be in the list one or more with each of the five elements not too dissimilar, with direction of motion the same, then it is possible—perhaps highly probable—that they are returns of the same comet. Appearances are, however, not to be relied upon in deciding this question, as they vary greatly at different apparitions, depending upon their positions as regards the sun and earth. The limits of variation are so wide as sometimes to render a comet, which was bright at one apparition, invisible at its next return. Most of the periodic comets are seen only at alternate apparitions; a striking example being the periodic comet, 1880 VI. (Swift's), having a period of $5\frac{1}{2}$ years. Its perihelion distance is greater than the earth's mean distance, and, consequently, is generally visible only when both the earth and comet are on the same side of the sun. Were its period an even five years, it would occupy the same relative position with respect to the sun and earth in 1885 as in 1880, and would be visible under like conditions, but the additional half year will cause the earth and comet to be on opposite sides of the sun in 1886, and as the comet will be 100 times less bright than in 1880 the detection of it will be hopeless.

Much speculation has been indulged in as to whether a comet ever did, ever will, or ever can fall into the sun, and, also, what the effect would be, not only upon that body, but upon the earth and the other planets. A thorough discussion of these questions would lead into speculative fields, which it seems undesirable as well as unprofitable to enter. We know little of the physical condition of comets; nothing, in fact, but what the telescope and spectroscope have gleaned from an examination of a very few bright ones. They appear, both under telescopic observation and spectroscopic analysis, to be wholly gaseous; yet such an idea is contrary to the experience of every chemist, and that no body entirely gaseous can exist in space is universally conceded. When the light from the nucleus and coma, and as much of the tail as is bright enough for the purpose, is examined by the spectroscope, it is found to be largely composed of one of the numerous forms of hydro-carbon vapor nearly or quite identical with olefiant gas (C_2H_4). In the comet of 1882 I. and Wells' comet, 1881, the vapor of sodium (D of Fraunhofer's lines) was observed with great distinctness, though, for some reason inexplicable to us, only when near its perihelion. Without doubt other substances exist which future investigators in spectroscopy will be able to detect and identify as synonymous with well-known forms of terrestrial matter, and will show that comets are more complex in their physical and chemical constitution than has hitherto been supposed.

The perihelion distances of comets vary immensely. While some almost or actually graze the sun's surface, others have their perihelia at a distance equal to that of Mars, and, as will be seen below, one was nearly equal to Jupiter's distance. How many, if any, have their perihelia still farther away, it will require the great telescopes of the future to determine. The following are examples of each class, from centre of comet to sun's centre, expressed both in terms of the earth's mean solar distance and also in miles :

Great Perihelion Distances. (That of 1729 greatest known.)			Small Perihelion Distances. (1843 smallest known.)		
Year.	Earth's =1	In Miles.	Year.	Earth's =1	Miles from surface of the sun to centre of comet.
1847	2.1172	191,000,000	1680	0.0062	137,000
1855	2.1935	208,000,000	1843 I.	0.0055	71,500
1747	2.1985	209,000,000	1880 I.	0.00672	195,000
1729	4.0435	384,000,000	1882II.	0.00806	310,000

We append also examples of small and great aphe-
lion distances. Concerning the latter much uncer-
tainty exists. To such an extent is this true, that it
has been thought best not to insert in the table those
with an assigned period of above 125 years. Some
have been computed to have periods from 100,000, to
1,000,000, and even to more than 2,000,000 years. It
is needless to add that these latter belong rather to the
domain of romance than to that of ascertained truth.

Small Aphelion Dis- tances. (Encke's smallest known.)		Greatest Aphelion Distances.		
Name.	Earth's=1	Name.	Earth=1	Period in Years.
Encke's	4.10	Tuttle's	10.51	13.78
Tempel's II.	4.66	Pons'=1812	33.40	71.37 (?)
Tempel's I.	4.82	Olbers'=1815	34.10	74.00 (?)
Swift's	5.14	Halley's	35.30	76.00
Winnecke's	5.50	Swift's 1862 III.	48.70	123.00

Comets intermediate between those of short and
long periods.—The following comets are with a good
degree of probability presumed to be periodic, though
the computations have not been verified by a return :

Name.	Period in Years.	Next Return. A. D.
Westphal's 1852 II.....	61.00	1913
De Vico's 1846 III.....	73.00	1919
Olbers' 1815.....	74.00	1889
Brorsen's 1847 V.....	75.00	1922
Swift's 1862 III.....	123.00	1982

The difference of the duration of visibility of comets
is very great, as the annexed tables will show :

Name.	Days.	Name. (1811 longest known.)	Months.
1780 II.	3	1847 II.	8
1786 I.	3	1847 IV.	9½
1818 I.	4	1861 II.	12
1808 II.	7	1825 IV.	12
1826 III.	9	1811 I.	17

Another feature of comets, and one as mysterious
and inexplicable as any, is the variation in volume of
both the coma and nucleus. The following table
shows the extraordinary variation of the coma of
Encke's comet, during its apparition in 1828. On
Oct. 28 the coma was nearly 20,000 times larger than
on Dec. 24. At its return in 1838 the variation was

far more wonderful. On Oct. 9 its diameter was
278,000, while on Dec. 17 it had contracted to 3000
miles.

Date.	Diameter in Miles.	Date.	Diameter in Miles.
Oct. 28.....	323,000	Dec. 14.....	45,000
Nov. 7.....	263,000	Dec. 24.....	12,000
Nov. 30.....	122,000		

Examples of large Coma. (1811 largest known.)		Examples of small Coma. (1799 smallest known.)	
Comet.	Diameter in Miles.	Comet.	Diameter in Miles.
1849 II.	50,000	1799 I.	1200
1846	129,000	1807	2000
1770	203,000	1838 V.	3000
Encke's 1828	323,000	1847 V.	18,000
1835	357,000	1847 I.	25,500
1811	1,125,000		

Examples of large Nuclei. (1769 largest known.)		Examples of small Nuclei. (1798 smallest known.)	
Comet.	Diameter in Miles.	Comet.	Diameter in Miles.
1825 IV.	5100	1798 I.	28
1815	5300	1806	30
1858 Donati's	5600	1798 II.	125
1845 III.	8000	1811 I.	430
1769	28,000	1807	550

Discovery of Comets in the United States.—The first
comet discovered in the United States was in 1847.
Since then 24 have been discovered, 14 of the number
having been found during the last 5 years, which marks
the zeal with which this branch of astronomy is being
prosecuted. Much of this is no doubt due to the
stimulus of the prizes for their discovery offered by
the Imperial Academy of Sciences of Vienna, and by
Mr. H. H. Warner, of Rochester, N. Y., founder of
the Warner Observatory.

The Vienna prizes which were offered for 3 years
consisted of a gold medal valued at about \$60, or its
equivalent in money. On the expiration of the 3 years
the prizes not being renewed, Mr. Warner, desirous
that the search for them be not abandoned, offered
for each discovery of a new comet a prize of \$200 in
gold. Three of the Vienna medals were awarded to a
single American. Four comet discoverers have re-
ceived from the latter an aggregate of \$1950. Fol-
lowing are the names of the discoverers and the
number discovered by each :—Miss Mitchell, 1 ; Bond,
1 ; Van Arsdale, 1 ; Peters, 1 ; Thatcher, 1 ; Brooks,
3 ; Wells, 1 ; Schaeberle, 2 ; Barnard, 2 ; Tuttle, 4 ;
Swift, 7 ; total, 22. Besides these, 10 more have been
discovered independently, viz. : 1 each by C. W. and
H. P. Tuttle, 2 by Bond, 3 by Swift, and 4 by Van
Arsdale. The periodic accorded to Brooks is a
comet of short period (cloudy weather prevented a
verification), which two days after discovery was found
by Denning, of England.

Subjoined is a complete list of the most successful
comet-seekers of all countries, Pons, of France, out-
stripping all the others :

Discoverer.	Total No.	Independent Discoveries.
Pons	28	5
Messier.....	13	2
Tempel.....	12	3
Winnecke.....	9	4
Mechain.....	8	2
Swift	7	3
Caroline Herschel.....	6	2

Connection between Comets and Shooting-Stars.—

The connection between comets and shooting-stars and star-showers leads to a fascinating subject sufficiently shrouded in mystery for the exercise of the liveliest imagination. The identity of these three phenomena, or, at least, an intimate relation between them, seems well-nigh proven. Briefly and concisely as can be stated, the theory covering these phenomena is as follows:

1. The coma in its normal condition is composed of small discrete particles of matter in a solid state, to which Prof. H. A. Newton has very properly given the name meteoroids, which must in numbers exceed all human computation.

2. As the coma approaches the sun these meteoroids are drawn away from it on the sunny side by something analogous to tidal action, which is in the strictest sense a disintegrating process, and that the sun, in a way unknown to us, repels this matter back, which, flowing past the coma off into space, forms what we call the tail or train; this repulsion is, probably, of an electric nature.

3. These comets' tails never return to the coma, but each is left to pursue its individual journey round the sun in an elliptic, parabolic, or hyperbolic orbit, depending upon conditions too abstruse to discuss in a popular disquisition of the subject; this cast-off tail forms a portion of a ring which, receiving an accession at each return of the comet, eventually becomes continuous with a closed orbit.

4. Such rings, of which there are thousands—perhaps millions—can be cognizable to us only when the earth in pursuing its journey round the sun passes through them, when occurs a meteoric shower of greater or less abundance, depending on whether the earth passes through a dense portion, as it did on Nov. 12, 1799, Nov. 13, 1833, and Nov. 14, 1866, and as it will on Nov. 15, 1899, or through a section more sparse, as is generally the case.

5. These meteoroids in the coma, by the sun's excessive heat (there being no atmosphere as on the earth to absorb it), exhale, by the decomposition of their surfaces, a gas which when subjected to spectrum analysis is found to contain hydrogen and the vapors of carbon, and sodium and a few other unidentified substances. This view is supported further by a reference to the well-known fact that some solids, for instance ice, evaporate at all temperatures. No body wholly gaseous can exist in space, and the same is true of a liquid. The inexorable law of diffusion in the first, and of evaporation in the second, would soon dissipate them through space.

The nature and cause of the sun's selective repulsion—that is, why it should attract a comet as a whole and repel only a part—is a mystery too deep for explanation, and yet it seems to accord with what we see. It must not be forgotten that the smaller the particle of matter the greater is the ratio of surface to volume, and, as electrical repulsion acts not in proportion to mass, but to surface, while, on the contrary, attraction acts in proportion to mass regardless of surface, it seems worthy of consideration as offering a possible explanation of what is observed. This view of the matter, with, perhaps, some modifications, may throw a little light upon the manner in which a comet's tail is formed, also as to what it is, and what finally becomes of it.

Over one hundred meteor streams and their radiants have been determined, but only two give rise to star-showers that attract general observation, and whose periodicities are strongly marked. They are called the August and November showers, and occur, in our age, on Aug. 9 to 11, and on Nov. 14, at which times the earth passes diagonally through the August and November rings respectively. The elements of these rings bear too close a resemblance to the comets of Swift and Tempel to be the result of chance, as indicated by the annexed table.

	August Meteoric Ring.	Comet III. 1862 (Swift's).	November Meteoric Ring.	Comet I. 1866 (Tempel's).
	° /	° /	° /	° /
Lon. Perihelion..	343 28	344 41	56 25	60 28
Lon. Node.....	138 16	137 27	231 28	231 26
Inclination.....	64 3	66 25	17 44	17 18
Per. Distance.....	0.9643	0.9626	0.9873	0.9765
Motion	retrograde.	retrograde.	retrograde.	retrograde.
Period.....	120 (?) years.	123 years.	33¼ years.	33½ years.

Comets which have Passed nearest the Earth.—No comet, as far as known, has ever come in contact with the earth or mingled its substance with our atmosphere; yet it would seem that, of the millions which have appeared during past ages which have had their perihelion distances within the earth's orbit, some of them must have made very close approaches to the earth, if, indeed, they have not actually collided with it. The nearest approach ever observed was the comet of 1770 (Lexell's), which passed, on the same day as the earth, through a point but 168,000 miles distant from that occupied by the earth five hours later, but during that time the earth had moved 327,500 miles, or a distance equal to about 1½ times the moon's distance. The comet, however, approached to within 1,400,000 miles of the earth, and subtended an angle of 2° 23', the largest apparent diameter yet observed in any comet. It has not been seen since 1770, although an orbit was computed for it of only 5½ years, by which all the observations were satisfied. Perturbation by Jupiter is supposed to have changed its orbit to one of long period. Should it ever reappear, it is quite unlikely that it could be identified.

Number of Comets.—The number of distinct comets belonging to our system must be very great. The number visible in each year is not at all uniform, in some years not any being observed, while sometimes several will appear in a single year. In 1858 there were 8 visible, and 9 in 1846, the greatest number ever seen in any one year. In 1845, 4 were visible at one time. The average annual number for the last 30 years has been a little less than 4, or 7000 comets since the Christian era. How many have escaped detection is of course unknown. An effort has been made to arrive mathematically at the number of comets which have their perihelia within the orbit of Neptune by the following train of reasoning. It is a matter of observation that 48 comets have had their perihelia within the orbit of Mercury. Assuming that comets are equally distributed through space (a rather uncertain quantity), and that the law of increase should be as the cube of the solar distances of Mercury and Neptune respectively, the formula will stand as follows: as the cube of Mercury's distance (= 1) is to the cube of Neptune's distance (= 78), so is 48 to the number sought, or $1^3 : 78^3 :: 48 : 22,778,496$, the number of comets that are under the dominion of the sun and have their perihelia within the orbit of Neptune. If comets are equally distributed through space, no good reason can be assigned for so short a limitation as Neptune's distance; it should rather extend to the neutral point between the sun and the nearest star, say ten billion miles, or half the distance of Alpha Centauri. This would swell the number to mammoth proportions. Neither should the fundamental number be restricted to 48, for since the solar system existed the number which have made their perihelion passages within Mercury's orbit must have been many millions instead of only 48. These taken as the basis, the number would be too great to be expressed by any numerical notation comprehensible to man. Considered in the above light, Kepler's statement that "comets are as numerous as the fishes in the sea" was more truthful than metaphorical.

The Great Comet of 1882.—Seldom has a comet excited the popular mind to so high a pitch, or united

in itself so many unique and important points of interest to the astronomer, as did this famous comet. It is a significant fact that during six of the twelve months of 1882 there appeared three comets that were not only visible to the unassisted eye but were seen in broad daylight, viz.: Comet 1882 I. (Wells), the comet seen close to the sun during the total eclipse in May of that year, and the one under discussion, generally called Comet 1882 II. The entire history of astronomy furnishes no instance of the successive appearance of three daylight comets. The eclipse comet, under the circumstances, could hardly be called a daylight comet, so, ignoring its claims to that distinction, and adding the very bright comet of 1881, it can be said that within a period of fifteen months the world has been treated to an exhibition of three daylight comets. Comet 1882, II., was discovered on Sept. 6, and became generally visible in the northern hemisphere after sunrise on Sept. 18, and, during that and the following day, was a conspicuous object without a telescope, and shone with a lustre probably never seen in any previous comet, although on the 18th it was only 3° from the sun. It was independently discovered by Mr. Common, of England, less than one degree from the sun, shining with intense lustre. The world is indebted to Mr. Gill, the astronomer at the Cape of Good Hope, for imparting the fact that two observers with separate instruments followed the comet close to the sun's limb, where, at 4h. 50min. 58 sec., on Sept. 17, it suddenly disappeared in transit across the sun's face. This remarkable observation was made only $1\frac{1}{2}$ hours before perihelion passage. During transit not a glimpse of it could be obtained, which is nearly sufficient proof that Pastorff's supposed observation of a comet on the sun's disk was simply a penumbral spot. A comet through which a tenth magnitude star can be seen undimmed would be very unlikely to be seen on the sun. The nucleus was large and bright, and, had it possessed any opacity, would undoubtedly have been seen (as it was carefully looked for), especially near the sun's limb, which is less bright than the central portion. The problem of the comet's orbit has caused much speculation and discussion, and the question at this writing is still unsolved. It has been supposed by many to be identical with several comets mentioned in history—notably those of 1668, 1843, and 1880—the reasons assigned being a close similarity of elements as indicated in the following table

	1668.	1843.	1880.	1882.
Longitude of π .	$277^\circ 2'$	$278^\circ 18'$	$277^\circ 23'$	$276^\circ 14'$
“ of Ω .	$357^\circ 17'$	$51^\circ 4'$	$358^\circ 22'$	$346^\circ 7'$
i	$35^\circ 58'$	$35^\circ 45'$	$36^\circ 41'$	$37^\circ 59'$
π distance.....	0.0047 (?)	0.0055	0.067	0.081
Motion.....	retrograde.	retrograde.	retrograde.	retrograde.

Some uncertainty attaches to the elements assigned to the comet of 1668. We give the second of two sets computed for it by Henderson. However, satisfactory proof has accumulated that the above comets are not identical, but strangely enough have elements so similar as to raise the presumption to a high degree of probability that the three now pursuing the same path were originally one comet. The nucleus of the comet of 1882 during visibility underwent many and unexampled changes. Several days after its perihelion passage it began to elongate, which process continued until it was merely a line nearly 100,000 miles in length, which, at times, exhibited several condensations of light. It was even affirmed by several astronomers that it separated itself into three distinct nuclei. Three observers report having seen in the immediate neighborhood of the comaseveral large though faint cometary masses, which have, with a good degree of probability, been supposed to be fragments of the comet itself,

thrown off probably when near perihelion by the force (analogous, it may be, to tidal action) heretofore mentioned. If they were fragments of the great comet, it marks an era which must ever be a memorable one in cometary astronomy, suggesting, as it does, the idea that all space may be filled with lost and disintegrated comets.

The above are not the only instances of more than one comet moving in a similar orbit. The great comet of 1881 had elements almost exactly like those of comet 1807, and, for a short time, was supposed to be a return of that comet. These have strengthened the theory, long entertained, that there are families of comets moving in similar orbits, which may, originally, have been a single comet.

Increase in the number of bright Comets.—This century, thus far, has been distinguished above all others, as far as human record extends, in the unexampled number of comets which have appeared eminent for size, brightness, and length of train. The following summary of the number, seen during the four preceding centuries, compared with the number seen thus far during the present one, strikingly confirms the above statement, and, in the minds of some, raises the inquiry whether our solar system, in its journey through space, is not passing through a region more thickly strewn with comets.

During the 15th century 3 bright comets appeared; during the 16th, 4; during the 17th, 6; during the 18th, 3, and, thus far during the 19th, 15. Halley's comet appeared twice in the 17th century, and once in each of the other centuries. If all the apparitions of Halley's be deducted from this list, on the ground of its being a periodic, it appears that only ten bright comets appeared during the four hundred years preceding this century, while during the last eighty-two years fifteen have been seen, at least eight of them having never been surpassed during the historic period. Those of this century appeared as follows: 1811; 1835, Halley's; 1843; 1847; 1853; 1858, Donati's; 1861, Tebbutt's; 1862, Swift's; 1865; 1874, Coggia's; 1880, Gould's; 1881, Tebbutt's; 1882, Wells'; 1882, Finlay's; 1883, Pons-Brooks.

Nomenclature.—Much confusion exists in regard to this subject in consequence of astronomers having used different systems in their numbering. Some insist that they should in each year be numbered in the order of their discovery, using Roman numerals, as: Comet I., Comet II., etc., while others desire them to be numbered in the order of their arrival at perihelion. This double system works uncertainty and perplexity, and ought to be remedied. While no doubt can arise regarding the date of discovery of a comet, different computers may disagree about the time of its perihelion passage; one, perhaps, claiming that it occurred in the latter part of one year, and another in the beginning of the next, thus creating confusion between indexes and catalogues. It has been proposed, and for a time was adopted, that comets be named in the order of their discovery, by the letters a, b, c, etc., while they should be designated in the order of their perihelion passages by the Roman letters I, II, III, etc. This double system of numbering has many objections, and has been abandoned by some of its originators. The most correct and simple way seems to be to follow the order of their discovery. For illustration of this, one of many reasons in favor of this system is given, viz.: the famous comet of 1811 did not pass its perihelion until nearly six months after discovery. Had this six months carried the perihelion passage into the next year, how futile would have been the attempt to educate the popular or even the scientific world to the point of calling it the great comet of 1812, which the world had seen in all its glory in the autumn of 1811. There are objections to either system, but the numbering of them in the order of their discovery appears, from its simplicity, to be the most satisfactory.

For other facts concerning Comets see articles on COMETS and on ASTRONOMY in *ENCYCLOPÆDIA BRITANNICA*. See also an exhaustive article on Comets in *Chambers' Descriptive Astronomy*, 3d edition, which contains a complete list of all comets which have been observed, whose orbits have been computed, extending from 370 B. C. to A. D. 1875; also a catalogue of all those for which, from lack of requisite observations, no orbit could be computed. See also *Guillemin's World of Comets*, translated from the French by Glaisher, an extensive and entertaining work, Cooper's *Cometic Orbits* and Kirkwood's *Comets and Meteors*. For an elaborate discussion of the connection between comets and star showers, see articles by Prof. H. A. Newton on the "November Star Showers," in *Silliman's Journal*, May and July, 1864, and on "Shooting Stars," same journal for March, 1865. (L. S.)

COMET EYE-PIECE, a celestial eye-piece, which may be either a positive or a negative, with lenses of long focus and field-lens of large diameter; the former for obtaining a low power, the latter for securing a large field—two essentials for sweeping the heavens for telescopic comets.

A comet eye-piece should give a field of at least $1\frac{1}{2}^{\circ}$ in diameter, which probably should be its largest limit of size, as the eye is unable to take in a field too large without roaming over it and stopping the telescope, which, in its sweeps, should be constantly though slowly moved, that no precious time need be lost.

The optical principles involved in the construction of a comet eye-piece are essentially the same as in all other celestial eye-pieces, the differences being those enumerated above—viz. lenses of low magnifying power and a field-lens (second from the eye) of large size. Such an eye-piece, if properly made and used upon a telescope of sufficient size whose aberrations are well corrected, will give a large, flat, and brilliant field.

The writer has for many years used with great satisfaction a comet eye-piece whose field-lens is two inches in diameter, and its eye-lens an achromatic. It is of the Ramsden or positive variety, and called by the maker "periscopic." It brings out very faint nebulae and comets which are beyond the reach of such eye-pieces as are usually made.

The proper size of a field-lens depends on several circumstances. Its diameter should not be less than two inches, and probably two and a half inches is sufficiently large. To secure the best results the rack-tubes of comet-seekers should be made to allow the use of large eye-pieces—a suggestion seldom heeded by telescope-makers. (L. S.)

COMET-SEEKER, a telescope differing in no essential particular from any other except in its short focus as compared with the size of its object-glass—usually called the objective—and low magnifying power used. It is made short for celerity and ease of movement and for easy portability, and its low magnifying power secures a large area of field. This instrument may be either a refractor or reflector, and may be mounted either equatorially or altazimuthally as the observer desires, the latter mounting being the least expensive. Each method has its advantages and disadvantages. If mounted equatorially, it is very difficult to sweep near the poles, and if altazimuthally, equally so to sweep near the zenith. The equatorially mounted comet-seeker with divided circles, and accurately adjusted to the latitude of the place of observation, possesses, however, one great advantage over the other, inasmuch as the position of a new comet can be easily, quickly, and exactly determined. This is important, as its place thus early ascertained can be used with two others subsequently obtained for computing the elements of its orbit.

The aberrations in an objective, which the skill of the optician has as yet been unable to correct, called the "secondary spectrum" and also "irrationality of the spectrum," is governed in amount by the size of the objective alone, and not by its focal length. All refracting telescopes for all purposes could be made short were it not for this secondary spectrum, to get rid of which, as far as possible, refracting telescopes to be used with

high powers are made long—usually about sixteen times their apertures. The longer the focus, the larger will be the image of the object to be magnified by the eye-piece; and, the secondary spectrum remaining the same, whether of short or long focus, it is plain that a large image requires less magnifying than a small one to get the same magnification of the object, and, of course, the secondary spectrum is magnified less, and in the same ratio is less obtrusive. With comet-seekers, however, where high powers are never used, the aberrations are not sufficiently magnified to be generally noticeable. The powers commonly used range from 15 to 35 diameters.

To secure that important desideratum, a large field, an eye-piece called a "comet eye-piece" is used. It must be remembered that the size of an object-glass does not, as many suppose, determine the size of the field of view. Other things being equal, a small glass gives the same sized field as a large one.

A new and, in many respects, improved comet-seeker is coming into use. Its mechanical construction is so simple that the following brief description will cause it to be understood: The tube is elbow-shaped, and divided into two equal lengths joined at the middle at an angle of 45° . At this junction is a prism or plain reflector placed at the same angle. At one end of the horizontal tube is the eye-piece, and at the opposite end of the perpendicular tube is the object-glass. To the horizontal tube is attached a handle for rotating the telescope, the object-glass sweeping the heavens from horizon to zenith while the observer sits at his ease looking constantly in a horizontal direction into the telescope. It possesses the advantage of ease and comfort to the observer, though attended by the loss of some light by reflection from the mirror. (L. S.)

COMFORT, GEORGE FISK, an American educator and writer on æsthetics, was born at Berkshire, N. Y., Sept. 20, 1833. He graduated at Wesleyan University, Conn., in 1857, and taught the natural sciences at Amenia Seminary, N. Y., and Fort Plain Seminary, N. Y. In 1860 he went to Europe, and spent five years in travel, studying critically the educational systems, universities, art-schools, and museums of various countries, and giving special attention to philology, archæology, and the history of the fine arts. In 1865 he was chosen professor of modern languages and æsthetics in Allegheny College, Meadville, Pa., but resigned this position in 1868 to devote himself to literary work. In 1869 he took an active part in organizing the American Philological Society, and was its secretary till 1875. In 1869 he assisted in establishing the Metropolitan Museum of Art in New York, and was a trustee and a member of the executive committee of this institution until 1872, when he removed to Syracuse, N. Y., to accept the chair of æsthetics and the modern languages in the Syracuse University. In 1873, through his efforts, a college of fine arts was established in this university, and he has been dean of this college since its opening. Its success has proved the wisdom of the innovation of placing the fine arts on a basis co-ordinate with that of the classics and the sciences in American universities. Prof. Comfort is a member of the archæological institutes of Rome, Paris, and Berlin, as well as of learned societies in America. He has contributed to various encyclopædias, magazines, and reviews, as well as to the daily and weekly press. He has delivered many lectures, chiefly upon topics connected with artistic culture and education. He has published *Æsthetics in Collegiate Education* (1867); *Art-Museums in America* (1870); a series of text-books for the study of the German language; *Fine Arts in Collegiate Education* (1875); *The Land Troubles in Ireland* (1881). He is also joint author with his wife of *Woman's Education and Woman's Health* (1875).

COMMINATION, a penitential service in the Church of England, used on the first day of Lent. It is defined in the Book of Common Prayer as a denouncing of God's anger and judgment against sinners.

It is a relic of the penance which for centuries after the Christian Church was fully established was required of those who had been convicted of grievous sins. These persons, when seeking restoration to the Church, came fasting and clad in sackcloth and ashes; after the penitential psalms were pronounced they were cast forth from the Church as unworthy of being admitted to the congregation. Again and again they came as before, and only after a long trial and ample proof of penitence were they by degrees admitted into participation in the services. At the time of the Reformation such practice had long been extinct. In compiling the English Book of Common Prayer the present office was introduced to take the place of the former custom of marking the people with ashes on the first day of Lent. Martin Bucer, the German Reformer, who examined the English Prayer Book, approved the service, and at his suggestion it was directed to be used "at divers times in the year." Practically, it is never used except on Ash Wednesday, and the American Episcopal Prayer Book in the service for that day has omitted the Communion.

COMMONS.—The continuity in America of the old English or Germanic system of land community is an interesting fact, which serves to connect American communal life with the earliest beginnings of Teutonic society.

According to Tacitus, the ancient German communities took up land in proportion to the number of cultivators. These lands they afterwards divided among themselves, according to their rank or position in the community. He says they changed the situation of their plough-lands every year, while the remaining land was left common. This pictures historically the agrarian status of most Teutonic village communities as regards their communal domain. Doubtless the early Germans owned their house-lots in severalty, and doubtless they gradually acquired individual farms by allotment and consolidation, but for a long period, in a new or thinly-populated country, there would remain vast outlying tracts of common land. The village domain within the forest-clearing was the mark. This, itself, although subdivided and owned to a great extent in severalty, had certain communal characteristics. It was the collective domain of the village. It had common open spaces, of which village-greens, streets, and foot-paths are modern survivals. Without such forms of land community, no local society could exist without perpetual trespass upon individual rights. In addition to such fundamental commonage, Teutonic villages have been accustomed, down to recent times, to one or more of the following rights, called commons: to common wood in the surrounding forest, to common pasture, and to common grass-land. These rights are known in German as *Wald*, *Weide*, and *Wiese*, or wood, pasture, and meadow. Common rights to fishery and to the use of turf were also frequently claimed. Certain features of this ancient communal system are kept up to this day in the village communities of Germany, Switzerland, and Great Britain.

In some parts of the English colonies in America, the old system was reproduced in absolute perfection. The Pilgrim fathers of Plymouth Colony, like the ancient Germans, took up a tract of land as a communal domain, and in proportion to the number of cultivators. This tract they divided among themselves, according to the size of their families. More usually, in New England settlements, the division was according to property-rights and the rank of the settlers. Very frequently, however, as in the town of Plymouth, lands, especially meadows, were allotted to heads of households, according to the size of their families. The agrarian community at Plymouth was not due to the existence of a partnership between the Pilgrim fathers and English capitalists, for the community survived the partnership. It was practically as independent of superior authority as were the

agrarian communities of English tenants upon the manorial estate of their lord. Old usages went on undisturbed by colonial legislation. For many years after the founding of Plymouth upon the site of Indian corn-lands, which became the village mark, grass-lands were assigned by lot in town-meeting. For years the wood was cut and hauled in common. For more than a century the undivided forests were known as "commons." As late as 1710 Plymouth had within its communal jurisdiction over 30,000 acres of common land, and there still remain more than 200 acres of so-called "town-land," chiefly forest, whence, it is said, villagers sometimes help themselves in good old Teutonic fashion.

Survivals of the ancient system of commons, more especially of common pasture, have been traced throughout the limits of the old colony of Plymouth, and down to the very extremity of Cape Cod. In the old town of Sandwich there is still a parcel of land known as the "Town Neck." This is owned by a company of twenty-four proprietors, the descendants or heirs of the first settlers of the town, and this tract is managed to this day as a common field. Originally the Town Neck, like other common lands, belonged to the whole town. In the town records, under the date May 22, 1658, stands the following note: "If an inhabitant wanteth land to plant, hee may have some in the Towne Neck, or in the common for six yeare and noe longer." Later, in 1678, April 6, townsmen are given liberty to improve Neck lands "noe longer than ten yeares, and then to be at the townsmen's ordering againe." In the year 1695 the use of the Town Neck was restricted to the heirs of original proprietors, and the land was staked out into thirty-eight lots. The lots were not fenced off, and the whole tract continued to lie as a common field, under the authority of the entire body of proprietors, like the arable lands of a Germanic village community. In 1695, April 4, it was agreed that the Town Neck should be improved for the future as a common field, until the major part of those interested should see cause otherwise to dispose or improve the same. The common fence was to be made up, and a gate to be provided by the first of May. A field-driver or hayward was to keep the Town Neck clear of creatures, and to impound for trespass. In 1700 it was voted that the Neck be cleared of creatures by the 16th of April, and that no part of the land be improved for tillage other than by sowing.

The above case well illustrates the survival of common fields in the older English colonies. The system prevailed throughout New England, especially in Massachusetts and Connecticut. In the town of Salem there were no less than ten common fields of associated proprietors, who, by a vote of the majority, planted the same crop in their respective fields, and fenced in common. The proprietors had individual rights, but those rights were subject to communal authority. In harvest-time, by the law of the colony of Massachusetts, all artisans and common laborers could be impressed by the town constable "to worke by the day for their neighbours needing them in mowing, reaping, and inning." If any person so required by law to labor should refuse, he was compelled to forfeit, for "the use of the poor of the towne, double so much as such a dayes worke comes unto." This was simply the revival of old English parish law. The records of the proprietary of Salem South Fields are still in existence, and contain curious evidence as to the continuity of ancient local customs. Associate tillage in the same common field was, however, only one phase of land community in New England. All three varieties of absolute commonage, wood, meadow and pasture, prevailed in Salem and in many other of the older towns. The woodland about Salem, as in ancient Plymouth, was long reserved "for the commons of the towne, to serve it for wood and timber." If a townsman needed wood for fuel, fencing, or

building purposes, he could have it freely within reasonable limits, but the export of timber, boards, and clapboards was strictly forbidden, unless the same had first been offered for sale to the selectmen, or, as they were often called in Salem, "the town representative." The town of Salem, like many others, had vast tracts of absolutely common meadow, where, as in ancient Plymouth, a place was annually appointed where every man should mow. Long after the division of the principal meadows among Salem householders, according to the size of their families, the old custom of allotting bits of grass-land to individuals for a year's tenure went on undisturbed. Throughout New England, the custom long obtained of allowing the cattle of all townsmen or commoners to feed in the meadows, after the grass crop had been gathered by individual owners. This custom survived in the older towns along the Connecticut River down to very recent times.

Common pasture, next to town commons or village greens, seems to be the most enduring feature of ancient land community. In Salem, the Town Neck, now a public pleasure-ground, continued to be used as a home-pasture for milch cows until long after the time when Salem became a city (1836). Boston Common was thus used by its residents for many generations. There are, to this day, within the city limits of Salem, 300 acres of common land, called the "Great Pastures," owned by the heirs or descendants of the original commoners. This is the last remnant of great tracts, once embracing 4000 acres, and extending over the present limits of the towns of Peabody and Danvers. Concerning this tract it was voted by the town, in 1640, that "none of the commons within the cattle-range should be granted to any individual use." But the increase of population and the claims of newcomers to the rights of commonage led, in the course of the 18th and 19th centuries, to the gradual break-up of the old system of communal land-tenure. The history of this gradual break-up shows that precisely the same questions which agitated the plebeians and patricians of Rome with regard to the *ager publicus*, long disturbed the cottagers and commoners of this little village republic. The cottagers were newcomers and landless men; the commoners were the descendants of the original proprietors of the commons. The village patricians, in all the early New England towns, yielded slowly to the demands of the *plebs*, but the struggle was everywhere long and bitter. The agrarian history of New England has never been written, but it would constitute, if properly prepared, one of the most important and suggestive chapters, for it would describe that slow-moving, economic revolution, which has resulted in the establishment of freehold land-tenure for all classes, and in a vast number of thriving communities, composed of independent proprietors, whose chief communal interests are based no longer on common lands but upon common schools.

Traces of the ancient system of land community are now cropping out in many different States of the American Union, wherever students have taken pains to investigate the history of early land-tenure. Commons existed in all early Teutonic settlements in America, whether English or Dutch. They have been noted, not only throughout New England, but upon Long Island, in Nantucket, New York, New Jersey, Delaware, Pennsylvania, Maryland, Virginia, and the Carolinas. The glebe lands in Southern parishes are only an ecclesiastical phase of original parish commons, set off and administered by corporate boards for church purposes, as were town lands in New England for the support of schools and clergy. The court-greens in Southern county-towns are precisely the same in principle as village greens and town commons. The old town-pasture of Annapolis has a hundred parallels in the local history of New England. The early customs of this latter section with regard to cattle-ranges and common pasture have their modern

counterpart in the customs of cattle-herding in the West, and in the practices of common pasturage which still obtain in many parts of the South. Almost everywhere survive certain communal usages, often with reference to individual land-holdings, farms, plantations, estates, woodlands, swamps, and pastures. Forest and stream are still regarded, in many sections, as free to the hunter and the fisherman. Private roads and foot-paths often become common to the public. Individual proprietors are not infrequently influenced or controlled by neighborhood considerations in the management of their own land. A Mississippi planter, who wanted to turn his plantation into a stock-farm, found himself prevented from so doing by an injunction of the court, his neighbors contending that the sowing of grass-seed in a cotton district would injure plantations adjoining the proposed stock-farm. Thus, occasionally even now, the sovereignty of the community over an individual domain is recognized by law or custom in the matter of what farmers may plant.

Further information upon the subject of "Commons" may be obtained from an article in *The Nation*, January 10, 1878, by W. F. Allen, on *The Survival of Land Community in New England*, and from the *Johns-Hopkins University Studies in Historical and Political Science*, Vol. I., No. 2, on *The Germanic Origin of New England Towns*, and Nos. 9 and 10, on *Village Communities of Cape Ann and Salem*.
(H. B. A.)

COMMON LAW. The ancient common law of England is generally considered by the jurists of the United States to have been imported hither by our forefathers, and to constitute the basis of our present law. It was a well-recognized doctrine of the mother country "that whenever a new and uninhabited country was found out by English subjects, as the law is the birthright of every subject, so wherever they go they carry their laws with them, and therefore such new-found country is to be governed by the laws of England, though after such country is inhabited by the English, acts of parliament made in England without naming the foreign plantations do not bind them." This principle has received express recognition by our own courts.

It must be observed, however, that the whole common law was not imported into this country. Much of that elaborate system had relation to matters purely local, which existed under the English political organization, or was based upon the triple relation of king, lords, and commons, or upon those peculiar social conditions, habits, and customs, obtaining in the mother land. Such portions of the law were evidently unapplicable to the condition and wants of the colonists. They are therefore not recognized as part of our jurisprudence. The doctrine of benefit of clergy has, for example, been pronounced in Indiana to be "the offspring of that absurd and superstitious veneration for a privileged order in society which unfortunately existed in those ages of darkness when the persons of clergymen were considered sacred." It was therefore declared certainly not to have been adopted as the law of our country.

The doctrines of the common law with reference to poaching, with reference to the ancient methods of transferring land by livery of seisin and the like, and with reference to fencing, have all been pronounced inapplicable to this country, and are not therefore deemed to constitute any part of our jurisprudence.

The States constituting the original thirteen colonies usually fix upon the date of their settlement as that at which the decisions and statutes made and declared in England ceased, *proprio vigore*, to form part of their common law. The other States, settled since the Declaration of Independence, usually fix upon the date of the earliest permanent English settlement in this country, viz., 1607. In many instances, however,

immemorial usage has sanctioned the adoption of principles which took their rise in England subsequent to the settlement of the colonies, and these principles are universally regarded as component parts of our municipal law.

It is clearly settled that it is not necessary in order to constitute a given doctrine part of our common law, that it should have been practically enunciated prior to 1607 in the very shape in which it is sought to be applied. It is sufficient if the principle involved existed in the common law prior to that date, although it was not until afterwards put into practical operation. It is accordingly held that an action for breach of promise of marriage will lie in this country irrespective of statutory provisions, although as a matter of fact no such action was ever entertained in England prior to 1607. The principles of the common law warrant such an action, and the right to bring the same was therefore unquestionably imported into this country.

In accordance with the principles which have been above laid down, English precedents prior to the settlement of this country are looked upon as of binding authority, except in so far as they are affected by the peculiar condition and requirements of our citizens. Such precedents rendered subsequent to the settlement and prior to our independence are viewed with great deference, but are not deemed absolutely conclusive. Such precedents rendered subsequent to our independence are accounted worthy of respect and attention, but have no further weight attached to them.

Those portions of the territory of the United States which have been acquired by treaty or purchase from other and civilized nations are not to be regarded as having in any manner lost by the transfer those systems of law which formerly prevailed there. Such systems remained in force until, by the proper authority, they were abrogated and new laws were promulgated. Accordingly in Florida and a great portion of the north-western territory, as well as in the trans-Mississippi territory, the French or Spanish law continued to prevail until by statutory enactment the common law was substituted.

Hitherto we have been considering the doctrines of the common law as applied in the various States. The same principles, precisely, apply in the case of the United States courts, as far as civil cases are concerned. All actions there are "according to the principles of common law and equity as distinguished and defined in that country from which we derived our knowledge of those principles."

In criminal cases, however, a different rule attains. The United States courts have no jurisdiction in such cases except that which is expressly conferred upon them by statute. All purely common law offences are not cognizable by them. But it is not to be doubted that the Constitution and laws of the United States were framed in reference to the existence of the common law. In many cases their language would be inexplicable without reference to it. Constant resort has therefore to be had by the courts of the United States in criminal cases to the doctrine of the common law in order to fix and ascertain their powers. Wherever an authority is once lawfully given them, the nature and extent of that authority and the mode in which it should be exercised are governed wholly by the principles of the common law.

The common law has, of course, been materially altered both in the United States at large and in the several States by statutory enactments. It is quite impossible to give even the briefest summary of these. The attempt would expand the present article into a treatise on the distinctive jurisprudence of the United States.

(L. L., JR.)

COMMON SCHOOLS IN THE UNITED STATES. The earliest schools in America were established by the citizens of towns. This seems to have been the origin of the first schools in Boston, Dorchester, Salem, Hartford, New Haven, and other of the older

settlements. There is evidence that previous to the formal vote of the inhabitants of a town establishing schools, they had by voluntary association and agreement employed teachers to instruct their children. The vote of the colony requiring the founding of schools usually followed the action of the towns. In Massachusetts colony the interval was seven years; in New Haven not more than three. In 1642 and 1647 Massachusetts passed laws regarding the training of children which have proved to be, in a degree, the basis of all succeeding requirements concerning education. In the former year the General Court, standing in the place of the parent and seeing "the great neglect of many parents and masters in training up their children in learning and labor and other employments which may be profitable to the Commonwealth," decreed that certain men in each town shall take account of the employments of children, and especially of their ability to read and to understand the "capital laws." The law of 1647 required every town containing fifty householders to appoint a teacher "to teach all such children as shall resort to him to write and read;" and every town containing 100 householders to "set up a grammar school," whose teacher shall be "able to instruct youth so far as they be fitted for the university." So important was the enforcement of this law regarded that the penalty for non-compliance with it was severe. At first the penalty was £5 a year. In 1671 it was doubled; in 1683 it was again doubled, and later yet again increased. All the forfeitures were appropriated to the maintenance of the public schools. It was in reference to the makers of these laws that Macaulay, in a speech in the House of Commons in 1847, said, "Those men, illustrious forever in history, were the founders of the Commonwealth of Massachusetts; but though their love of freedom of conscience was illimitable and indestructible, they could see nothing servile or degrading in the principle that the State should take upon itself the charge of the education of the people."

The Connecticut colonies, settled by Thomas Hooker and his companions, were not behind Massachusetts, from which they emigrated, in the establishment of schools. Within three years after the first log-house was built at New Haven, a public grammar-school was opened. It appears that previous to this action a school of a more elementary character had been formed. So deep was the interest in education that in 1644 certain officers proposed that the colony make an annual contribution to aid children, of good abilities but of limited means, in attending the college at Cambridge. In November of that year the General Court ordered that "Joshua Atwater and William Davis shall receive of every one in this plantation, whose heart is willing to contribute thereunto, a peck of wheat or the value of it." Not content with these generous provisions for the education of all children, the colony established, in 1672, county grammar-schools, four in number, and endowed each with 600 acres of land.

Although a larger proportion of the children of Rhode Island than of other colonies were educated either abroad or by family-teaching in the seventeenth century, yet within two years after the settlement of Newport (Aquidneck), in 1638, a teacher was invited to the town by a vote of its freemen. The school was provided with a hundred acres of land, the income from which helped to meet the tuition fees of children unable to pay them. Like the schools of Hartford, New Haven, Boston, and other large towns, it fitted its students for Harvard College.

Before the middle of the first century of its settlement every colony in New England, with the exception of Plymouth, had made education compulsory. In Plymouth colony the earliest action taken regarding schools occurred in 1663, when the Court merely proposed to the towns that "they ought to take into their serious consideration" the employment of a school-master, to "train up children to reading and

writing." Ten years later the profits of the Cape fishery were given toward the support of a public school at Plymouth. Fourteen years later an "order" was passed requiring every town having twelve families to maintain a public grammar-school.

The absence of literary interests beyond the New England boundaries was at once the cause and the result of the failure to establish the system of public schools. In Virginia, for three generations after its settlement, education suffered neglect. From 1618 to 1622 various attempts were made, both in the colony and in the mother-country, to organize free schools, and even to found a college. Large grants of land and some ten thousand dollars were given for the purpose. In 1619 the Virginia Company instructed the governor to see "that each town, borough, and hundred procured, by just means, a certain number of their children to be brought up in the first elements of literature, that the most towardly of them should be fitted for college." A free school was opened in Charles City, and one in Elizabeth City in 1642. Four years before John Harvard endowed Harvard College, by the gift of his library and of a few hundred pounds, a Virginian endowed the school at Elizabeth City by the donation of 200 acres of land, and of the "milk and increase of eight cows." The school seems to have been blessed with prosperity, for in 1649 a "fine house" stood on the land, and it possessed "forty milch kine, and other accommodations." But so slight was the attention paid to education, that the historian, Burk, asserts that "until the year 1688 no mention is anywhere made in the records of schools, or of any provision for the instruction of youth." In 1671 Sir William Berkeley, the governor for thirty-six years from 1641, wrote in reply to a question of the English commissioners: "I thank God there are no free schools, nor printing; and I hope we shall not have, these hundred years; for learning has brought disobedience, and heresy, and sects into the world; and printing has divulged them, and libels against the best government. God keep us from both." During his long term of rule Sir William did much to answer his prayer.

The cause of education, however, did not suffer so severe a tyranny as the printing-press. In less than five years after Governor Berkeley offered his notorious petition, a citizen bequeathed 600 acres, "together with ten cows and one breeding mare, for the maintenance of a free school, forever." The accession of William and Mary promoted the immigration of a race to whom religion and education were dearer than all other interests. In the sixteenth century the people of Scotland had enacted that each parish should have a school for instruction in grammar, Latin, and the principles of religion; and at a period somewhat later, had directed that the schools should be so supported by the public funds as to make education possible to the poorest child in the community. The coming of Scotchmen to Virginia, near the close of the seventeenth century, marks the real beginning of a genuine interest in public education. It resulted in the establishment of the second college founded in America.

As Maryland was first established on the territory of Virginia, its early educational history has little apart from the record of the schools of the older colony. It was not until 1694 that its first act was passed regarding education, which resulted in the establishment of free schools. Towards their support were appropriated taxes imposed on negroes and spirits imported, and on the exports of furs, skins, beef, and pork. It was not, however, till 1723 that the system thus devised was realized. At this time a board of seven visitors for each county was created. To them authority was given to purchase in each county 100 acres of land as the site of a boarding-school, and to employ masters, "members of the Church of England, and of pious and exemplary lives and conversa-

tion, and capable of teaching well the grammar, good writing, and the mathematics." By an act passed five years later they were required to teach as many poor children as the visitors should direct. Though far inferior to the school system of New England, Hildreth affirms that the provision of Maryland, for the instruction of her youth, was more liberal than that "elsewhere made in the colonies for public education."

The advantages for education provided in New Amsterdam (New York) were hardly superior to those of the Old Dominion. The stolid Dutchman cared but little more for the training of his children in any art save that of money-getting than the Virginian. The first school was opened in 1633, and was under the control of the Dutch Church. The advance in methods of education was slow, and was not materially hastened by the transformation of New Amsterdam into an English town, in 1664. In 1659 the first "Latin schoolmaster" came to the colony. In 1702 a "free grammar-school" was partially endowed; but it was not till 1732 that a school for teaching Latin, Greek, and mathematics was incorporated. The interests of education were slighted. For many years the colony contained only two citizens of a liberal education. In 1745 the number was only fifteen. "What a contrast," exclaims William Smith, the historian of New York, "in everything respecting the cultivation of science between this and the colonies first settled by the English!" "Our schools," he laments, "are of the lowest order—the instructors want instruction; and through a long and shameful neglect of all the arts and sciences, our common speech is extremely corrupt."

Professor M. C. Tyler, the historian of American literature, has remarked that, "in spite of all outward differences, of all mutual dislikes, there was an inward kinship between the Quakers of Pennsylvania and the Puritans of New England." This kinship is in no respect more clearly indicated than in the early provision made for education. "Before the pines had been cleared from the ground," William Penn and his comrades "began to build schools and set up a printing-press." Their first school was opened in the first year of the colony, and in the sixth year a free academy was established at Philadelphia. So strong and permanent were the influences in behalf of free schools that the State of Pennsylvania is one of the few States which in their original constitution inserted a clause regarding education.

It is fitting, before considering the later development, to trace out the causes of these original differences in respect to education in the several colonies.

The general cause is, of course, to be found in the character of the colonists and in the purposes of their immigration. It is estimated that, down to the year 1640, 21,000 persons, or 4000 families, had landed in New England. Careful investigation, recently conducted by Professor Dexter, of New Haven, indicates that among these 21,000 were 100 graduates of Cambridge or Oxford University. The larger majority of these scholars were residents of Massachusetts Bay; but it is probable that throughout New England, in the 60 years from 1630 to 1690, were to be found as many university graduates as in any population of the size.

Plymouth, however, contained the smallest number. Elder Brewster was, from the date of the landing in 1620 to the arrival of the first settled minister in 1629, the only university man in the colony, and he had, by at least a year, failed to complete his course at Cambridge. In his farewell letter to the Pilgrims, John Robinson writes: "You are not furnished with any persons of special eminency above the rest." The fact that, of the entire company of a hundred of the Mayflower, only three can be traced to English homes, shows that the Pilgrims were, as has been said, of the "humble stock of English common people of indistinguishable ancestry." Of the early graduates of Harvard College, to the year 1658, only three came from Plymouth Colony.

The glory of the Pilgrims lies neither in the intellectual training they enjoyed, nor in the educational privileges afforded their children, but in the simple faith and courage of their devout hearts and lives.

As the purpose leading to the settlement of the Massachusetts colonies was religious, so that which chiefly contributed to the formation of the Virginia Company was commercial. Yet, notwithstanding the worthiness of this purpose, the complaint was constant that the majority of the immigrants to Virginia were either too idle or too incompetent to earn a livelihood. To their numbers were added, by the king's special order, a hundred convicts, commonly known among the colonists as "jail-birds;" and the policy by which England rid herself of these dissolute vagabonds and criminals was, in spite of the protests of the colonists, continued. But the crowning shame and injustice was the importation of women who were stolen from English homes by authorized kidnappers, forced over the ocean, and sold as wives to the planters. A colony thus settled was not the nurse of schools and colleges. The mode of settlement also tended to foster the growth of the public school in New England, and to oppose its development in the Old Dominion. The colonists of New England settled along the coast in towns adjoining each other. Population was compact. The homes were in neighborhoods and villages. In 1650 Charlestown contained about 150 dwelling-houses. The general tendency was toward concentration. In Virginia the condition was different. Its settlers "brought with them, as a type of the highest human felicity, the memory of the English territorial lord, seated proudly in his own castle, breasting back all human interference by miles and miles of his own land." The capital of the colony, Jamestown, had only a state-house, a church, and eighteen dwelling-houses. Bancroft says that in Virginia, even in the latter part of the 17th century, "there was hardly such a sight as a cluster of three dwellings." In his history, Campbell remarks that "the Virginia parishes were so extensive that the parishioners sometimes lived at the distance of fifty miles from the parish church." In a population so scattered, no system of public schools could be formed. But the comparative compactness of the New England colonists invited the establishment and support of schools in every town.

In return for his instruction, wherever in the colonies given, the teacher received an annual salary varying from perhaps \$125 to \$300. It was paid in part by the town and in part by each scholar. The fee a year for a scholar was seldom less than \$2, and at times more than twice this amount. Payment was made not only in money, but also in what was known as "country pay," as wood, corn, and produce. "A half-cord of good merchantable wood" seems to have been equivalent to 4 shillings and a bushel of wheat to 5. But instruction was refused to no one in consequence of his poverty. In this sense the town school was free; and for its support the town taxed its property-holders far more heavily than is now necessary to maintain the present system of public schools.

Throughout the 18th century the common schools pursued substantially the system and methods of the 17th. In the Northern colonies the system became more firmly fixed, both in statute and public sentiment, and the methods and means of instruction, especially toward the close of the century, were improved and enlarged. In the Southern provinces, however, the cause of public education languished. Notwithstanding the endeavors of Jefferson, the public school system did not, previous to the Revolution, obtain a firm footing beyond the boundaries of the Eastern States, and even not till after the close of the civil war was its permanent standing assured by statute, and the favorable sentiment of the people of the Southern States. Even in the Northern States, if the laws were severe in requirements concerning the

establishment and support of schools, as they were in New Hampshire, Massachusetts, and Connecticut, they were constantly broken. The poverty of the settlers, the unsettled condition of society caused by the frequent Indian wars, and new physical conditions, tended to minify the usefulness of the public school. New Hampshire law required that every town of a hundred families should maintain a school which should fit students for college, but the failure to observe the provision was constant; so constant that, to help remedy the evil, Phillips Exeter Academy was founded. The Constitution of North Carolina, of 1776, declared that "a school or schools shall be established by the legislature, for the convenient instruction of youth, with such salaries to the masters, paid by the public, as may enable them to instruct at low prices; and all useful learning shall be duly encouraged and promoted in one or more universities;" but the education of the people remained meagre. Georgia was among the first of the States to affirm in its fundamental law the duty of establishing free schools. This it did in the Constitution of 1777. Six years later the legislature donated 1000 acres of land to each county for the support of free schools, and in 1792 gave \$5000 for the endowment of an academy in each county, besides making munificent offerings for the endowment of a university. But the isolated population and the unrepublican character of society prevented the establishment of the system of common schools. The duty of the State to education was recognized in the Constitution of Massachusetts of 1780; the law of the commonwealth provided that each town of 50 householders should maintain a school for teaching the common English branches, and of 200 householders one for fitting students for the university. As early as the beginning of the 18th century as good a system of public schools was in existence in Connecticut as in any State, and included provisions for a common school in every town of 70 families during half of each year, for a grammar school in each county, and for the support of these schools by public taxation. In 1795 the State set apart the proceeds of that portion of the Territory of Ohio now known as the Connecticut Reserve—reserved by the State when it ceded certain claims to the national domain—for a school fund, which has amounted to about \$2,000,000. The first constitutional reference to public schools in New York occurred in the instrument of 1822. In the 18th century the schools of New York were of little worth. The quality of the instruction was poor, and the people showed little interest in education. Towards the close of the century, about \$150,000 were yearly appropriated by vote of the legislature, towards the support of the schools, and it was required that a school be kept within the limits of at least every four miles square. In the second Constitution of Pennsylvania, that of 1790, it is ordered that "the legislature shall, as soon as conveniently may be, provide by law for the establishment of schools throughout the State, in such manner that the poor may be taught gratis." To promote education, a large tract of land was set apart for the establishment of free schools.

While the legal requirements respecting common school education were few and general, not only were they frequently evaded, but the quality of the instruction actually given seems to have been of a low order. The conditions were not favorable for the promotion of either mental discipline or of knowledge. The school-houses were few, scattered, and poor. In private houses schools were not infrequently kept. Blackboards, slates, globes, and the apparatus of the more modern school were unknown. Text-books were few. Dilworth's spelling-books, the Bible and the Psalter were chiefly used. No geography was studied till the introduction of Morse's small works, in 1786-87; no history was read, and grammar received little attention. In 1783 Webster's spelling-book was introduced, and worked a great reform in a department of knowl-

edge in which previously there had been little uniformity. Arithmetic was taught in the "Schoolmaster's Assistant," and a few other simple treatises. To "ciphering" was the chief attention paid, and progress beyond the "Rule of Three" was deemed remarkable. Writing was also taught. But a prominent defect of the schools of the eighteenth century is found in the intellectual character, and moral, though perhaps to a less degree, of the teachers. The calling was despised, and therefore failed to attract those of the best ability. Many foreigners were engaged in American schools, and evidence indicates that they were ill qualified to instruct. Teachers were constantly changed. Men taught in the winter sessions, and in case of sessions in the summer women were employed. The compensation was relatively no greater than in the preceding century. The schools of the large towns and cities were much superior to those of rural districts. The greater compactness of population and the greater wealth and culture combined to create a demand for a broader course of study and a better quality of instruction. The grammar-schools still fitted youth for college as in the preceding century, and fitted them well. But "the country schools," which included the larger proportion of the population, a writer affirms, in 1791, "through most of the United States, whether we consider the buildings, the teachers, or the regulations, are in every respect despicable, wretched, and contemptible." President Humphrey writes of the school-house in which he sat as a pupil, at the close of the century: "The first school was taught in a barn. . . We had no school-house in our district. We met as much for play as anything, where we could find shelter. . . None of the school-houses were convenient or even comfortable. They were rather juvenile penitentiaries." President Nott thus describes the severe discipline: "It was a maxim that 'to spare the rod was to spoil the child,' and on this maxim the pedagogue acted in the school-room, and applied it for every offence, real or imaginary."

For the fifty years following the War of the Revolution, the common schools were better supported by law and public opinion than in the first half of the eighteenth century. During the war the schools suffered constant interruption. The quality of instruction also generally improved toward the close of the century. This period, down to the year 1830, was the prosperous period of academies. They were incorporated institutions, of the grade of the secondary or grammar-school, and were frequently under the care of a religious denomination. They were usually situated in the country, in towns in which the grammar or high-school did not exist, and drew their pupils from a wide range of territory. In the South they were generally under the control of the State. In the fourth decade of the present century, however, occurred a great increase in the efficiency of the public school system. At that time, at least in the Eastern States, the system underwent modifications which gave it the form it has since retained. Among the causes directly contributing to these changes were the formation of the American Institute of Instruction, in Boston, in 1830, composed of members from all parts of the country; the influence of James G. Carter, of Massachusetts, who was the mover in advanced legislation, from 1830 to 1838; the labors of Henry Barnard, of Connecticut, in both public and private capacities; and, above all, the appointment of Horace Mann, in 1837, as Secretary of the newly created Massachusetts Board of Education. To the enthusiasm, the learning, the patience, the devoted labors of Mr. Mann the common school system, not only of Massachusetts and of New England but of the whole country, owes lasting obligations.

As States were organized out of the new territory of the Ohio and Mississippi valleys, and of the Pacific coast, the system of common schools was successively

introduced into each. Although the provision for public education was made by either the constitution or the statute, yet the execution of the law was in many States dilatory and ineffective. The Constitution of Ohio, of 1802, enjoined that "schools and the means of instruction shall forever be encouraged by legislative provision;" but it was twenty-three years later that a general school law was passed. In even 1836, Samuel Lewis, appointed at that time State Superintendent, declared that he found "out of Cincinnati there were no public schools worthy the name, practically open to rich and poor, and nearly half of the organized school districts were without school-houses, and that not one-third of the whole number would be appraised at \$50 each." But the labors for three years of the superintendent partially removed these evils, and the system of public education has become well established through the agency of the State Teachers' Association. Indiana, in its Constitution of 1816, made it the duty of the Legislature "to provide by law for a general system of education, ascending in regular gradation from township schools to a State university, where tuition shall be gratis and equally open to all." The first school law was passed in 1821, but so ineffective was it that in 1840 the schools of Indiana were inferior to those of most States. The law of 1848, providing for a system of free schools, and the law of 1855 resulted in enlarging the amount of instruction and in improving its quality. The first general school law of Illinois was passed in 1825, but it was not till 1854 and 1855 that a thorough organization of common schools was made. Above most Western States, Michigan was favored in having among the framers of its first constitution and its early legislators, graduates of the academies and colleges of the East. The Constitution of 1835 ordains the appointment of a superintendent of public instruction; devotes the proceeds of all land grants for education to educational purposes; directs that a common school be maintained in each school district for three months each year, and provides for the establishment of a State University. These provisions were at once carried into effect. The provision of the Constitution of Iowa, of 1846, relating to education, is similar to that of Michigan. The Constitution of 1857 formed a "Board of Education," which was invested with great power in respect to the management of the educational institutions supported by the State; but in 1864 the school system was reorganized by the General Assembly. The Constitution of Wisconsin, 1848; of California, 1849; of Minnesota, 1850; of Nevada, 1864, and of Nebraska, 1867, contain provisions respecting education not dissimilar to those of the instruments just cited.

Before the Civil War the common school system had not thoroughly penetrated the Southern States. In Louisiana, and in Charleston, S. C., and in the States of Kentucky and Missouri it existed, but in a feeble condition. Governor Hammond, of South Carolina, said in his message, in 1844: "The free school system has failed. Its failure is owing to the fact that it does not suit our people, our government, our institutions. The paupers, for whose children it is intended, need them at home to work." But since the close of the war the system has been introduced into every Southern State. The statute law provides for the education of all children at the public expense. Although the efficiency of the system is not as great as in many Northern States, which are at once wealthier and have a greater experience in educational matters, it has gained a firm footing, and the sentiment of the better classes is in its favor.

The administration, organization, and support of schools ultimately depend upon the legislative body of each State. In many States a Board of Education has special charge of public education, subject, however, to the control of the legislature. In each town or city is usually a committee, chosen by its citizens,

who have immediate superintendency of its schools. For convenience, each municipality is frequently divided into sections called "districts," and the children living in each district ordinarily attend its schools. These geographical divisions are less frequent in cities than in the country. In some States, as Florida, each county forms a school district. Schools are in general divided into the graded and the ungraded. The basis of the division of graded schools is advancement in the studies. Three grades are commonly recognized, known as the primary, the grammar (a term that has ceased to represent the fitting school for college), and the high. The high-school prepares the student for college, or affords an education in the advanced English branches; the grammar offers the ordinary English studies; the primary provides instruction in the elements of reading, writing, arithmetic, and geography. The course in each school usually occupies four years, although usage differs not only in different States, but also in adjoining towns of the same State. Graded schools are seldom found in the rural districts. The sparse population does not permit the division of pupils into schools of different degrees of proficiency. In the ungraded school all branches may be taught. Teachers are examined in respect to their qualifications by the school committee, and their schools are inspected also by them. The changes of teachers are frequent, and, together with the irregular attendance of pupils, form a principal hindrance to the highest usefulness of the schools.

Schools for the professional training of teachers, usually called normal schools, are established in every State except Delaware, Florida, and Nevada. In the United States there are no less than 207, with 1400 instructors and 40,000 pupils. The larger number are supported wholly or in part by the State in which they are located; and several are organized in connection with the school systems of cities. The course of study occupies two or three years.

For the financial support of schools, dependence is placed upon permanent funds and upon taxation. The permanent funds are mainly derived from the sale of public lands. In May, 1785, the Congress of the Confederation voted to reserve in the "western territory" "lot No. 16 of every township for the maintenance of public schools." The ordinance of 1787, concerning the government of the "territory northwest of the river Ohio," affirmed the duty of providing for education. The newer States especially, as well as Connecticut, of the older, have large funds derived from the lands thus reserved. In 1836 the United States distributed its surplus revenue among the several States, and many of them have, under the name of the "United States Deposit Fund," applied their proportion to the support of the public schools. In certain newer States and Territories 2 lots of land from the 36 in each town are reserved for the support of schools. The permanent school fund of 28 States in 1875 was \$81,486,158; of 30 States in 1876, \$97,227,909; of 26 States in 1877, \$100,138,348; of 32 States in 1878, \$106,138,348; and of 30 States in 1879, \$110,264,434. The largest proportion, however, of the support of public schools is derived from taxation. Table I. represents the amount thus raised, as well as the total income, in each State and Territory in 1881, the total income for all being \$88,142,088.

The annual cost of education to each scholar enrolled varies from about four dollars to more than sixteen dollars. The cost is much less than in the public schools of England of similar grade. The compensation of teachers varies as much as the cost of the education of each pupil, in the different States. The average pay of male teachers a month, in the District of Columbia, is \$89; in Nevada and Arizona, \$84; in California, \$82; in Rhode Island, \$74; in Massachusetts, \$67; of female teachers in the same States, \$62, \$83, \$68, \$66, \$42, \$33. The smallest remuneration is afforded in Louisiana, Tennessee, South Carolina, North

Carolina, and Alabama, which allow each teacher amounts varying from \$27 to \$19 for every month's service. Table II. presents a general view of the condition of public education in the United States.

The legal school age varies in the different States. The longest runs from 4 years to 21, the shortest from 8 to 14. There are no less than 16 different school ages. The total school population of the United States exceeds fifteen millions, of whom slightly more than one-half are enrolled in the public schools, but the average daily attendance is only about one-third of the entire school population. In a few States attendance for a certain time each year is compulsory. There are nearly 200,000 public schools, taught by nearly 300,000 teachers, about two-thirds of whom are women. In the Southern States a division of schools is made between white and colored children.

Not till the last quarter of the eighteenth century was the opinion current that girls both required and deserved an education equally with the boys. As early as 1770 the common schools of Connecticut were open to every child, but the studies of the female portion were hardly as advanced as those of the male. The Moravian school at Bethlehem, Pa., and the academy opened at Medford, Mass., in 1789, were among the first institutions designed for the superior instruction of young women, but they were of private organization. In 1784 girls in Boston were admitted only to so-called "writing schools," in which penmanship, reading, and spelling were taught. These schools were kept by the public school teachers between the forenoon and afternoon sessions of the boys' schools. Five years later, girls were admitted to certain of the public schools. But it was not till 1825 that a school for their instruction in the "higher departments of science and literature" was established. Before the close of the eighteenth century, however, provisions, though meagre, had been made in most towns for public instruction of girls, especially in the summer, in the common English branches. From 1840 to 1880 the advance in opportunities for their education was rapid. It can in general be said that at the present time the advantages afforded them in the public school are equal to those that boys enjoy. In the primary and grammar grades both sexes usually attend the same school, and likewise in many high schools, although the division of high schools into those for boys and those for girls is more frequent than a corresponding division of schools of a lower grade.

The direct religious teaching given in the public school is slight. It is not permitted to exceed the reading of the Bible, prayer, and devotional singing. No sectarian instruction is allowed. In the schools of many cities, in which the Roman Catholic population is large, the reading of the Bible is omitted. The Constitutions of most States require the teaching of morality, but in only a few schools is direct instruction afforded in practical ethics. It is, however, usually considered the duty of the teacher to emphasize moral principles in connection with intellectual discipline.

Concerning the direct results of the public school system, it is to be noted that ninety per cent. of the total population ten years old and over can read. Illiteracy is more prevalent in the Southern States, owing to their proportionally large colored population. In several of them about one-third of those ten years of age and over cannot read. In most other States less than 5 per cent. are unable to read. In California it is 5.62; in Connecticut, 3.37; in Massachusetts, 4.24; in Minnesota, 2.63; in Ohio, 2.71; in Pennsylvania, 3.41; and in Nebraska, the lowest percentage, 1.73.

The public school system is based upon the principle that the virtue and intelligence of the people are the foundation of a Republic. The Constitution of Rhode Island affirms that "the diffusion of knowledge, as well as of virtue, among the people being essential to the preservation of their rights and liberties, it shall be the duty of the General Assembly to promote public

TABLE I.

States and Territories.	Amount received from taxation.			Total income.	States and Territories.	Amount received from taxation.			Total income.
	State tax.	Local tax.	Total.			State tax.	Local tax.	Total.	
Alabama.....	\$130,000	\$128,212	\$258,212	\$397,479	New Jersey.....	\$1,017,785	\$724,413	\$1,742,198	\$1,914,447
Arkansas.....	111,605	77,475	189,080	710,462	New York.....	2,750,000	7,393,890	10,143,890	10,895,765
California.....	1,490,328	1,343,306	2,833,634	3,680,161	North Carolina..	.....	.....	352,887	698,772
Colorado.....	.....	336,333	336,333	708,516	Ohio.....	1,515,621	5,663,323	7,178,947	8,129,326
Connecticut.....	215,597	1,068,205	1,283,802	1,482,025	Oregon.....	146,806	91,569	238,375	323,201
Delaware.....	.....	.....	.....	147,360	Pennsylvania.....	.....	7,746,931	7,746,931	8,798,724
Florida.....	.....	.....	104,530	139,710	Rhode Island....	81,410	434,566	515,976	582,965
Georgia.....	363,677	134,856	498,533	498,533	South Carolina..	.....	.....	.....	452,965
Illinois.....	1,000,000	5,769,538	6,769,538	7,922,169	Tennessee.....	127,839	513,404	641,243	706,152
Indiana.....	.....	.....	.....	4,480,306	Texas.....	678,603	.....	.....	891,235
Iowa.....	.....	4,087,446	4,087,446	5,006,024	Vermont.....	112,671	342,161	454,832	454,832
Kansas.....	.....	1,206,242	1,206,242	1,740,593	Virginia.....	564,795	745,701	1,310,496	1,335,984
Kentucky.....	741,672	384,070	1,125,742	1,194,258	West Virginia....	229,814	548,762	778,576	855,466
Louisiana.....	250,000	177,000	427,000	486,790	Wisconsin.....	.....	1,750,430	.....	2,178,219
Maine.....	235,979	613,258	849,237	1,089,414	Arizona.....	.....	.....	.....	58,768
Maryland.....	.....	.....	.....	1,608,274	Dakota.....	.....	.....	.....	363,000
Massachusetts.....	4,594,207	4,594,207	4,594,207	4,851,567	Dist. of Columbia..	.....	551,325	551,325	555,644
Michigan.....	2,796,299	2,796,299	2,796,299	3,645,328	Idaho.....	.....	84,008	84,008	94,551
Minnesota.....	241,000	915,738	1,156,738	1,679,297	Montana.....	.....	.....	.....	32,171
Mississippi.....	200,000	373,077	573,077	716,342	New Mexico.....	.....	.....	.....	198,876
Missouri.....	.....	2,163,339	2,163,339	4,020,860	Utah.....	59,706	65,793	125,499	127,609
Nebraska.....	88,196	824,959	913,155	1,320,449	Washington.....	115,323	12,286	127,609	127,609
Nevada.....	.....	96,811	96,811	138,640	Wyoming.....	.....	.....	.....	36,161
New Hampshire...	437,573	76,380	513,953	586,139	Indian.....	.....	.....	.....	151,950

TABLE II.

States and Territories.	School age.	School population.	Number enrolled in public schools.	Average daily attendance.	Average school term in days.	Annual expenditure per capita of attendance.	Number of teachers.	Amount of available school funds.	Interest on permanent funds.
Alabama.....	7-21	422,739	176,289	115,316	80	\$3.56	4,698	\$2,528,950	\$138,014
Arkansas.....	6-21	272,841	98,744	.....	.....	.....	2,169	144,875	.....
California.....	5-17	211,237	163,855	105,541	115	26.32	3,737	1,990,400	293,592
Colorado.....	6-21	40,804	26,000	14,649	89	38.03	801	36,000	.....
Connecticut.....	4-16	143,745	119,381	76,028	180	17.41	3,112	2,021,346	100,612
Delaware.....	6-21	37,285	29,122	.....	153	.....	583	495,749	.....
Florida.....	4-21	88,677	39,315	27,046	.....	4.25	1,095	246,900	17,962
Georgia.....	6-18	461,016	244,197	149,908	.....	3.32	6,128	.....	.....
Illinois.....	6-21	1,002,222	701,627	425,858	149	16.61	22,133	9,247,281	624,138
Indiana.....	6-21	714,343	503,855	306,301	135	12.72	13,418	9,133,606	.....
Iowa.....	5-21	594,730	431,513	254,088	148	16.97	21,776	3,547,124	234,622
Kansas.....	5-21	348,179	249,034	139,776	117	11.69	8,208	2,467,891	280,004
Kentucky.....	6-20	553,638	238,440	149,226	102	.....	6,910	1,760,652	.....
Louisiana.....	6-18	271,414	62,370	45,626	100	9.41	1,584	1,130,867	45,235
Maine.....	4-21	23,927	150,067	99,500	118	10.05	6,940	438,287	26,297
Maryland.....	5-20	319,201	158,909	79,739	.....	16.37	3,180	906,229	.....
Massachusetts.....	5-15	312,680	325,239	233,108	178	21.54	8,861	2,086,887	69,008
Michigan.....	5-21	518,294	371,743	219,328	154	12.45	14,472	3,040,183	512,301
Minnesota.....	5-21	300,923	177,278	79,901	100	15.55	5,571	4,835,476	385,748
Mississippi.....	5-21	419,963	237,288	160,064	78	4.75	6,058	800,000	.....
Missouri.....	6-20	723,484	476,376	219,132	100	13.79	10,447	8,950,806	936,245
Nebraska.....	5-21	152,824	100,776	65,504	110	17.78	4,559	5,126,565	190,135
Nevada.....	6-18	10,533	8,329	5,406	140	23.97	176	415,000	33,844
New Hampshire...	5-15	60,899	68,235	43,943	97	16.02	3,585	.....	23,253
New Jersey.....	5-18	335,631	203,542	110,052	190	15.91	3,486	1,452,720	100,000
New York.....	5-21	1,662,122	1,021,282	559,399	178	19.52	30,826	3,276,602	170,000
North Carolina..	6-21	468,072	240,716	142,820	48	2.81	5,002	100,000	.....
Ohio.....	6-21	1,063,337	744,758	468,141	155	15.68	23,970	3,795,206	244,675
Oregon.....	4-20	61,641	34,498	25,196	86	12.29	1,339	610,000	48,346
Pennsylvania.....	6-21	1,422,377	931,749	599,057	147	11.45	21,352	.....	1,051,793
Rhode Island....	5-15	53,077	44,920	28,836	186	18.04	1,287	240,376	12,449
South Carolina..	6-16	262,279	133,458	.....	73	.....	3,249	.....	.....
Tennessee.....	6-21	545,875	283,468	180,509	70	3.53	6,880	2,512,500	.....
Texas.....	8-14	230,527	186,786	.....	73	.....	4,361	.....	44,623
Vermont.....	5-20	99,463	74,646	49,700	124	8.99	4,419	669,087	.....
Virginia.....	5-21	556,665	239,046	134,487	117	7.22	5,392	40,600	1,350
West Virginia....	6-21	213,191	145,203	91,266	99	7.31	4,237	441,947	39,137
Wisconsin.....	4-20	491,358	300,122	190,878	176	.....	9,919	2,790,214	199,354
Arizona.....	0-21	9,571	3,844	2,847	109	.....	102	.....	.....
Dakota.....	5-21	38,815	25,451	.....	.....	.....	1,033	.....	.....
Dist. of Columbia..	6-17	43,558	27,299	20,730	190	19.97	460	60,385	2,577
Idaho.....	5-21	7,520	6,080	4,127	150	10.38	175	.....	.....
Montana.....	4-21	9,895	5,112	2,800	110	.....	177	.....	.....
New Mexico.....	7-18	29,255	4,775	3,150	.....	9.20	164	.....	.....
Utah.....	6-18	42,353	26,772	18,682	140	7.96	565	.....	.....
Washington.....	4-21	23,899	14,754	11,275	100	11.92	443	.....	.....
Wyoming.....	7-21	4,112	2,907	1,920	.....	14.85	70	.....	.....
Indian.....	.....	9,315	6,183	3,496	180	.....	209	1,028,630	59,009
Total.....	.....	15,879,506	9,860,333	5,664,356	.....	.....	289,368	\$78,368,341	.....

schools, and to adopt all means which they may deem necessary and proper to secure to the people the advantages and opportunities of education." The general principles of common schools are well enunciated by a leading educator, Horace Mann: "Under our republican government, it seems clear that the minimum of education can never be less than such as is sufficient to qualify each citizen for the civil and social duties he will have to discharge: such an education as teaches the individual the great laws of bodily health, as qualities for the fulfilment of parental duties; as is indispensable for the civil functions of a witness or a juror; as is necessary for the voter in municipal and in national affairs; and, finally, as is required for the faithful and conscientious discharge of all those duties which devolve upon the inheritor of a portion of the sovereignty of this great Republic."

The literature of the history of common school education in America is at once immense and meagre. No general work exists, though one is now contemplated. The reports of State and town committees contain a vast deal of information relating to both fact and theory, but they still remain uncollected and uncollated. Of these reports those of Horace Mann, Secretary of the Massachusetts Board of Education, 1837-1848, are specially valuable. Barnard's *Journal of Education*, which has reached its 30th volume, though somewhat defective and desultory in method, contains an immense amount of matter concerning education not only in America but also in all countries. A general index is now in preparation which will render its treasures more accessible. The annual reports of the United States Commissioner of Education, a most useful Bureau established in 1867, present valuable statistics concerning the progress and condition of education in each of the States. Several volumes relating to education in America have been published in Europe. Among them may be named Fraser's *Report on the Common School System of the United States and Province of Upper and Lower Canada* (London, 1866); Laveleye's *L'Instruction du Peuple* (Paris); *L'Instruction Publique aux Etats Unis*, by the French Commissioner, Hippeau, and the *American School System*, by F. Adams.

COMMUNISM, in America as elsewhere, is of two types. The first is the primitive, unreflective and tribal type, which characterizes the less advanced portions of the human race in every part of the world, and of which traces and reminiscences exist even among civilized races. This communism has its origin in the gradual development of society from the family (the institute of the affections) to the state (the institute of rights), a development which in most cases has been checked before reaching its goal. That rule of common ownership, which is right enough within the family, is carried over into the new community, in which it has no proper place. It corresponds to that sentiment of personal regard for the chief, as father of the kindred, which in tribal forms of society is the rudimentary anticipation of loyalty to the law and reverence for its authorized agencies.

The first European settlers of America came hither from communities out of which this primitive communism had been extirpated by the influence of the civil law. The nations which they represented already had accepted the institution of private property as the normal mode of ownership, and had emancipated the individual from those restraints upon his activity in the pursuit of wealth and happiness which existed in primitive society. To this fact we owe, in good part, the magnificent display of human energy which has brought the new world to its present stage of development as regards occupation and civilization. Had America been laid open to the nations of Western Europe at a time when the forms of European society were less mobile and adaptable, and the conception of property less developed, we might have seen armies conquering America from the natives, but no floods of peaceful settlers spreading the arts of peace and of civilization over the continent. "We are indebted," says Sir Henry Sumner Maine, "to the peculiarly

absolute English form of ownership for such an achievement as the cultivation of the soil of North America."

But what the European settlers had escaped from at home they found in full vigor in America. When Columbus landed at San Salvador, the continent was in the hands of communists. Every American people, from the Esquimaux of the remote North to the Patagonians of the remoter South, held at least their lands in common, the nearest approach to a subdivision of land being the exclusive right of the person who planted a crop to gather the harvest, and even that existing only in some cases. And in spite of all the changes effected by European conquest, communism remains the rule of life for those of our aborigines who live in or north of the United States; and a closer study of the social arrangements in the villages from Mexico southward probably would show that this method of land tenure still perpetuates itself there also.

Dr. Lewis H. Morgan, to whose investigations in this field America owes much, divides the American aborigines into three groups, according to the stage in civilization they had reached. The first and lowest consists of those who lived by hunting and fishing, without horticulture. The third and highest includes the village Indians, who lived chiefly by the culture of the soil. The second are the intermediate group, who obtained a subsistence in both ways. The first group was found, of course, only in sparsely settled regions, from which it drew a scanty subsistence; an exception being the valley of the Columbia, that American *officina gentium*, where the abundant supply of fish supported a rather dense and not uncivilized population. The village Indians were found in Arizona, New Mexico, Mexico, and especially Central America, the population growing in density and rising to higher stages in social development the farther south the locality.

Among the tribes which lived by hunting and fishing were the Ojibwas in Wisconsin, the Dakotas, the Nez Percés and other tribes of the Columbia valley, the Blackfeet and most of the Indians of the great plains. Whatever they took was thrown into a common stock, and divided each day according to the numbers in the families. Except in the Columbia valley, these Indians lived in separate wigwams, and did not build community houses. The contrary was true of the Indians who lived only partly by hunting. These included the Iroquois in New York, the Powhatans in Virginia, the Creeks in Georgia, the Sawkees in Wisconsin, the Mandans and Minnetarees of the upper Missouri, and the Maricopas and Mohaves in Colorado. All these built village houses capable of containing a large body of people. These generally were long parallelograms, constructed of poles, birch-bark, dried grass, and straw. The houses of the Mandans were circular in form, roofed with earth. These Indians cultivated maize, and generally put their harvest into a common stock. In some cases each Indian family cultivated its own patch, and enjoyed for the year exclusive possession of the land thus used. But even under this advance to private property, the resources of the whole village were at the service of all its members. This was effected by what Mr. Morgan calls the "law of hospitality," which required that food should be set before every visitor who entered house or wigwam, at whatever hour of the day.

The community houses of the third group were pueblos of adobe or of stone. Some of these still exist and are in use in Arizona, New Mexico, the most notable being that of the Zuñis. Others remain as the monuments of a past civilization in the forests of Yucatan. Such barrack-like structures constituted the city of Mexico, at the time of the Spanish invasion. Those at Uxmal, in Central America, are the most curious and imposing of these ruined pueblos. As to the industrial economies of these village Indians, we know little more than is indicated by their common dwellings. In whatever part of the world

such houses have been found, communism has been found to be the mode of life practised by those who live in them. And the Indians of the pueblos of New Mexico "still hold their lands in common, with a possessory right in each to cultivate land, so long as the individual chooses to occupy it."

The existence of an undeveloped social system among the aborigines did much to facilitate European conquest. There was no coherence among these communistic tribes, who still rested social relations on kinship and not on proximity, and therefore were incapable of large and effective organization. The nearest approach to this was the confederacy of the Aztecs, with the large dependency of conquered tribes, and that of the six nations of the Iroquois, held together by the cross organization based on community in the same *totem* or coat of arms. For similar reasons there was a great want of individuality, a great repression of personal force. Communism creates irresistible power to punish dissent or independence of opinion. And this power easily passes into the hands of a few persons, to be used by them for any purpose they may choose, however narrow and selfish their aims. The chief, the priest, the medicine man amounted to more than public opinion in such a form of society. They are able to inflict substantial annoyance, and even suffering, through the community's control of the whole property. In the last resort they will cut off the man's "pipe and water," according to the threat of the Hindoo villagers. For this reason it is felt that the destruction of the communism which exists among our Indians is necessary as a first step to their elevation to a genuine civilization. Even among the more civilized tribes, such as the Cherokees, the power of the chief over the people is found to be tyrannical and oppressive. For this reason most of the proposals which have been made for the elevation of the red man to the level of American citizenship have been accompanied by plans for the assimilation of their land tenure to that of the rest of the country. At the same time it is felt that any sudden and complete transition of this sort would be accompanied by great dangers. To prevent the land-speculators from getting possession of the Indian's holding, it is proposed further to make his lands inalienable for fifty years.

See Dr. Lewis H. Morgan's *Letters on the Iroquois*, in the *American Review* for 1847; his *League of the Iroquois* (1851); his *Ancient Society, or Researches on the Lines of Human Progress from Savagery through Barbarism to Civilization* (New York, 1879); his paper on *System of Consanguinity and Affinity*, in the *Smithsonian Contributions to Knowledge*, Vol. XVII.; his article on *Montezuma's Dinner*, in the *North American Review* for April, 1876; his article on the *Architecture of the American Aborigines*, in Vol. I. of *Johnson's Encyclopædia*; and *The Iroquois Book of Rites*, edited by Horatio Hale (Philadelphia, 1883). Also H. H. Bancroft's *Native Races of the Pacific States*; Prof. E. Laveleye's *Primitive Property*, Chapter IX. (London, 1878).

The second type of communism is the theoretical and voluntary. It is developed by the reflective and intelligent association of those who have not been born to this order of things, but who have taken it up by preference. This again distinguishes itself into two great classes. The first accepts communism, not as a general law for human life, but as a special arrangement for a few, in order that these may exert a greater influence upon the rest of mankind. They seek in communism, as Fortlage has well observed, the Archimedean *πον στῶ* outside the world, from which to move the world in some direction they think desirable. The second class regard communism as the only right order of human life, the only means of escape from the selfishness and the covetousness which they believe to be the root-evil of human society. They advocate it for the many, not for the few only.

Communisms of the first class are nearly always religious. The forms most familiar are the monastic

orders—Buddhist and Christian. Of these we have developed no new order in America, except the Paulist, founded in New York by Father Hecker for the conversion of American Protestants to Catholicism. But we have seen transferred to American soil every notable order of the Roman Catholic Church: the most remarkable in its American activities being that great order of the Jesuits (*q. v.*), which explored the wildernesses of North America, and created the Republic of Paraguay from native material in the southern half of the continent.

In Protestant experiments at religious communism America has more abounded than any European country. The first great group of these is of German origin, the members of the communities being German mystics and separatists, more or less influenced by the ideas of Jakob Böhme (1575–1624.) A sort of forerunner of these was the community of Dutch and German Labadists in Maryland, at the head of Chesapeake Bay (1684–1722). The proper members of the group are (1) the "Woman in the Wilderness," founded on the Wissahickon, within the present limits of Philadelphia, by Johann Kelpius in 1695, and dissolved by his death in 1704; (2) the colony of Dunker celibates, founded in 1713 at Ephrata in Lancaster co., Pa., and imitated by a purely American community at Snowhill, near Harrisburg, Pa., established in 1820; (3) the Harmony Society, established first in Western Pennsylvania, then in Indiana, and finally at Economy, near Pittsburg, in 1824, and still in existence; (4) the Separatist community, established at Zoar in Tuscarawas co., Ohio, in 1817; (5) the Community of the Inspired, a sect established in Germany in 1714–6, as one consequence of the excitement spread through Protestant Europe by the Camisards, and transferred to America in 1846, settling first near Buffalo, but in 1855 removing to Amana in Iowa; (6) the Bethel community in Missouri, with a colony in Oregon, offshoots of a secession from the Harmony Society; and (7) the community of Swedish pietists, founded at Bishop Hill, in Illinois, in 1846, and finally dissolved in 1860–62. All these societies, except perhaps the last, have common characteristics traceable to the influence of Jakob Böhme. They all either proscribe marriage, or treat it as an inferior and less perfect state conceded to human frailty. Strictly celibate were the community of Kelpius, that of Ephrata, and the Harmony Society. The latter became so in 1807, after two years of community life in the married state, the younger members taking the lead in the change. A great revival of community zeal, as well as religious fervor, was the immediate result. The secession of 1832, which cost them a third of their members, moved in the opposite direction; but their new community underwent a gradual decline,—the Bethel community, mentioned above, being a mere remnant in a new field. The Zoar community passed from compulsory celibacy to the toleration of marriage in 1828–30, and the Inspired always have tolerated it as a less perfect form of life, and require the sanction of inspiration in each case. Even in these communities, however, marriage is no more than tolerated, and the family relations are treated as carnal and secular, in contrast to the ties of community brotherhood. In Zoar the sexes are kept apart in every way possible, and no man is permitted to marry until he has reached his twenty-fourth year.

In their arrangement as to property all these societies are purely communistic, aiming in this to reproduce the condition of things which existed in the Church of Jerusalem after the day of Pentecost (Acts iv. 34; v. 11). In point of prosperity they vary a good deal: the Harmony Society being much the richest, although it has had to sustain numerous lawsuits by members withdrawing from the community. The rights of a member expelled from the Society have not been tested.

"The Millennial Church or United Society of Be-

lievers, commonly called 'Shakers,' might be classed with these German Behmenists on many accounts. Their founder, Ann Lee, while a resident of Manchester, in England, had belonged to a peculiar religious society, which probably was one of those started in England by the disciples of Böhme and Jane Leade and which were influenced by the Camisards. What of theology there is in Shakerism—their notions of a female principle in the godhead; that the first man was male and female in one person; of marriage as a state inconsistent with Christian perfection—is a detritus of Behmenism. The society was gathered first in 1774, at Watervliet, N. Y., organized as a church in 1787, and assembled into community life in 1792. It has a few members who live in the world, under the inspection of the ministry of the communities. The society regards itself as a kind of spiritual priesthood, serving important purposes in that economy of salvation by which all fallen spirits are to be restored to God. As its members are strictly celibate, it perpetuates its existence partly by adopting children and partly by conversions from the world.

The property and the affairs of the society are in the hands of the ministers and elders, who are not chosen by the community and who give no account of their stewardship. Vacancies in their numbers are filled by the surviving members, and complete obedience to the Lead, as these authorities are called, is an especial point of Shaker ethics. These select trustees to manage the property and care-takers to direct the work, and remove or transfer these at their pleasure. Persons who attain to full membership by signing the covenant thereby renounce all claims to the property they have brought into the community, and to wages for their labor while they remain. But it is not unusual for members to abstain from signing. The sixteen communities, spread from Maine to Kentucky, enjoy a varying degree of prosperity. As a rule the members do not work hard. Farming is the principal business, but manufactures on a small scale are practised. Each community is independent of the rest financially. The membership is less than 2500, and they own nearly 50,000 acres of land.

The first religious community of purely American origin was the Hopedale community, founded by Rev. Adin Ballou in 1841, on a farm near Mendon, in Massachusetts. It set before it no less an object than the complete conversion of society to the principles of Christian socialism. It was at once a Christian church and an industrial community. Its members were sundered from the world by the prohibition of voting, office-holding, and the resistance of evil by force of any kind. This last feature led Mr. Emerson to mention it to Mr. Carlyle as the most original contribution America had made to the world's wealth of ideas. It lasted until 1857, but proved at last a complete failure. At first it was purely communistic, but in the hope of attracting persons of some means, a joint-stock system was substituted. The person who proposed this change afterwards employed it to break up the community, by getting a majority of this stock into his own hands. But while it lasted, it was a remarkable instance of an honest effort to realize a great idea.

Four years later was formed the Community of the Perfectionists, another native form of religious communism, and the least reputable of the series. It was organized at Putney, in Vermont, by John H. Noyes, a preacher in the great revival which culminated in 1837. He, with many others, had begun to preach the duty of attaining Christian perfection through a complete emancipation from selfishness, and had reached the conclusion that monogamous marriage and private property were institutions rooted in selfishness. The discovery of his principles and practice led to disturbances which compelled his emigration, in 1848, to Oneida, N. Y., which, with a branch at Wallingford, Conn., remained the seat of the community until it gave up its objectionable practices in concession

to a general agitation against these in 1879. Up to the time of change, every woman in the community had been regarded as the wife of every man in it. Sexual intercourse had been regulated by certain esoteric rules, which seem to have had the double object of pratising human stirpiculture, and the prevention of special attachments among the members of the community. At the time of the dissolution, a large proportion of the members entered the married state, and a joint-stock partnership was substituted for communism.

These, with a short-lived community of modified Swedenborgians (disciples of T. L. Harris), on the shores of Lake Erie, make up the series of American communities of the religious type. The Church of the Latter-Day Saints sometimes is classed here, because of certain co-operative arrangements, but incorrectly. The apostles of that body appeal very strongly to the passions for private and especially landed property, in addressing the poorer classes in Europe, from whom they draw their recruits.

Whatever may be true of the influence of the Roman Catholic orders, it cannot be said that these Protestant communities have found in their communism a powerful fulcrum from which to move the world. Their united influence upon the national life is infinitesimal—less than that of the smallest of the American churches. But they and the monks have solved the conditions upon which communism can maintain itself. The first of these is the presence of some masterful authority, either personal or official, for the control of the membership. Nothing is more notable in the history of these societies than the part played by the founders, and the demand for a strongly constituted paternal authority at the centre. The second requisite is some sort of religious enthusiasm as a motive power. Where this is wanting, individualism is too strong for the community. The third is the exclusion of the family from the community. Where the natural unit has been permitted to exist inside the artificial unit, it has proved too strong for it. Where it has been excluded, either by celibacy or by some such arrangement as that devised by Mr. Noyes—or even where it has been vigorously and effectively depreciated as profane and sensual—then the community has managed to perpetuate itself.

For Kelpius see the *Penn Monthly* for August, 1871; for the Labadists, *Journal of a Voyage to New York in 1679-80*. By Jasper Dankers and Peter Sluyter; edited by H. C. Murphy (Brooklyn, 1867); for the Ephrata Community see the *Chronicon Ephratense*, and Dr. Seidensticker's article in the *Century Magazine* for December, 1881; for the Inspired see Max Goebel's articles in the *Zeitschrift für historische Theologie* (1876) and also Chas. Nordhoff's *Communitistic Societies of the United States* (New York, 1875), which includes all the later religious Communities except those at Hopedale, Snowhill, and Brocton; for the Harmony Society see Dr. Aaron Williams' *The Harmony Society* (Pittsburg, 1866); for the Oneida Community see J. H. Noyes' *History of American Socialisms* (chapters xli-xlvii), also *The Oneida Circular*, 1854-1874, and its continuation, *The American Socialist*, 1875-1879; for Brocton and Snowhill see Noyes.

The foregoing sketch of the American communities founded on religious views enables us to understand the general and rapid failure of communism of the second type, *i. e.*, those which put this order of society before men as the only rightful mode of human life, but refuse to associate this conviction with any views as to the infinite and the eternal. Of these secular communities in America, the two great groups are the Owenites and the Fourierites, but with these may be classed the famous community at Brook Farm, and the Icarian community at Nauvoo, in Illinois.

Robert Owen made his great experiment in communism in 1824 at New Harmony, in Indiana, a village which he purchased of the Harmony Society when the latter returned to Pennsylvania. Into this village there streamed a great multitude of persons of all classes,

who thought they would like the new experiment. Nothing that Mr. Owen and his friends could do to defeat the movement was left undone. While asking others to embark their substance in the experiment, he took measures to secure his own interests and to get a return for his investment. He gathered a miscellaneous mass of human material into the village, without exercising any kind of discrimination. He left the community to itself for the first two years of its existence. He changed repeatedly the constitution of the community, one plan after another having proved worthless. Finally he dissolved the community by selling the property, in lots, to private owners. Ten other communities, modelled on Owenite ideas, were established in various parts of the country, but none of them lasted more than a few years, and by 1832 the Owenite movement came to an end in America.

In the interval between this and the Fourierite movement came the memorable experiment at Brook Farm, first suggested by Dr. Channing, and organized by the most remarkable group of men and women that ever embarked on such an undertaking. It had not a solitary condition necessary to success. It professed to be an attempt to realize "Christ's idea of society," but it had no religious enthusiasm as its motive power. It had no central authority sufficient to secure a proper attention to needful work. Its property arrangements, instead of the simplicity of pure communism, consisted of a joint-stock arrangement, somewhat similar to that proposed by Fourier. The community relation, so far from dominating every other, was too weak to stand the first strain. Having no proper basis of its own it fell in with the Fourierite movement in the first month of 1844; but in 1847 it was dissolved through financial difficulties, yet without the quarrel which has characterized every other dissolution.

In 1842 the Fourierite movement was at its height; by 1848 it was a thing of memories and epitaphs. In strictness this movement does not fall within our scope, as Fourier did not favor communism, but common labor and common dwellings based on a joint-stock arrangement. But it stands in such close relation to the history of our communisms, that it cannot be omitted.

To transplant Fourier's ideas to America was a sufficiently hazardous experiment, and especially so in a period of great religious interest such as that in which the experiment was undertaken. There was much in his denunciation of selfishness as a social motive-power which appealed to earnestly religious people, who felt strongly the difference between the actual condition of society and the Christian ideal. But his doctrines as to marriage and his indifference to religion generally were equally offensive to them. These, however, were slurred over by his American disciples generally, who thought to adopt a part of his system and ignore the rest. They founded thirty-three communities or phalanxes in the years 1842-53, of which the last was dissolved in 1855. A few proceeded strictly upon Fourier's principles and methods, and were fair tests of both. The majority were the outgrowth rather of an enthusiasm for his general ideas of attractive labor in society and the abolition of selfishness, than of an exact understanding of his plans. But the extent of the interest in socialist principles is by no means to be measured by these communities scattered over the Northern States from Massachusetts to Iowa. A great agitation stirred the cities of America. Lectures, debates, and conferences on socialism were the order of the day between 1842 and 1847; and a large proportion of the men who were to bear the burden of the war for the Union, or to create American art, literature, and science, were enlisted in the new crusade. But everywhere and under every sort of condition the experiment was a failure.

The interest centred in New York, where it was sustained by Mr. Greeley's *Tribune* and Mr. Brisbane's *Phalanx*. Here the National Convention was held in

1844, under the presidency of George Ripley, the principal founder of the Brook Farm Community, which had joined the new movement. From New York were organized the two most important phalanxes—the Sylvania, in Pike co., Pennsylvania, under Mr. Greeley's especial influence, and the North American, in Monmouth co., New Jersey, under that of Mr. Brisbane. Sylvania was begun in the heyday of first enthusiasm; the North American, after repeated failures, had warned the Fourierites that their best men and their utmost efforts were required to carry the experiment to success. Never was an experiment made with more earnestness and self-sacrifice, but the results proved how weak the bonds which unite a secular community. After lasting for ten years, it received in 1853 its first and perhaps fatal shock, by the intrusion of religious disagreements, such as the natural forms of society have to sustain constantly, but which generally prove too much for the artificial forms. Two years later the burning of the community's mills caused its dissolution, and the Fourierite movement disappeared from our history.

Since the failures of the Fourierites the religious communities have had the field to themselves. The only exception is the Community of French Icarians, which, since 1850, has been attempting to carry into practice the ideas of Etienne Cabet, first at Nauvoo, in Illinois, and latterly at Corning, in Iowa. At one time there were fifteen hundred members at Nauvoo; not a twentieth of the number resumed the experiment at Corning. They have no religious principles or observances, and the affairs of the society are controlled by the vote of the membership in weekly meeting. They live in separate dwellings, and sanction marriage. They are very poor, but are out of debt and have overcome great difficulties in the struggle to acquire the ownership of their homes.

The fullest record of the secular communities is found in the *History of American Socialisms*, by John Humphrey Noyes (Philadelphia, 1870). See also Semler's *Geschichte der Socialismus und Communismus in Nord-Amerika*. A good account of Brook Farm will be found in Mr. Frothingham's *George Ripley* (Boston, 1882), in the series "American Men of Letters."

Communism as a theory still exists in some quarters, especially among groups of working people who learnt it in Europe. Mr. Henry George's remarkable work on *Progress and Poverty* (1882) is hardly an exception to this statement. It starts from the premises furnished by foreign economists and socialists. It has in view the evils of European rather than American society in its proposals for the nationalization of the land. And since Fourier's influence ceased, it is the only able statement of such principles in our literature.

That communism of any sort is likely to take any firm or extensive hold of the American people is not the judgment of any impartial observer. This is prevented (1) by the popular love of that liberty which communism denies to the individual; (2) by the strength of those family affections which communism must extirpate; (3) by the general diffusion of private property, and especially of property in land, among the American people; (4) by the increasing influence of Christianity, which points to the future as the scene of a perfect order of human society, and discourages the expectation of the immediate realization of this great hope. (R. E. T.)

COMPTROLLER. An officer of the United States, of a State or of a county or municipality, who has certain duties to perform in the regulation of the fiscal matters of the government under which he holds office.

The office of Comptroller is French in its origin, and was first created in this country upon the organization of the Board of Treasury by the Continental Congress on Sept. 26, 1778. By the terms of the resolution of

Congress that day passed, an officer of that Board was appointed who was termed the Comptroller, and who was to be annually elected by Congress. He was to keep the treasury books and seal, to file all accounts and vouchers and to direct the manner of stating and keeping them. He was to draw bills under seal upon the Treasurer of the Board for sums due by the United States on accounts that had been audited, which bills were, however, to be countersigned by the Auditor previous to payment. He was also to draw bills in a similar way for such sums as Congress from time to time should order. He was to notify any debtor owing money to the United States of his delinquency, and fix a time for payment. In case of failure to pay he was to notify the executive of the State wherein the debtor resided. Wherever the Treasurer of the Board received money and signed a receipt he was to transmit said receipt to the Comptroller, who, after entering the same, charged the Treasurer, credited the proper accounts, indorsed the receipt, and transmitted the same to the person paying the money. Reports were ordered to be made quarterly by the Comptroller to Congress. Jonathan Trumbull, Jr., was the first Comptroller of the Board of Treasury, elected by Congress.

By the act of Congress of Sept. 2, 1789, constituting the Treasury Department of the United States Government, the office of Comptroller was continued. It was declared to be the Comptroller's duty to superintend the adjustment and preservation of the public accounts; to examine all accounts settled by the Auditor and certify the balances arising therefrom to the Register; to countersign all warrants drawn by the Secretary of the Treasury which shall be warranted by law; to report to the Secretary the official forms of all papers to be issued in the different offices for collecting the public revenue, and the manner and form of keeping and stating the accounts of the several persons employed therein. He was, moreover, to provide for the regular and punctual payment of all moneys which might be collected, and was to direct prosecutions for all delinquencies of officers of the revenue, and for debts due to the United States.

The great increase in the business of the Treasury Department afterwards rendered it necessary to subdivide the duties of the Comptroller's office, and to appoint two Comptrollers, known respectively as the First and Second Comptrollers of the Treasury. It is the duty of the First Comptroller to examine all accounts settled by the First Auditor except those relating to the receipts from customs, and all accounts settled by the Fifth Auditor and the Commissioner of the General Land Office, and to certify the balances arising thereon to the Register. It is also his duty to superintend the adjustment and preservation of the public accounts subject to his revision, to countersign all warrants drawn by the Secretary of the Treasury which shall be warranted by law, to superintend the recovery of all debts certified by him to be due to the United States, and for that purpose to direct all such suits and legal proceedings, and to take such measures as are authorized by law and are adapted to enforce prompt payment thereof. The First Comptroller has power to direct the First and Fifth Auditors to audit and settle any particular account he may deem necessary. He is also bound to make an annual report to Congress of those officers who have failed to make settlement of their accounts during the fiscal year, proceeding in the manner directed by law.

It is the duty of the Second Comptroller to examine all accounts settled by the Second, Third, and Fourth Auditors, and to certify the balances arising thereon to the Secretary of the department in which the expense has been incurred; to countersign all warrants drawn by the Secretaries of War and of the Navy which shall be warranted by law; to report to said Secretaries the official forms to be issued in the different offices for disbursing the public money in those departments, and the manner and form of keeping and stating

the accounts of the persons employed therein, and to superintend the preservation of the public accounts, subject to his revision.

By the act of June 3, 1864, a Third Comptroller has been added to the Treasury Department, known as the Comptroller of the Currency. He is at the head of the Bureau charged with the execution of all laws passed by Congress relating to the issue and regulation of a national currency. He makes an annual report to Congress showing the state of the National Banks in the country, the capital embarked in those enterprises, the volume of the circulating notes, and other matters of financial interest.

The office of Comptroller also exists in many of the States *eo nomine*. In some States the functions of a Comptroller are discharged by an officer known as a State Auditor or Auditor-General. It is usually the duty of a State Comptroller to superintend the fiscal concerns of the State, and to manage the same in the manner required by law. He exhibits to the Legislature, at stated times, accounts of the receipts and expenditures of the State, suggests plans for the improvement and management of the public revenue, keeps and states all accounts of the State, directs and superintends the collection of all moneys due it, and either draws or countersigns all warrants on the State Treasurer. The various States differ, of course, materially as to the powers and duties of this officer.

In many of the counties and municipalities of the United States, the office of Comptroller exists with duties substantially similar to those above specified. The existence of the office is generally esteemed to constitute a most salutary check on improper and unlawful appropriation of the public funds. (L. L., JR.)

CONANT, THOMAS JEFFERSON, D. D., an American Baptist divine and Biblical scholar, was born at Brandon, Vt., Dec. 13, 1802. He graduated in 1823, at Middlebury College, Vt.; was for a time tutor in Columbian College, Washington, D. C., and later became professor of language in the college at Waterville, Me., resigning this place in 1833. In 1835 he was made professor of Biblical literature and criticism in the theological school at Hamilton, N. Y., and afterwards studied for some years in Germany. In 1850 he accepted a similar professorship in the seminary at Rochester. In 1857 he removed to Brooklyn, and devoted himself to the work of preparing a revised English Bible, under the auspices of the American Bible Union. He was afterwards one of the American members of the Old Testament Company for revising the authorized version. Among his publications are annotated translations of the book of *Job* (1857), *Matthew* (1860), *Genesis* (1868), the *Psalms* (1868), and *Proverbs* (1872). His wife, HANNAH CHAPLIN (1809-1865), a daughter of Rev. Jeremiah Chaplin, D. D., became well known as a translator and author. Her chief work was *A History of the English Bible* (1856).

CONCEPTION is a logical term, variously defined. All definitions agree in giving to the word a significance which corresponds to one of the ideas involved in its composition—viz. the idea of unity in multiplicity. Conception, from *con* and *cipio*, means taking or grasping several things together or at the same time. Accordingly, pure Nominalism employs the word to denote any complex idea, such as that of a horse. "I have the ideas of the sensations of sight, of touch, of hearing, of smelling, with which the body and actions of a horse have impressed me, these ideas all combined, and so closely that their existence appears simultaneous, and one. This is my idea of a horse. If I say I have a conception of a horse, and am asked to explain what I mean, I give the same account exactly, and I can give no other" (James Mill, *Analysis of the Phenomena of the Human Mind*, new ed., vol. ii. p. 284). To have a conception is thus to have several ideas together, as if they were but one. Mr. Mill—of whose doctrine J. S. Mill opines that it "is as just as it is admirably stated"—is careful to use the phrase "I have a conception,"

rather than "I conceive," in order to exclude the notion that conception involves a special intellectual activity; according to his sensational theory, all knowledge must be regarded as merely "impressed" on the mind, rather than as resulting from an active labor of the mind itself. Thus viewed, a conception can only be particular, not general; or, at most, it can only be the name for the whole aggregate of particular complex ideas which one has actually "had," and which are held to resemble each other.

According to a more universal doctrine, founded on a more experimental and concrete theory of the nature of knowledge, conception is not a mere state of mind, but also, and primarily, an intellectual activity. It denotes not simply "having together," but "putting" or "grasping together." It is a selective and discriminative act, directed at once by the laws of thought and by the nature of the immediate subject-matter about which thought may be employed. And its result is a general notion or concept, which embodies whatever is known to be universally essential to the existence and nature of the object, or class of objects, under consideration. The object of the concept is thus the universal law or nature of an object, in distinction from the purely individual peculiarities whereby one object is distinguished from another of the same kind.

Concepts of the highest order of generality (pure concepts) are often termed Categories. Thus, for example, the twelve "categories" enumerated in Kant's famous table are termed by him "fundamental concepts of the understanding"—i. e. of the understanding as employed about all possible objects in *space and time*. They denote, in other words, aspects or relations, some of which must enter into, and, *pro tanto*, condition, the form of all our particular conceptions of physical objects.

(G. S. M.)

CONCEPTUALISM, as a system of philosophy, must be viewed in its relations to other modes or stages of thought. The distinction between subject and object, familiar and essential to modern thought, appears, in the history of philosophy, only after the lapse of ages in which the mind looked out upon the world, trying to understand it, but not perceiving that what it called the world could be only known in its relations to a sentient subject, the observer himself.

In Plato, the idea, the objective counterpart of the (subjective) concept, is a permanent reality underlying all phenomena, suggested by them, not deduced from them. He assumes, rather than proves, the (objective) existence of the idea; and it would seem that the process of definition on which he lays so much stress, and which he so carefully develops, is a search for clear and distinct "ideas." But these are not contrasted with concepts as products of the mind itself, giving unity in consciousness to manifold objects of cognition. The idea is either subjective or objective, or both in one. It may be only regulative, or, as Plato seems rather to regard it, it may be *constitutive*, individuals being what they are by "participation" (*μετάληψις*) in the idea. But psychology must be developed far beyond the point which it then had reached, before the relation of the concept to the idea could be distinctly sought. Plato we may call, however, an "extreme realist."

The case is not very different with Aristotle. The form, *εἶδος*, or essence of things, is universal, apparently objective. The concept (if *λόγος* can be deemed equivalent to our modern word) defines or expresses the essence of things (*ἡ κατὰ λόγον οὐσία*). But no distinction is clearly made between thought and what it supplies to experience on the one side, and objective being on the other. Aristotle, accordingly, has been called a "moderate realist," or, again, a "conceptualist."

Conceptualism had a later origin. The prevailing subjectivity of some of the sophists, and, still more, of the critical Academy, and the Pyrrhonists, by awakening doubt, and demanding an answer to critical

questions (*e. g.*, Is man a measure of all things? *πάντων χρημάτων μέτρον*) might have elicited a solution of the problem, if their method had not been destructive of philosophy itself.

We may say that when the terms *νόημα*, *ἐννόησις*, and the like appear, we are reaching at least the possibility of conceptualism. Among the ancient Stoics, then, we may find the nearest approach which ancient philosophy makes to modern conceptualism, for the problem appears when a (subjective) criterion of truth is sought for which involves a nearer approach to the psychological methods of modern philosophy. The Stoical theory of knowledge resulted naturally from their materialism, and we may call them the unconscious, inconsistent nominalists or conceptualists of their age. The only reality is an individual, corporeal thing, which produces in the soul impressions (presentations, *φαντασίαι*) like a seal on wax. These, being individual effects, must be assumed to be produced by individual objects. Chrysippus, in whom the psychological tendency begins to appear, includes among these objects of knowledge individual states and activities which can be referred only to the mind itself. Remaining in memory, these impressions produce experience, and are united in common notions (*κοινὰ ἔννοια*) by comparison, combination, analogy, etc. (*Diog. Laert. VII.*) The concept (*τὸ ἐννόημα*) is therefore a mental product, a "phantasm of the understanding," in which, somehow, truth is found. The eternal ideas of Plato are, for the Stoics, only *ἐννοήματα* produced by sense-perception; as we may say, images together with the notion of a universal application, and a subjective certainty of an object represented. Ideas or concepts, as such, are neither true nor false. Truth or falsehood is found only in connecting them. (This must be *logical* truth.) Concepts exist in the mind only for what they are. Universality consists in their application to a number of individual things whose differences generic terms do not represent to the mind.

The well-known passage translated by Boëthius from Porphyry presented this (undeveloped) Stoical conceptualism to the middle ages as one of possible theories: "Whether genera and species subsist by themselves, or in thoughts only, *ἐν μόναις ψυχαῖς ἐπινολαῖς*, (i. e., concepts of the mind subjective and abstracted), etc." When logic, and consequently the use and signification of terms, were the principal subjects of investigation, the problem could not be ignored. It was only natural that a crude nominalism should at first appear; but a subtle thinker like Abélard was not likely to rest in it. Although the tract *De Generibus et Speciebus* may not be his, and we have not elsewhere in his authentic works any explicit discussion of the subject, it certainly represents the prevalent opinion of his school. And Abélard himself, without distinctly enunciating his conceptualism, applies it to the Christian doctrine of the Divine Trinity. As nominalism must consider "three Persons" to be three individuals, so he interprets them (conceptualist) as the power, wisdom, and love of God. For the problem could not remain an abstract discussion of logic in the schools. Penetrating, as it does, to every part of philosophy, it must needs affect most those questions (*e. g.*, the being of God) which were then most in dispute. For on its solution depends our mode of regarding politics, nature, man, the universe, God himself.

In the tract *De Gen. et Spec.*, against realism, individuals are the true and only substantial realities, and in them exists only the individual. Against nominalism, general words are not mere names for individuals. The words represent things. What things? It is answered (*Ab. Opera*, (Cousin's) Vol. III., p. 522) from Boëthius, "*nihil aliud species esse putanda est nisi cogitatio collecta ex individuorum dissimilium numero substantiali similitudine; genus vero collecta cogitatio ex specierum similitudine;*" the species or

genera are formed by the mind from individuals which resemble one another. Both matter and form are individual only, but the matter (*e. g.*, man) is similar in Plato and Socrates (p. 524), and that essence of man which underlies (*sustinet*) the individuality of Socrates is nowhere but in him. Species, then, is not that essence of man which is in Socrates alone, or any other, but that "whole collection conjoined, of individuals of this nature. This whole collection, although essentially manifold, custom calls one species, one universal, one nature; as a people, although composed of many persons, is called one." As for genus, "each particular essence of that collection which we call humanity is composed of matter and form; the matter is animal, the form several,"—"but that animal which underlies the form of humanity in one is not essentially elsewhere."

This, of course, is a discriminative nominalism, in peripatetic form, attempting to evade some of its consequences. Words, indeed, sensuously viewed, are but a breath of air (*flatus vocis*), but they are invented signs for these results of comparison, abstraction, and generalization, and they accompany each successive step of these processes, fixing each as it is accomplished.

With William of Occam (d. 1347, A. D.) we may say that English nominalism and conceptualism begin the long career which they still pursue. Knowledge, he says, is of individuals only: "*scientia est de rebus singularibus*." Terms are signs of concepts (conceptualist), but concepts are undetermined notions, the result of abstraction from many individuals. "Intelligible species" is a non-entity, the universal standing indifferently for many individual things, "*significans univoce plura singularia*."

The logical questions from which scholasticism took its rise involved the significance of terms rather than the nature of objective truths, and the mode in which the mind arrives at it. But with the advent of modern philosophy we find new questions arising, new modes of arriving at truth.

Hobbes seems to stand on the dividing line between the mediæval and the modern. His forms of thought are scholastic, while his nominalism is modern, *ipsis nominalibus plusquam nominalior*. "Nothing," he says, "is universal but names," and "universals recall one of many things." (*Lev. I., i. 4.*) Yet, after all, Hobbes, in his calm assumption of the objectivity of his knowledge, and his superficial psychology, is himself a schoolman out of date, and in revolt from his school.

But when Locke views his "idea" (individual notion) as the only direct object of knowledge, and the medium between the sentient subject and the (assumed) objective actuality, it is plain that conceptualism is before us in a new and modern dress. Locke may be considered as the representative conceptualist of modern times, and modern idealism in general as the successor of mediæval (logical) conceptualism; we will let conceptualism, therefore, state its principle through its chief exponent. We still find ourselves on nominalist ground when Locke says, "all things that exist are particulars (individuals) only." But admitting his "simple ideas" of single qualities, either existent in (assumed) objective realities, or produced by them in us, it is plain to him that the mind may combine these, and will thus form a complex of qualities to which a general name is attached. "The mind being furnished (by sensation and reflection) with a great number of the simple ideas, conveyed in by the senses, as they are found in exterior things, or by reflection on its own operations, takes notice also that a certain number of these simple ideas go constantly together; which being presumed to belong to one thing, and words being suited to common apprehension—are called, so united in one subject, by one name." (*Essay on Hum. Und., B. II., c. 23.*) Words stand for ideas only (B. III., c. 2, § 4), but "words become general by being made

the signs of general ideas; and ideas become general by separating from them the circumstances of time, and place, and any other ideas that may determine them to this or that particular existence. By this way of abstraction they are made capable of representing more individuals than one, each of which has a conformity to that abstract idea." (B. III., c. 3, § 6.) Names (§ 7) are at first particular (individual), but children, observing resemblances among things, form complex ideas, imperfect as respects those individuals, but capable of representing each one. "Thus they come to have a general name and a general idea"—"leaving out of the complex idea they had of Peter and James, etc., that which is peculiar to each and retaining only what is common to all." Then children advance to still more general names and notions. (§ 8.) "For, observing several things that differ from their idea of man, and yet have certain similar qualities, and uniting them into one idea, leaving out the differences, they have again another and more general idea." General notions, then, are, and words signify, "abstract and partial ideas of more complex ones taken at first from particular existences." (§ 9.) Thus, if Locke's doctrine of mediate knowledge through "ideas" is accepted, conceptualism seems to be established on a firm and immutable basis. For "generals and universals belong not to the real existence of things, but are the inventions and creatures of the understanding, made by it for its own use, and concern only signs, whether words or ideas." (§ 11.) This, in Locke's opinion, is not nominalism. General words do not "signify barely one particular thing," or a plurality; but they do signify this "abstract idea" which is all one with the "essence of the species." (§ 12.) Here we pass to the consideration of the objective nature of things, which, according to the theory, is not directly known, but is individual only. Things may be similar in certain qualities, but species signifies this abstract idea, this "creature of the understanding."

The third book of Locke's Essay is the best development of conceptualism which has thus far appeared; but it is too familiar to need more than this passing reference. The "good Berkeley," however, though retaining and developing Locke's idealism, can find in these abstract general ideas only a subtle net to ensnare the wit of man (*Introd. Princ. of Human Knowledge, § 22.*) He can discover in his own thought only "particular ideas" (confounding conception and imagination), but they may become virtually general by representing an "indefinite number of particular ideas of the same sect." (§ 12.) This destructive criticism evidently lands us in pure nominalism, for words (general names) "signify indifferently a great number of particular ideas."

We may pass on, therefore, to the final dissolution of idealism in the crucible of Hume's scepticism. Pursuing the same nominalist track on the same ground of idealism, and finding once more that "all general ideas are nothing but particular ones annexed to a certain term" which represents any one of them indifferently, we reach at last the (positivist) conclusion that nothing but "ideas" can be known, simple qualities connected, correlated, under the influence of associations. We may call this indifferently nominalism or conceptualism, since any conceivable difference has vanished, but Hume expresses himself in the ordinary nominalist manner.

With Reid begins the attempt to dismiss ideas altogether, and, under the guidance of "common sense," to bring the mind directly in contact with the object. In a vague way he seems to admit the conceptualism of Locke. "The power of forming abstract and general conceptions [which Berkeley so explicitly denied] is one of the most distinguishing powers of the human mind" (*Intell. Powers, Ess. V., c. 6.*) "Common names signify common attributes," and need not actually represent any individual thing. He could understand perfectly and have a distinct conception what

was meant by such and such a mathematical line, without ever "conceiving" in his imagination one of the kind. In fact, Sir Isaac Newton reached the general conception of lines of the third order before he found out the particular species of them. But what under Reid's theory were *common* attributes, while the only existences, as he says, are individual, he (as usual) failed to explain. The whiteness of this sheet of paper, he says (c. 3), is not the whiteness of that sheet; it is individual; but whiteness (taken simply) implies no existence: it is general; it may be predicated of many things. So then there are "general conceptions signified by such names," viz.: every attribute common to several individuals. "Nature has given us the power of combining such simple attributes, and of giving one name to that combination, and considering it as one object of thought." (c. iv.) This sounds like conceptualism, although we are told again, "each of those names signifies in general a substance (individual) having a certain combination of attributes. The name, therefore, must be common to all substances in which those attributes are found," and now we seem to be listening to a nominalist, and may reasonably arrive at Sir Wm. Hamilton's conclusion that there is no essential difference between the two. Dr. Brown seems to give conceptualism a firmer foundation, pointing out also the imperfect analysis made by nominalism which, in his view, leaves out from its theory the *resemblances* of things. Forming general notions, he says, is discerning relations between many individuals. Certain things are found to have more intimate and more numerous relations than others. If not, John and an egg might as well be classed together as John and Peter. This notion of relations constitutes that thought which we express as species and name accordingly; and so the general name signifies "the general notion of the relation of similarity in certain respects" (*Philos. Hum. Mind*, xlvii.); see also Sir W. Hamilton's *Metaph. Lect.*, xxxv.).

Kant, also, rejecting pure idealism which in the hands of Hume was proving such a solvent of all knowledge, tried to lead thought out of the shallows of pure nominalism where it must lie stranded and helpless into a discriminative conceptualism. This, at least, if not the object, is a result of his criticism. For, if materials of knowledge (phenomenal) are given by experience only, and the forms of thought are supplied by the mind, it is evident that whatever universality the concept possesses, and, with it, general names, is due to the mind itself. Nominalism has talked as if things in themselves were known. That conceit of knowledge is rudely swept away. Such things may exist, but, being unknown, Kant would hardly say that general names stood indifferently for any one of them.

But nominalism cannot be thought to have abandoned the field while it speaks so clearly against conceptualism as in Mill's discussion of Sir W. Hamilton's doctrine of concepts (c. xvii.). "A concept is a mere part of a concrete image—has nothing that discriminates itself from the other parts except a special share of attention, guaranteed to it by special association with a name, etc." Thus the general is eliminated, or reduced to a plurality of individuals, and that plurality has no essential ground of unity. Similarity in our feelings as affected by the object leads to a practical identification, either inward and subjective (conceptualism), or objective (Platonic idealism).

Mill, like other nominalists, ignores the law that no empirical concept exists without an image in representation, and these two so distinct in their characteristic marks are confounded. "To say that we think by concepts is a circuitous way of saying that we think by means of general or class names." It is "a misfortune that the words concept, general notion, or any other phrase to express the supposed mental modification corresponding to a class name, should ever have been invented." Mill, as we see, would erase the term "Begriff" from the German Lexicon. "Instead

of the concept of a class, we should speak of the signification of a class name."

In this brief glance at the historical progress of one of the principal modes of thought we have thought it best to let conceptualism speak for itself, or display itself in encountering the attacks of its nearest relative, nominalism.

The question for so many ages asked in various forms is briefly this: Viewing the world of phenomena as presented to consciousness, and uniting those correlated in the unity of individual objects, do we thus terminate our knowledge of being? A crude nominalism answers, yes. Being is a plurality of individuals united by no common essence or nature. Names stand only and indifferently for any one of these which similarly affect the sentient subject. But genera and species are nothing but "class names," representing a plurality of objects whose resemblances are more or less indefinite, and which we collect into conventional groups for our convenience in examining them. Realism says, no: There is a permanent reality in genera and species. Even if these forms have been produced by gradual development, there is a fixed type or plan at the end toward which that evolution has proceeded. In some manner left unexplained, individuals "participate" (*μεταλαμβάνουσι*) in the idea; or, the universal is a common element objectively existing in each individual substance, and in knowing it we know the *essence* of the thing, what it is; *τὸ τί ἦν εἶναι* or being is only one, and all the manifold is but manifestations of it, or emanations from it, having, as such, no reality. Phenomena are manifold, being is only one (in which case it would seem that either names represent collected phenomena, or else the one is expressed under many names); or, finally, finite beings, though many, pre-exist as one thought of one infinite Being; this thought constitutes their unity, and the common name expresses it as suggested to human reason in its experience of individuals belonging to time and space.

Conceptualism, while seeming to hold an intermediate position, is in reality a form of nominalism (Sir Wm. Hamilton) in which the subjective element of thought has come distinctly into consciousness. The difference is one of method only, or in the mode of regarding the same truth. Attention is given to the mental processes involved in generalization, and to the subjective result whereby things are comprehended (*concepts*), which result is not to be found outside of the mind itself.

The (empirical) concept in itself does not refuse to be referred to the (Platonic) idea, although its mode of formation is so different; but conceptualism simply ignores the latter, if it do not deny it, and must, therefore, be regarded as a psychological nominalism. The fundamental (negative) principle is one, viz.: a denial of any objective validity in universals. Objectively viewed the only reality which they possess is actual or possible, past, present or future, individuals; subjectively viewed, their name is the sensuous sign of an individual mental product.

Under the guidance of the one principle or the other, ages, parties, schools have boldly attacked or defended one another, seeming to solve some portion of the everlasting riddle of the Sphinx, What is truth? Conceptualism is the special thought of a subjective and introspective age. It may not be richly loaded with the fruits of ideal genius, but it has met the demands of the severe logic of the critical understanding.

It is evident, however, that so long as we travel the empirical road to knowledge, we shall be fenced in by nominalism and conceptualism on either side. When reason attempts to leap over the fence, we may find ourselves in the limitless fields of the ideal. And Plato and Parmenides, or Porphyry and Proclus, or the mediæval realist will appear under the flag of Hegel or Schelling. But for all the ends of empirical

science, whether of matter or of spirit, conceptualism has proved, and, doubtless, will prove, a sufficient and satisfactory theory, since the concept itself is an empirical product, and the question of its objective reality belongs to ontology and not to any special science.

(J. J. E.)

CONCORD, the capital of New Hampshire, and seat of justice of Merrimack co., is on the Merrimack and chiefly on its W. bank. It is 73 miles by rail N. N. W. of Boston, and is the converging point of the following railroads: the Concord, the Concord and Portsmouth, the Northern, the Boston, Concord, and Montreal, the Concord and Claremont, and the Peterborough Railroad. Across the Merrimack there are 7 bridges, 3 of them railway bridges. Concord has a handsome granite State-house standing in a fine park, a State prison, a State insane asylum, a city hall, 2 orphanages, a home for the aged, 7 hotels, 3 national and 4 savings banks, 4 weekly and 2 daily newspapers, 3 large libraries, 18 churches, public, high, and graded schools; also St. Paul's school, a celebrated private school for boys. Concord has a large number of factories and shops, a part of them run by water-power, although the motive power of the Merrimack, naturally very great, is here not extensively utilized. Cotton goods, woollens, furniture, castings, and carriages are the leading articles of manufacture. Here are also extensive quarries of fine white granite, also stone-dressing works, machine works, and the shops of two of the railroads. The city has water- and gas-works; property is assessed for taxation at \$10,000,000, and the city debt is \$175,000 net, besides the water-works debt of \$630,000. The streets are well laid out and effectively sewered. Population in 1870, 12,241; in 1880, 13,843. Concord was settled by Massachusetts people in 1726; was incorporated as the town of Rumford in 1733; was named Concord in 1765, and received a city charter in 1853.

CONCORD, a town of Middlesex co., Mass., 20 miles N. W. of Boston by the Fitchburg Railroad. Population, 3922. It was the seat of an Indian village previous to its settlement by Rev. Peter Bulkley and Major Simon Willard in 1635, who gave it the name "Concord" from the Christian union and concord among the first settlers, and their peaceful dealings with the Indians, of whom they bought the land. The river on which it stands was called by the Indians "Musketaquid," or "Meadow River," from the great grassy meadows beside it. The apostle Eliot often preached to the Indians here, and there was a village of Christian Indians on the border of the township. But the colonists could not avoid Indian wars, and many of them were killed from 1648 to 1730 in these wars. It soon became an important inland town, and maintained a military company, which took part in the overthrow of Sir Edmund Andros at Boston in 1689. As early as 1767 the Concord people became active in opposition to British taxation, and in 1774 were ready for the separation from the mother-country, which took place, so far as Massachusetts was concerned, in 1775. At that time the population of Concord (including the parish of Carlisle) was 1900, out of which it furnished 174 men for the army of Washington.

The town's own experience of the Revolutionary War was limited to the so-called "battle of Concord," which took place April 19, 1775, between two regiments of colonial militia and minutemen, commanded by Col. James Barrett, but led in the engagement by Major John Buttrick (both citizens and farmers of Concord), and a detachment of British infantry, grenadiers, and marines, commanded by Lieut.-Col. Smith and Major Pitcairn. The occasion of the encounter was the accumulation of colonial military stores at Concord, where the provincial congress of Massachusetts had been in session in October, 1774, and March, 1775, with John Hancock as president and Samuel Adams as one of its leading members. Gen. Gage,

the British commander in Boston, hoped to destroy these stores, and also to seize the persons of Hancock and Adams, who were supposed to be at Lexington, on the road from Boston to Concord. He therefore sent out the detachment above mentioned of 800 men on the evening of April 18, and followed this up with a supporting party of 1100 men under Hugh, Earl Percy, a brigadier-general, who, however, got no farther than Lexington, six miles east of Concord. The first detachment was confronted at Lexington before sunrise, April 19, by the minutemen of Lexington, who, when fired upon, dispersed after a few scattering shots in return. By this time the whole country was alarmed by the vigilance of Paul Revere (whose famous ride extended no farther than Lexington), and at Concord a force of 180 men had gathered before the British 800 came in sight at seven o'clock in the morning. Rev. William Emerson of Concord, grandfather of Ralph Waldo Emerson, urged immediate resistance with this small force, but more cautious counsels prevailed, and Col. Barrett ordered a retreat across the North Bridge to await reinforcements. Meantime, the British began to seize and burn the military stores in the village, and were supposed to be destroying the town; whereupon the American militia, now increased to 300, were formed in column by Lieut. Joseph Hosmer of Concord, who acted as adjutant, and began marching toward the village square to prevent the burning of the place. As they approached the North Bridge, which was guarded by a British company, they were fired upon, and several Americans were killed. The Concord and Acton minutemen, by order of Major Buttrick, returned the fire, killing three British soldiers and wounding seven more. The British at once retreated, but were not then pursued, and this ended the actual fight at Concord bridge. But when the whole British force began their retreat about noon they were fired upon along the road from Concord to Lexington, and lost many men within the limits of the town. At Lexington they were reinforced by Gen. Percy and his brigade, with two field-pieces; but the whole body then retreated to Charlestown, pursued all the way, and losing in the whole day's engagement 73 killed, 172 wounded, and 26 missing—271 men out of 1900. The loss of the Americans was 49 killed, 36 wounded, and 5 missing—or one-third as many as the British lost. Two captains and two privates of the Concord men were wounded. This was the first battle of the war, and was the last time Concord was invaded by armed enemies.

Exactly eighty-six years after the above battle the Concord militia, commanded by Capt. Prescott, left town to join in the defence of Washington against the Southern rebels (April 19, 1861). During both these wars the Concord people kept a large number of soldiers in the field, and were liberal in their contributions of money and supplies. Two monuments have been erected to commemorate the fight at the North Bridge—one erected in 1836, on the spot where the British stood,—a granite shaft, with an inscription describing the event; the other a bronze statue of a minuteman standing where the first American soldier fell, on the west bank of the Concord River, and erected in 1875. In the village square stands a "soldiers' monument" to commemorate the Civil War of 1861-65; and in the Sleepy Hollow Cemetery, not far off, are the monuments of Emerson, Hawthorne, Thoreau, and other famous citizens of Concord, who are buried there.

Since 1834, when Emerson went there to live in the "old manse" of his grandfather Dr. Ripley, where he wrote his first book, *Nature*, the town has been the home or the resort of many persons celebrated in literature and philosophy—of Bronson Alcott, Margaret Fuller, Ellery Channing, Mrs. Sarah Ripley, Miss Hoar, Miss Alcott, Thoreau, Hawthorne, Miss Peabody, Mrs. Jane Austin, Prof. Harris, etc. Emerson, Thoreau, Channing, and Hawthorne have made the scenery of Concord familiar by their descriptions, and the social cha-

racter of the place has been described by George W. Curtis in his *Homes of American Authors*, and by F. B. Sanborn in his sketches of Emerson, Lowell, and Thoreau. It is a quiet region, inhabited chiefly by farmers and professional men, on the banks of the Concord River, and with Walden Pond and other small lakes near by.

Since 1878 the State prison for men, formerly at Charlestown, has been established in the western part of Concord, and about 800 of its present population are the convicts, officers, and employés connected with the prison.

The town contains three churches—Unitarian and Trinitarian Congregationalist and Catholic—and two chapels, one Episcopalian. The "Hillside Chapel," on the estate of Mr. Alcott, is used in the summer for the sessions of the "Concord School of Philosophy," which was opened in 1879, and in which lectures and conversations have been given by Emerson, Alcott, Dr. Jones, Dr. Harris, the late Prof. Peirce of Cambridge, Pres. McCosh of Princeton, Mrs. Julia Ward Howe, Dr. R. G. Hazard, Mrs. E. D. Cheney, and others of the Transcendental or the Hegelian schools in philosophy. The founder of this unique school (see *ALCOTT*) is Mr. A. Bronson Alcott of Connecticut, who has lived in Concord most of the time since 1840, and still flourishes there at a great age. His daughter, Miss Louisa Alcott, is also a resident of Concord, and so is Prof. W. T. Harris, the chief Hegelian teacher in the School of Philosophy. Several eminent American journalists—Frederick Hudson, William S. Robinson, Robert Carter, C. C. Hazewell, and F. B. Sanborn—have been residents of Concord, and Hon. George F. Hoar, Senator from Massachusetts, was born there, as were also his elder brother, E. R. Hoar, who was attorney-general in Gen. Grant's first administration, and William Whiting, who wrote elaborately in favor of Pres. Lincoln's right to emancipate the slaves under the war-powers of the Constitution. Concord was one of the centres of anti-slavery opinion for twenty years before emancipation, and had been still earlier a focus of the Transcendental movement in New England. See *ALCOTT*, *EMERSON*, and *THOREAU*. (F. B. S.)

CONCRETE. This name is given to any mixture of mortar with fragments of stone or gravel, though it is now generally limited to that made with hydraulic mortar, or mortar made with a hydraulic cement. Certain limestones, when calcined, produce a natural hydraulic cement. As, however, the proportions of the elements vary in different pieces of the same rock, it is much better, in order to obtain a uniform product, to use the so-called Portland cement, in which the constituents are mechanically mixed in the proper proportions. This consists of a double silicate of lime and alumina—about 60 parts of lime and 10 of alumina to 24 of silica, with 1 of magnesia and 2 of other alkalies, in a total of 100 parts. Carbonate and sulphate of lime should be especially excluded. This mixture should weigh 115 lbs. per bus., and bear 250 lbs. per sq. in. in tension. It should likewise be ground sufficiently fine for 85 per cent. to pass through a sieve of 50 meshes to the inch. It should feel rough, and be of a bluish-gray color, and when immersed in water of a uniform temperature for six days should show no cracks, but should set in from one to six hours. If mixed with lime it will not get so hard under water. As a test of its quality, it is recommended that blocks $1\frac{1}{2}$ in. sq. and 10 in. long, supported on edges $9\frac{1}{2}$ in. apart, should bear 150 lbs. at the centre; if more than 1 out of 3 are broken within one minute, the cement should be rejected. In Germany the usual test is for blocks of 5 sq. centimeters section to stand, under tension, 8 kilogrammes per sq. centimeter; the blocks having been for 24 hours in the air and for 27 days in water. It is there also specified that when the cement is passed through a sieve of 900 meshes per sq. centimeter, not more than 25 per cent. shall be too large to go through.

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The lighter cements set more quickly than the heavy ones, and the natural cements, of which Rosendale may be taken as a type, only bear in tension 40 to 70 lbs. per sq. in. In mixing the cement for use in concrete, the best proportion of water is such as will make the mortar only moist, so as barely to cohere; the proportion will be about 1 of water to 4 of cement, though English Portland may require a little more water. Sand is always mixed with the cement for the sake of economy and to prevent cracking; it lengthens the period of setting and likewise diminishes the strength, in the proportion of one-half for an equal mixture, to one-fourth for a mixture of four of sand to one of cement. Ordinarily, in building, the natural cements, such as go by the name of Rosendale in the market, are mixed with 1 to $1\frac{1}{2}$ part of sand, while Portland cement is mixed in the proportion of 2 to 3 parts of sand, the character of the work influencing the engineer in his decision of the ratio. The sand and cement are mixed together dry with a shovel, and the water afterwards added. This is to obtain a thorough intermixture which would otherwise be difficult on account of the weight of the sand being less than that of an equal quantity of the cement, and, therefore, tending to float on top of it. The sand should be in coarse grains of unequal size, "pit" being better than "bar" sand, if well washed.

The best broken stone to use in the concrete is granite or basalt, or other hard rock, or brick-bats, of an irregular shape and not larger than a hen's egg, and free from dust. It is spread out upon a platform of boards. If gravel is likewise used, it should be placed at the bottom and the broken stone on top, and the layer should be from 8 to 12 in. thick. The mortar is then spread over it in the proportion, usually, of one-half to two-thirds the broken stone, or of the mixture with gravel. When gravel and broken stone are used together, the gravel should be about one-half the bulk of the broken stone. All the materials having been thus collected together, they are mixed with shovels and hoes working from the outside to the centre and back again twice, by which time, if skilfully done, each stone will be covered with mortar, and the mixture is ready for use. When put in its permanent place it should be well rammed, a good size of rammer being 4 ft. long, 8 in. in diameter at the foot, with a lifting handle, and shod with iron. It is let fall about six inches.—See *BÉTON* and *AQUEDUCTS*. (T. M. C.)

CONCUSSION. The word *concussion*, originally applied in surgical writings to certain symptoms of several ill-defined conditions of the brain or spinal marrow, supposed to follow severe injuries not accompanied with external evidence of actual lesions, has gradually been narrowed down until now it has come to signify rather the injury itself than the phenomena resulting from it. At present, although it is at the best a misnomer, by concussion of the brain or spine the majority of surgeons mean that, in consequence of a severe blow, or some similar injury, generally unattended with fractured bones, or with extensive wounds, one of the following four conditions of the nerve centres has been produced: 1. A disturbance in the molecular relations of the nerve tissue, not demonstrable, of course, but aptly compared to the change in the particles of a magnet which causes it to lose its power when forcibly struck by a hammer. 2. An extravasation of serum into the nerve structures, due, it is thought, to a temporary vaso-motor paralysis. 3. Actual contusion or bruising of the brain or cord with extravasation of blood. 4. Laceration or tearing of the substance of the brain or cord. It would be better to limit the use of the term concussion to the first of these conditions, to which alone it is strictly applicable. The symptoms of the second and third are due either to pressure, compression, or to subsequent inflammatory changes; of the fourth to the actual disorganization of nerve structures. They may, however, be de

scribed under this head. Although in respect to symptoms the first and slightest of these four degrees of injury is easily distinguishable from the last and gravest, the diagnosis of the exact amount of damage to nerve tissue and the differentiation of true concussion from that surgical condition known as "shock" are by no means easy. At the other extreme an equal difficulty is experienced in separating those cases of serous or hemorrhagic effusions, or of tearing of nerve structure, which, on account of the absence of certain symptoms, such as coma and paralysis, are included under the head of concussion, from cases of true *compression* of the brain. Remembering, however, that the lines cannot be drawn too strictly we may describe as follows the characteristic symptoms of these four classes of injury: 1. After a blow of medium force upon the cranium, or a fall from a height, a patient on attempting to rise staggers and falls, his skin becomes cold and bedewed with a cold perspiration, he is confused, or possibly even insensible for a short time, his face is pale and shrunken, his pulse is feeble and intermittent, his breathing sighing and interrupted. After a few moments, or at the most a few hours, reaction sets in; vomiting, indicating a return of reflex sensibility, occurs, the face becomes warmer, the pulse stronger, the mental symptoms gradually disappear, and the patient in a short time is entirely well. 2. After an injury of greater severity we have the above symptoms much intensified, especially as regards sensation and motion. The patient is oblivious to the external world, and can be aroused with difficulty. He lies motionless, or drawn up into a peculiar position, with the legs flexed on the thighs, and the thighs on the abdomen, and obstinately resumes it if he is forcibly straightened. The same conditions of pulse, skin, and respiration prevail, only more markedly, and the duration of the attack is greater, often extending over several days. 3. If the brain is contused over a very moderate area, or if the accompanying extravasation of blood is small in amount, diffused instead of circumscribed, or situated in certain regions, we may have, instead of the phenomena of *compression* usually seen in cases of hemorrhage into the brain substance or ventricles, simply those of cerebral irritation. The patient has muscular tremors or spasms, is morbidly taciturn or foolishly loquacious, sometimes actively delirious. The temperature is apt to be elevated, the patient obstinately unconscious, the breathing noisy. It is evident that a very slight increase of these symptoms would convert them into those of *compression*, coma succeeding to stupor, stertor to mere loudness of breathing, paralysis to convulsions. 4. Laceration of the brain, if not followed at once by sufficient hemorrhage to produce apoplectic symptoms, is characterized by great restlessness, wild delirium, with moans or shrieks, general convulsions, and finally by the motor and sensory phenomena of general encephalitis.

In the treatment of all these conditions the first indication is to keep the patient quiet and at rest. Nearly all the dangers of these accidents from first to last arise from consecutive inflammation, and everything which might conduce to this should be sedulously guarded against. Stimulants, therefore, even during the early stages, should be avoided. Where there is such profound depression as to threaten death, they may be given in small doses—preferably, as spirits of hartshorn or carbonate of ammonium—and should be accompanied by the application of external dry heat, by sinapisms, hot-water bottles, warm flannels, or a current of hot air conveyed beneath the bed-clothing. After reaction has begun, cold to the head, absolute rest in a darkened room, sedatives such as bromide of potassium, a diet chiefly of milk and farinaceous articles, attention to the various secretions, the use of small doses of mercurials, or of an occasional purgative dose, and catheterism, if necessary, are the essentials of treatment. Convalescence in the graver cases is

slow, and should be favored by perfect tranquillity of body and mind.

Concussion affecting the spinal cord is probably always associated with some lesion either of the nerve fibres or of the smaller blood-vessels of the cord. The physical conditions are very different from those existing in the skull. There we have a large, inelastic, nerve mass completely filling a dense hollow sphere, to which it is closely connected throughout. Under these circumstances we can understand how force suddenly applied to the cranium may be transferred to its contents, producing great temporary disturbance or disarrangement of their particles. But the spinal cord hangs loosely in a canal extending through a segmented and markedly flexible column, being connected therewith only at the points—the intervertebral foramina—where its membranes are continuous with the sheaths of the spinal nerves. It is evident that an injury producing a violent general shock is much more likely to inflict damage by "concussion" upon the brain than upon the cord, and it is very doubtful whether the latter structure ever suffers in precisely that way.

The symptoms said to be characteristic of *succussion* or perturbation of the *medulla spinalis*, without recognizable injury to its structure or membranes, or to the spinal column, are numbness, formication, loss of power in the extremities, pallor of the face, general weakness and depression, nausea and vomiting. These, however, may all be due to the shock of the injury, to contusion of peripheral nerves, to disturbance of the sympathetic ganglia, or to other causes independent of the spine or its contents. The secondary results said to follow such injuries are distinctly due to inflammatory or degenerative changes affecting either the cord or the membranes. The chain of causation has never been satisfactorily demonstrated. An individual who sustains a severe shaking-up during a railway collision, or in some other manner, may develop, after an interval of apparent health varying from a few hours or days to two or three months or even some years, a certain group of symptoms referable to his cerebro-spinal system, and in all probability originating at the time of his accident. There is no evidence, however, justifying the assumption that the original trouble in such a case was simply an uncomplicated concussion. By the time death occurs the changes found would of course be those due to long existing disease. In the only carefully recorded case of the kind the signs of spinal meningitis and myelitis were found together with a condition of the posterior columns closely resembling that seen in progressive locomotor ataxia.

The general conclusions warranted by these facts are, 1st, That there is no evidence that uncomplicated concussion of the spinal cord has taken place, while there are good *à priori* reasons for doubting the possibility of its occurrence.

2d, That the symptoms described as following railway concussion of the spine probably originate in some actual though slight involvement of the tissues of the cord or of its membranes at the time of the accident, but in their full development are certainly due to well-recognized and by no means peculiar pathological conditions.

The medico-legal importance of these latter cases, upon which are often founded suits for damages, makes them especially interesting. Among the earliest phenomena observed after the interval of apparent health which has been alluded to is an alteration of the manners or temperament of the patient, who, whatever his original disposition, is apt to become gloomy, morose, and ungracious; defective vision, hearing and speech ensue; the sense of touch is affected, its delicacy being greatly destroyed; muscular movements are irregular, and the gait awkward or unsteady; paralysis of motion and of sensation may supervene, or there may be tremor associated with pricking, burning or tingling sensa-

tions. Emaciation, general paralysis, and death usually terminate the case.

Passing from these cases to those in which some definite spinal injury exists, we find that here even more than in the brain it is difficult to dissociate the phenomena of so-called concussion and those of compression or of inflammation. Just as in cases where a serous or bloody exudation has taken place within the skull the symptoms of cerebral irritation pass insensibly into those of compression or of traumatic encephalitis, so in spinal injuries the alteration of sensation and motion and the disturbance of function, sometimes connected with very slight exudations or trifling hemorrhages, deepen into more or less extensive and profound paralysis, or give rise to spasms or convulsions, dyspnoea, retention of urine, fecal incontinence, priapism, and other symptoms of pressure upon or disorganization of the spine. The fact that each segment of the cord is really a distinct nerve centre makes it possible to determine accurately in these cases the exact seat and area of the lesion involved. So, too, the time of appearance and degree of severity of certain symptoms, such as motor paralysis, afford valuable evidence of the amount of involvement of the cord.

If after a spinal injury complete paralysis comes on immediately and persists, the cord is probably divided or compressed by an extensive blood-clot or by a broken vertebra. If it is merely transitory the condition has in all probability been one of slight hemorrhage into the substance of the cord. Such a case might be described as one of simple "concussion," but the term, though convenient, is manifestly inaccurate.

Gradual paralysis, slowly advancing, is due either to continuous hemorrhage from a small vessel or to inflammatory extravasation. It sometimes slowly disappears. If it does not, or if it increases, the inference is that some progressive disorganization of the cord is taking place and will finally cause death.

The treatment of cases of spinal injury in which there is no paralysis consists in rigid confinement to bed, preferably in the prone position so as to favor the gravitation of blood away from the back; the application of ice-bags, hot poultices, or strong counter-irritation along the spine; careful attention to the bowels and bladder, the former being emptied by enemata, and the latter, if necessary, by catheterization; and the administration of small doses of iodide of potassium and mercury. The patient should rest on a water bed, the skin should be kept scrupulously clean, and the parts exposed to pressure often bathed with astringents or with stimulating liniments. Where paralysis exists, the supine position is preferable, and all these precautions must be even more rigidly observed.

(J. W. W.)

CONDITION, in law, a clause in a contract or agreement which has for its object to suspend, rescind, or modify the principal obligation, or in case of a will to suspend, revoke, or modify a devise or bequest. In real-estate law a condition is a qualification or restriction annexed to an estate, whereby it is provided that in case a particular event does or does not happen, or in case the grantor or grantee does or omits to do a particular thing, the estate shall commence, be enlarged, be abridged, or be defeated.

Conditions are of various kinds. They may be affirmative or negative, copulative or disjunctive, consistent or repugnant, express or implied; all of which are sufficiently defined by their names. Conditions may also be lawful or unlawful. A lawful condition is one which does not contravene public policy or the express provisions of a statute. An unlawful condition is such as is forbidden by law. Unlawful conditions are—1, such as require the performance of some act which is forbidden by law or which is *malum in se*; 2, such as require the omission of some act which the law requires to be performed; and 3, such as tend to encourage such acts or omissions.

Conditions are also either precedent or subsequent. A condition precedent is one which requires the performance of some act before the estate or interest can vest. Conditions precedent are said to be favored in law. Conditions subsequent are such as upon their happening divest an estate or interest which has already vested. Conditions subsequent are not favored in law.

By the rules of the common law no person was entitled to take advantage of the breach of a condition subsequent except the grantor and his heirs. If, however, a limitation was annexed to an estate, a third party could take advantage of it. Hence the origin of what are known in real-estate law as conditional limitations, which are in substance conditions after the nature of limitations.

If a condition precedent be unlawful, and therefore void, the estate depending upon it can never vest, and is never entirely defeated. If, on the contrary, a condition subsequent be void, the estate, having once vested, can never thereafter be defeated.

Where performance of a condition was possible at the time of its creation, and afterwards through the act of God has become impossible, the law will excuse it.

(L. L., JR.)

CONDONATION, in general language and sometimes in legal proceedings, is used to indicate a forgiveness of almost any offence; but it is technically applied in law to the forgiveness of only one or two particular offences. In this sense it is a forgiveness of the matrimonial offence of adultery or cruelty, known by the party forgiving to have been committed, on the condition that the party forgiven shall ever afterwards conduct himself or herself properly in the marital relation. The word is usually employed in reference to adultery and is best considered from that standpoint, though it is equally applicable to cruelty. When a husband or wife has been guilty of adultery, the party offended against has generally the right to a divorce from the bonds of matrimony, on the ground that the other party has failed to adhere to the obligations entered into on the marriage. But this right may be given up, if the party so wills, and the husband and wife may agree to live together again. In order to constitute a condonation, however, it is not enough that the party offended shall merely make an offer of forgiveness, in case the offending party will return to the relation of man and wife, but the offer must have been actually accepted and the marital relation re-established; but it is not necessary that the parties shall continue to live constantly together in that relation; as to the husband, at least, it is enough if they have once slept together. The mere fact of living together in the same house of course creates a presumption that the parties have resumed the marital relation, but this presumption will be rebutted by showing that they have occupied different beds. It is considered in law that, where the marital relation is so re-established, there is an implied condition annexed that the party forgiven shall in the future conduct himself properly—with conjugal kindness in all respects—and, in case he or she fails to do so, the original offence is revived and can be alleged as a ground for a divorce. And this is not only so, if the adultery is committed again, the rule is much stronger and the party must in all ways behave himself in accordance with the duties of the relation. Even an offence which is cause only for a divorce from bed and board has been held to be a reviver of an adultery which has been condoned; and comparatively slight cruelty will also give the right to break off the condonation and reassert the first wrong. The rule as to cruelty especially is less severe against the wife than the husband, owing to the greater difficulty for her to take the means of avoiding the cruelty. Condonation may be shown in other ways than by continuing to live together in the relation of man and wife; thus, the abandoning or long neglect of proceedings instituted for a divorce, and perhaps mere words of forgiveness, are sufficient evidence that the

party offended has condoned the offence. The subject of condonation has not been largely the subject of legislation, and the doctrine remains generally as above stated; but its conditional quality has been abolished in a few of our States. (W. M. M.)

CONDOR. See CATHARTIDÆ.

CONEY ISLAND, a seaside resort in the vicinity of New York, is a narrow island, 5 miles long, in the Atlantic ocean, off the S. W. corner of Long Island. It is included in the township of Gravesend, Kings co., N. Y. Coney Island creek, a narrow strait winding through a salt marsh, separates the island from the mainland and connects Gravesend and Sheepshead Bays. The island, according to old records, was once three separate islands, and at another time two; more than a century ago it extended two miles farther than at present, and is said to have abounded in foxes and rabbits. About 1800 it was used for farming and pasture, and cedars were cut from it for building small vessels. The first hotel was built in 1819. Two years later, during a violent storm, the tide rose to a height never since equalled; everything was swept away and the island left almost level and perfectly barren. A turnpike road was constructed from Brooklyn to the island in 1830, and later there was communication by a daily stage as well as by a steamboat to New York city. About 1865 a horse-car line was laid from Brooklyn, and soon a steam railroad followed. But the island did not become a popular resort until 1874, when the Prospect Park and Coney Island Railroad was opened, and capitalists did much to increase the attractions of the place, especially the east end. Six steam railroads now run trains at frequent intervals from Brooklyn and from various points on New York Bay and East River, where connection is made by boat for New York city. Large iron steamboats also leave New York every half-hour for the island. The Park Commission of Brooklyn own 70 acres of land near the centre of the island, with a frontage of 2750 feet on the ocean, and an avenue 210 feet wide and $5\frac{1}{2}$ miles long has been laid out from Prospect Park to the "Concourse" on the island. Near the latter, two large iron piers extend 1000 feet into the ocean, ending in 14 feet of water. The piers have a general width of 50 feet, but one is in part 85, and the other 125 feet wide. They are used for promenades, restaurants, and popular concerts. Brighton Beach Hotel is five stories high and 450 feet long, and near it is a race-course, which for five months of the year is used almost daily for horse-races. The Manhattan Beach Company own 500 acres of land, with an ocean frontage of two miles. They have two large hotels, a marine railway, and an elevated railway running to the centre of the island. During the summer season the railroads carry over 2,000,000 passengers to Coney Island, but few persons stay there more than a day at a time.

CONFECTIONERY denotes a class of preparations in which sugar is a principal ingredient. It comprises all kinds of sugar candies, cream and fancy ices, compotes or stewed fruits, fruit and animal jellies, etc. Two centuries ago the art of making sweet preparations was for the most part confined to apothecaries and physicians, who used sugar and honey to make nauseating medicines palatable, and pharmaceutically, in making syrups, electuaries, etc.; but the preparation of conserves and the compounding of drugs have now become distinct arts, though the separation is not entirely complete, the drug trade being dependent on the manufacturing confectioners for what are usually called medicated candies. Of these there are upward of a hundred varieties, chiefly in the form of drops and lozenges, and containing many of the standard medicines. Thus we have cachou lozenges, quinine lozenges, anti-bilious lozenges, cough drops, bronchial troches, etc. These goods are manufactured in very large quantities.

Confectionery is usually classed among the luxuries, but in the United States custom has rendered some forms of sweetmeats indispensable adjuncts to the fashionable dinner and lunch, thus placing them in the rank of articles of diet, and their use is becoming common among all classes. Many causes have contributed to this result, such as the custom of making gifts of boxes of candy at Christmas and other holiday seasons, the multifarious forms which modern confectionery has assumed, the variety of materials introduced into their composition, and the skill and attention devoted to the delicate task of flavoring them. They are thus made to conform with every taste and appetite.

Few industries have experienced more radical changes during the last thirty years. Up to the year 1851 boiled sweets were almost exclusively an English specialty, and it was the novel display in this line of the London confectioners, at the first International Exhibition of that year, that led to their introduction into other countries. The Germans appear to have been the first, or at least the foremost, to emulate the example of their insular rivals, and so well did they improve the occasion that in the Exhibition in 1862 two confectioners from across the Rhine created no little surprise by their superior display of boiled sweets and rock candies. The French artists in sugar have not developed any special skill in this branch, but have devoted themselves assiduously and with surprising success to the manufacture of chocolate and sugar bonbons, liqueurs, pastilles, and comfits, in all of which they greatly excel. In the United States, less than forty years ago, confectionery, both as an art and a business, was in a very crude state. With few exceptions, each confectioner was his own manufacturer, and his stock in trade was limited to the common varieties of stick candy, plain sugar-plums, sugared seeds, and molasses candy. Candied fruit was only made "to order," and was sold at \$2.50 per lb. All the fancy goods were imported from France, chiefly from Paris. In the more pretentious stores of those days the rear portion was fitted up as a saloon-parlor, where cake and ice-cream, cold meats, tea and coffee were supplied to customers. For parties, ice-cream was served only in the form of plain pyramids, the moulds being delivered in long, painted tin pails. In the workshop, too, simplicity prevailed. The tools and utensils were of the most primitive style, such as the hard candy kettle and brick furnace, the finger gauge, the old mortar and pestle.

In all these respects there has been a complete revolution. To the plain candies mentioned above have succeeded the dragées, patées, nougats, pastilles, fondants, *fruits au sucre* and *liqueurs sucrés* of the modern confectionery art. Chocolate occupies a prominent place, and is produced on a very extensive scale and manipulated into an endless variety of forms, giving employment to hundreds of workmen, requiring special machinery and great skill in casting the subjects, glazing and covering them. Among the most popular types are figures of fruits, vegetables, spiders, and other smaller insects, made in moulds of hammered sheet copper. Powdered sugar, beaten with the white of eggs, also enters largely into confectionery, the composition being stamped, or cast in moulds. The excellence of these productions is largely due to mechanical improvements in triturating and grinding the materials. In the class of goods known as nougats, the kernels of nuts, especially of almonds, are incrustured with honey. The patées and pastilles, also, are a favorite specialty, and they call for great ingenuity and skill in the intricate interlacing of the fruits, and in the crystallizations. Preserved sugared fruits and fruits in syrup are now important articles of diet, and they include all the favorite products of the orchard, marmalades and jellies. Much attention is given to fruits in jellies and *liqueurs sucrés*, the latter being graded according to quality. The low grade has about

20 per cent. of sugar and glucose, and the same proportion of alcohol, the remainder being water. A finer quality contains 40 per cent. of sugar and 30 per cent. of alcohol, and the highest grade 50 per cent. of pure sugar and 30 per cent. of alcohol. This class includes spirituous bitters, such as absinthe, *elixir de longue vie*, *vulnere*, etc., which have been brought to great perfection in France. American confectioners manifest their superiority chiefly in the manufacture of comfits, containing fruit essences, candied fruits, preserves and jellies; in cocoanut cakes, bars, biscuits, and paste, stick candies, caramels, gum drops, and walnut candy. Most of the above are of American origin. Comfits have been brought to great perfection during the last ten years, owing to the introduction of machinery in their production. In the days of the old copper pan, fifty pounds of well-finished comfits or dragées were considered a full day's work, whilst at the present time a skilled workman can superintend a dozen revolving steam-pans, capable of turning out from three to four tons a week. The new system has not only cheapened production, but is much cleaner than the use of fire-heat, and is attended with less risk of fire. These advantages have thrown the manufacture into few hands, who make this class of goods a specialty. The new comfit or dragée pans are made either to oscillate or revolve, both forms being equally suitable for the purpose. In the packing and wrapping of confections great taste is displayed, the style of boxes used being an important item in the make-up of the bon-bons. The manufacture of boxes and other goods of this class is a separate industry, and of late years has grown into large proportions. Steam-appliances are in use in all large establishments, as well as benches, containing six, eight, and even ten machines, with rollers of various patterns, all set in gear. Each of these machines is provided with a lever and clutch wheel, so that one or all can be worked at once. Then there are machines for beating, kneading and mixing materials; for cutting, chopping, and slicing; for grinding, rolling, and grating; ice-crushers, cream-freezers, corking machines for bottling fruit juices and preserves, revolving ovens, steam-kettles, the saccharometer for testing sugar, etc., etc. These contrivances effect a vast economy in time and labor, as compared with the old methods. Twenty years ago, for instance, it was quite an exploit to cut a seven-pound boil of acid drops with scissors and round and press them flat in half an hour, whilst with the machine now in use a boy can do the same work and turn out the goods in better shape in five minutes. These improvements cover all the details of the laboratory, except where hand-work is indispensable to the quality of the goods, and have completely revolutionized the business. The quality of standard goods is greatly improved, necessitating corresponding changes in classification. Articles which a few years ago were imported from Paris or Vienna are now manufactured here in excess of the home demand, and are being exported to London and to Central and South America. Even ornamental work which a few years ago was prepared only by Parisian confectioners has become a home industry, the importations being mostly confined to samples. In pastillage work there are at least two hundred hands employed in the United States, chiefly in New York and Philadelphia. The product is shipped to all parts of the United States and the British Provinces.

In the management of the mercantile parts of the business the same progress is everywhere perceptible. Stately warehouses, filled with an almost endless variety of goods, and crowded manufactories attest the magnitude of the wholesale branch of the business, whilst handsome retail stores, with their bewildering display of confections in every conceivable style and form, give equal evidence of the increased popular demand. The retail branch, in the leading establishments, is usually divided into four departments, viz. :

the candy, the cake and ice-cream, the outside orders, and the restaurant or café. The latter is conducted on a more or less extended scale, the bill-of-fare often comprising fifty to sixty kinds of cake and twenty to thirty varieties of ices. For party orders the latter are served up in plain and fancy bricks, in melon moulds or other elaborate designs, with or without fruit ices, colored and set in spun sugar.

As may be expected, competition among the trade has led to numerous frauds and adulterations in materials used, in order to cheapen production. Baking powder, which is used in many kinds of confections, is often found to contain starch and alum. Ultramarine is sometimes employed in adulterating sugar and saccharine preparations, to offset the yellow color of inferior grades of sugar; cotton seed, walnut, and chestnut oils are sold for olive oil. Oil of lemon, as well as others, are adulterated with fixed oils and alcohol, and sometimes with turpentine, the latter being difficult to detect on account of its similar composition and specific gravity. Chocolate is often mixed with starch, wheaten flour, and other articles, and glucose is made to do duty for sugar in making caramels. Gelatine and glue often find their way into gum goods, especially those known as "A. B. goods," starch into lozenges, lard into chocolate; terra alba, or plaster of Paris, is used in adulterating candies solely to increase their weight, and certain much more dangerous chemicals are sometimes used in coloring candies. The most of the above-named adulterants are comparatively harmless, and their introduction is mainly due to the popular demand for cheap candies; but certain coloring matters are positively pernicious, and their use deserves the severest penalties.

Sugar is the base of all confectionery, and it therefore ranks first in importance among the materials used by the trade. There are two kinds—namely, the natural product of the cane, sugar beet, maple tree, and a few of the palms; and glucose, or grape sugar, which, as known to commerce, is artificially produced from starch by the action of sulphuric acid. Glucose is undoubtedly destined at no distant day to become a prime factor in the confectioner's economy. Glucose differs from cane sugar in not being readily crystallizable, and also in the smaller yield of sweetness. Its great value in the confectionery art consists in the fact that when added in the proportion of seven to ten per cent. to cane sugar, and boiled with it, it destroys the tendency of the latter to return to the crystallized form; in other words, it removes the grain, and thus dispenses with the employment of cream of tartar or acids for this purpose. On this account it is extensively used in the manufacture of "A. B. gum goods," lozenges, "kisses," cocoanut preparations, and creams. It also gives to cream and pulled candy a certain waxiness—a desirable quality—and adds to the keeping properties of caramels, cough candies, and clear fruit drops, all of which have a tendency to become sticky when exposed to the air. Though its introduction has encountered much opposition, on the ground that it is an unhealthy adulterant, it is now conceded by competent chemists to be harmless and even nutritive; whilst in making confections of the class referred to above it is decidedly an advantage when not used to the comparative exclusion of cane sugar. American glucose is made from corn, and has been greatly improved of late by being thoroughly freed from the sulphuric acid with which it is prepared. In Europe there are some ninety glucose factories, but there it is produced from potatoes. That manufactured in France stands higher in the market on account of its being freer from acid; but it does not appear to possess any more sweetening power than the products of the United States or of Germany. On the other hand American glucose has the advantage of being fifty per cent. cheaper.

One of the first requisites in the successful production of confectionery on a large scale is a knowledge

of the chemistry of sugar, and of its treatment for the various purposes to which it is to be applied. Pure cane sugar melts at a temperature of 320° Fahr.; crystallized glucose, or grape sugar, at 187°; and the anhydrous, or glucose proper, at 270°. When sugar and glucose are mixed the point of melting will depend on the proportion of each to the mass; and it is in calculating this relation in each case that the art of sugar- and of course candy-making largely consists. The next step is to ascertain the amount of boiling needed to bring the sugar to the proper condition, and this varies with the class of goods to be made. Where pure cane sugar alone is used, the following degrees serve most purposes: 1. The *Smooth*. This degree is reached at 215° to 220° Fahr., and is ascertained by immersing the thermometer in the pan. At this point the sugar is used for crystallizing creams, gum goods, and liqueurs. 2. The *Thread*, at 230° to 235°, for making liqueurs. 3. The *Feather*, at 240° to 245°, for making fondants, rich creams, cream for chocolates, and fruit-candy. 4. The *Ball*, at 250° to 255°, for making cocoanut-ice, cocoanut, and other nut candies, and most grained sugars. 5. The *Crack*, at 310° to 315°, for making all kinds of drops, toffees, rocks, and all clear goods. There is also the *Caramel*, at 320°, used for making confections of that name. This is the highest point at which sugar can be kept on the fire without burning. Where refined sugars are to be used it is of the greatest importance to know that when boiled above the *Ball*, or 250 degrees, they are grainy, and when turned out of the pan and allowed to cool will be simply hard-candied sugar, unfit for further use. To prevent this the grain must be "cut" by the addition of cream of tartar. This ingredient makes the sugar pliable when hot, and transparent when cold; and hence its use for making drops, rocks, toffees, and clear goods. The usual proportion of this ingredient is $\frac{1}{4}$ oz. to every 8 to 10 lb. boil of sugar. Glucose is equally effective in preventing crystallization, and being harmless, and at the same time cheaper, it is rapidly displacing cream of tartar.

According to the census returns of the Bureau of Statistics there were in 1880 in the United States and Territories 1450 manufacturers of confectionery, with a combined capital of \$8,486,874, employing 6157 male adults, 2827 adult females, and 817 children, or a total force of 9801. The amount paid annually in wages is \$3,242,852, for materials \$17,125,775, and the value of the products for that year is put down at \$25,637,033. A comparison of the States shows that New York takes the first rank, her proportion being 25 per cent. of the whole, and Pennsylvania second, with 20 per cent., the two combined containing nearly half the establishments of the entire country, and holding the same relation as to the value of the products. Massachusetts, Illinois, Ohio, Missouri, and Maryland come next in the order named, but in these States the production, as compared with New York and Pennsylvania, is largely in excess of the number of establishments, owing to the fact that the business is chiefly centred in a few cities, such as Boston, Chicago, St. Louis, and Baltimore, where it is conducted on a very large scale by comparatively few houses. The returns from twenty of the leading cities of the Union show an aggregate production of \$17,921,929, or nearly 70 per cent. of the entire country. Among these cities New York heads the list, having 187 establishments, and showing a production of \$4,592,622. Philadelphia follows with 173 establishments and a production valued at \$2,653,074; Chicago third, with only 24 factories and a production valued at \$1,953,558, and Boston fourth, with 33 factories and producing goods estimated at \$1,606,214, the next in order being St. Louis and Baltimore. Imposing as these figures are they are quite misleading as to the real magnitude of the business. They take no account of the foreign goods consumed here, or of the large amount produced by small dealers and retailers in all sections of the

Union. Thus, for instance, the local statistics of Chicago show that the sales of confectionery in all its forms during the year 1880 foot up a valuation of \$3,000,000—two concerns alone doing a combined business of over \$2,000,000 a year. This is a fraction over the whole production of the 27 establishments accredited to Chicago in the United States Census for that year. The same remark applies to New York, Philadelphia, and all other large cities similarly situated.

Though the consumption of confections is pretty well distributed over the Union, it appears that the largest share compared with population is found in that part of the West bounded east and south by the Ohio River, and west by the Mississippi. Nor is this matter of taste confined to the mere element of quantity. Whilst the people of the United States have a strong affinity for sweetmeats of some kind, and consume more than any other nation in the world, they are equally fastidious in their choice of goods. What suits one section is unpopular in another. This diversity of popular taste is particularly noticeable in the choice of flavorings. Thus, in the North, winter green is most in favor; in the South peppermint, whilst in the Southern seaboard States a decided preference is shown for sassafras.

One peculiar feature of this important industry in the United States is that there is no local specialty in any city or section; for though many of the most popular goods had their origin in the inventive brain of some individual, and for a while the inventor was able to guard the secret, it was soon discovered and imitated. The "A. B. gum-drop," for instance, is said to have been first introduced to the trade by a German confectioner of New York city a few years ago; cocoanut caramel and walnut candy in Philadelphia by a German and his wife about the year 1869, and "soft Imperial pan-work" by a manufacturer of New York city in 1868. All these and many other standard goods of purely American origin are now made by confectioners everywhere: the only distinction recognized being based on the real or supposed superiority attached to the individual brands. In the manufacture of machinery and tools used by confectioners circumstances have combined to create specialties in certain lines. Thus Philadelphia is conspicuous among the large cities of the United States as the headquarters for machinery, tools, and most utensils used in the trade, a branch of industry which is carried on here on a more extensive scale than in any other city. New York city, in the same way, enjoys a monopoly of the copper work used by manufacturers, whilst all the delicate machinery used for making chocolate is imported from France, where it originated.

Among the causes which have led to the remarkable growth of this industry is, first, the general introduction of machinery and implements, which, besides enlarging the productive capacity of the numerous establishments, has improved the quality of the goods; secondly, the rapid increase in the population of the country; thirdly, the general prosperity of the country. In Europe the laboring classes cannot afford to indulge in luxuries of any kind, and least of all in sweetmeats; and hence confectioners are driven to depend for their support and patronage on a very small fraction of the populations of the respective countries. In the United States, on the contrary, the industrial classes are by far the largest consumers. Lastly, the low prices at which confections are sold being the result of cheap production as compared with Europe, have largely aided in the development of the industry. It reflects no little credit on the ingenuity and enterprise of American manufacturing confectioners that notwithstanding the higher cost of material, labor, capital, rents, etc., the most popular goods, such as caramels, plain and fancy cream bonbons, creams, and nougats, are fully 50 per cent. cheaper in any of our large cities than the same grades of goods in Paris

Vienna, or London; without detracting in the least from the credit due to the French or German confectioners for their discoveries and progress in the art, the American representatives in the trade have done, and are still doing, more to popularize the manufacture and consumption of confections than all Europe combined. The result of the causes referred to are apparent even to the most superficial observer. More confections are made and sold in the three cities of New York, Philadelphia, and Chicago, with a combined population little more than the single city of Paris, than in the whole of France. In each of these centres goods are made by the ton, and often sold in single orders ranging from ten to fifty barrels each. Transactions on a similar scale are entirely unknown in any other country in the world. To sum up in a single sentence, the confectionery industry of the United States has already attained vast proportions, its development is steadily onward, and its possibilities in the future practically unlimited. (E. H.)

CONFEDERATE STATES. The organization of the "Confederate States of America" in 1861, as an independent government, is now commonly regarded as the result of a conspiracy, for the reasons which follow. A distinction may be properly made between secession, the withdrawal, or attempt to withdraw, from the National Union, and the organization of the Confederate States. The former was only an abnormal development of the particularist side of American politics, brought to a head by the sectional differences caused by negro slavery. The particularist notion that the union was a league, a "voluntary association" of States for mutual benefit, was extremely common everywhere until after the end of the war of 1812, though its corollary, the right of secession, was either unthought of or kept out of sight, except in such isolated instances as the Virginia and Kentucky resolutions of 1798, from which it may perhaps be drawn by argument, and Tucker's edition of Blackstone's Commentaries in 1803, in which it is completely formulated. There was very little national feeling at any time, and it is hardly too strong an assertion to say that the national government owed its continued existence during this period to its control of the great western territory, in which States and individuals had a common interest. After 1815, the national idea grew rapidly and increasingly in those States in which slavery had ceased to exist, (1) because of the growth of manufactures, banking, commerce, and other interests which ignored or were embarrassed by State lines; (2) because of the rapid internal transfer of population to new States without historical associations; and (3) because of the increasing influx of foreign immigrants, who sought and thought of only the United States, not a particular State. From all these influences, with the possible exception of the second, the South was completely shielded by slavery, and the idea of State sovereignty remained as strong there as ever. Indeed, by a reactionary movement, it had grown stronger in 1860 than in 1787-88, and community of interest had given it the more dangerous character of sectional sovereignty. But, though the two sections were thus drifting apart, the political vocabulary of the North and West remained unchanged, and such phrases as "the confederacy" and "the voluntary nature of the Union" were very frequently used by men of all parties, who either forgot that they implied a right of secession, or did not see that they had already collapsed under New England's experience before and during the war of 1812, and that unseen physical forces had given the Union a stronger than "voluntary" character. Even the idea of secession, for which the way had been paved by consistent theory in one section and by a survival of political phrases in the other, was not at first generally terrible in 1860-61, for there was a vague feeling that the process, however extraordinary, was nothing more than a final summons to the other States to compromise national difficulties. Even

after the formal inauguration of the Constitution in March, 1789, two States, Rhode Island and North Carolina, had for considerably more than a year refused to ratify the Constitution, or take part in the government; and yet their troublesome independence had been submitted to by the other States until "voluntary" ratification ended the difficulty. In 1861 there were some far-seeing men in the North and West, like Gov. Andrew, of Massachusetts, who ordered arms and prepared for war; there were others, like Seward, who looked to Canadian annexation to make good a confessed loss; but to the great mass of the people the status of South Carolina and the other seceding States seemed quite on a par with that of Rhode Island and North Carolina in 1789-90. Neither in 1789 nor in 1861 was there any definite idea of the method by which the problem was to be solved; but in both cases there was the same reliance on natural forces, the same characteristic American confidence that the solution would be reached "somehow." And in the South the feeling was generically similar. We have the emphatic testimony of a competent observer, Alexander H. Stephens, that the "wavering scale" in the essential State of Georgia was turned by one cry, "We can make better terms out of the Union than in it." It was hard, at the best, to carry a majority of Southern voters into secession, with all its vague idea of only a temporary suspension of union, and every motive of pride, passion, prejudice, interest, and even terror, had to be invoked to do it. Had the spectre of a Southern national government, and its inevitable war with the United States, been as familiar to Southern voters as to Southern politicians, it is difficult to name any State outside of South Carolina which would have seceded; and we have Gov. Gist's confidential letter to other Southern Governors, in October, 1860, to assure us that South Carolina's secession, without assured support by one or more other States, was "very doubtful." For all these reasons, secession, pure and simple, was looked upon at the North, until very late in January, 1861, as no finality, but as the last desperate effort of a minority to compel some compromise which both it and the incoming administration of President Lincoln would be glad to accept. President Lincoln's inaugural in March, 1861, declaring his intention to collect duties and to continue the mails, "unless repelled," but not "to force obnoxious strangers" into any locality "where hostility to the United States shall be so great and universal as to prevent competent resident citizens from holding federal offices," seems to mark his acceptance of a policy which, impossible as it had then come to be, was at least in the line of the idea which had at first been generally entertained of the design and possible results of secession. But the organization of a new national government by the seceding States was a very different matter. Secession, so long as it looked to individual State action alone, was at the worst a negation of national authority for a longer or shorter period; but here was a distinct affirmation of a new power, whose recognition would end the Union, in its old form, forever. Such an affirmation was desirable only to the politicians, as a means of coercing the allegiance of the doubtful mass of voters. It was made in every case by the State conventions, without reference to or ratification by the popular vote. It was proposed in the first instance by a few great leaders at Washington, whose influence over their respective State conventions was very great. It is not wonderful, then, that the story of a secret meeting of the senators of the seven original seceding States, at Washington, Jan. 5, 1861, of its decision to force through the organization of a national government, of its appointment of an executive committee headed by Jefferson Davis, and of its dictation of the whole course of procedure, has been accepted by all historians, North and South, without any great search for its authority. It rested originally on an anonymous

letter to a Washington newspaper four days after the date of the meeting, but has since been confirmed by several detached items of evidence; and the least that can be said of it is, that it is not at all improbable. It is for these reasons that the organization of the Confederate States government, rather than the antecedent act of secession, is usually termed a conspiracy, the few Washington leaders being the conspirators, and the mass of Southern slave-owners and politicians being rather active supporters than admitted participants.

The event which crystallized the theory of secession into practice was the election of President Abraham Lincoln in November, 1860. While the United States extended only to the Mississippi, the Ohio furnished a safe boundary between new slaveholding and non-slaveholding States. When migration passed the Mississippi, the dividing line was lost. Louisiana, when acquired in 1803, was a slaveholding territory by French and Spanish law, and Congress took no steps to prohibit slavery therein. Consequently slavery spread over the intervening Territory of Arkansas into Missouri, which was a slave State when admitted in 1821. With its admission was coupled a proviso prohibiting slavery for the future in the remainder of the Louisiana purchase, north of latitude $36^{\circ} 30'$. The whole was known as the Missouri compromise. When California, Utah (including Nevada), and New Mexico (including Arizona) were acquired from Mexico in 1848, a conflict between the two sections, so much stronger in wealth and population, was a more serious matter than in 1821.

After a struggle of more than two years, the compromise of September, 1850, admitted California as a free State, ignoring the question of slavery in Utah and New Mexico, and gave the South a more stringent fugitive slave-law. This last item proved highly unpopular in the North and West, but was submitted to. In 1854 the Territories of Kansas and Nebraska were organized. Both were part of the Louisiana purchase, and north of the line of $36^{\circ} 30'$, and hence were free territory by the Missouri compromise; but, most unfortunately, the Northern Democratic leaders conceived the idea that political consistency called upon them to follow the same plan with Kansas and Nebraska as with Utah and New Mexico. The result was the passage of the Kansas-Nebraska bill, which effusively proclaimed its neutrality as to slavery, and thus repealed the Missouri compromise, with its prohibition of slavery. The secondary results never stopped short of war. The Republican party was instantly organized, its leading tenet being the right and duty of Congress to prohibit slavery in *all* the Territories. In the struggle, 1855-58, between pro-slavery and anti-slavery settlers for the control of Kansas, the former were defeated, in spite of the Dred Scott decision in 1857, in which the Supreme Court affirmed the constitutional existence of slavery in a Territory, whenever an owner should see fit to carry a slave thither. In 1860 the National Democratic party split into two sections, and Lincoln and Hamlin were elected, having a majority of the electoral and a minority of the popular vote. Their election was the signal for action. The South Carolina Legislature, which was in session to choose presidential electors, called a State Convention. It met Dec. 17, unanimously adopted an ordinance, Dec. 20, repealing the State's ratification of the Constitution in 1788, and dissolving "the union between the State of South Carolina and other States under the name of the United States of America." Its declaration of causes for secession was extremely meagre. It consisted mainly of an argument for the abstract right of secession; and the causes were but two—one general, a loss of the identity of interest between the North and South which had made the Union possible, and one particular, the passage of "personal liberty laws" by Northern States, intended to secure the privilege of the writ of *habeas corpus* to alleged fugitive slaves. In the other Southern States the pro-

cess was closely similar, omitting the declaration of causes. In this manner ordinances of secession were passed by the State Conventions of Mississippi, Jan. 9, 84 to 15; Florida, Jan. 10, 62 to 7; Alabama, Jan. 11, 61 to 39; Georgia, Jan. 19, 208 to 89; Louisiana, Jan. 25, 113 to 17; and Texas, Feb. 1, 166 to 7. The ordinance was submitted to the people for ratification in but one State, Texas, and there only because the convention was an entirely revolutionary body, called by private persons, the Legislature not being in session, and it needed some vestige of authority.

The act of secession, though only a stepping-stone, was a most important one. Under the State sovereignty theory, the primary allegiance of the citizen was due to the State, and his obedience, or secondary allegiance, to the Union of which his State was a member. By the dissolution of the Union the allegiance of the citizen was due only to the State, whose sovereignty was represented now by the conventions. These did not finally adjourn after the act of secession, but, by concert of action, elected delegates to a Congress at Montgomery, Ala., Feb. 4, and continued in existence. The "provisional" Congress, of one house, met at the time and place appointed, though the Texas delegates were not appointed until ten days later. Each State had one vote. A provisional constitution, being that of the United States with some changes, was adopted, Feb. 8; and Jefferson Davis, of Mississippi, and Alexander H. Stephens, of Georgia, were elected provisional president and vice-president on the following day, and inaugurated Feb. 18. Having ratified the provisional and permanent constitutions, and having thus transferred the "secondary allegiance" of their citizens to a new national government, the State Conventions were at last able to adjourn *sine die*; the most important part of their work was accomplished. Even while the Congress of the United States, in session at Washington, had been engaged in discussing hopeless plans for reconciliation and reunion, without one effort to defend the unity of the nation, an organized government had arisen at Montgomery, able to levy armies and taxes, support navies, make treaties, peace, and war, and, above all, demand the allegiance of its citizens even in a war against the United States. In all this work the unconditional secessionists enthusiastically concurred, while the mass of the voters had no control whatever over the action of the State Conventions which they had so rashly called into being. Acts of war, sometimes the official action of State governments, sometimes the unofficial action of mobs, afterwards indorsed by officials, had long preceded any declaration of war, or even the formal acts of secession. Forts, arsenals, custom-houses, navy-yards, war vessels, hospitals, and mints, had been seized and turned over to the State authorities; and United States troops had been forced to surrender, paroled, and sent North. President Buchanan declared in his messages to Congress that he saw no legal method to check or punish these acts, so long as Federal judges and marshals in the seceding States continued to resign, and no persons could be found to take their places. Even when the South Carolina batteries, Jan. 9, fired upon and drove back a United States vessel which was endeavoring to provision Fort Sumter, in Charleston harbor, the Federal government showed no disposition to accept the act as one of war. Nominally, President Buchanan succeeded in "keeping the peace" until the end of his administration; but when President Lincoln took office, March 4, 1861, he found that every vestige of Federal authority in the seceding States had disappeared, except at Fort Pickens, in Florida, and Fort Sumter, in South Carolina. To allow both of these to go was to make the Confederate government the undisputed successor to the Federal government within the territory claimed by it; to allow either to go was to hazard the whole result upon a single die. Seward, Secretary of State, was against any attempt to provision the forts, trusting thus to confine the rebellion

to the seven seceding States, retain the border States in the Union, and supply losses by Canadian annexations. Early in April he was at last overruled, and the attempt was made to provision Fort Sumter. Before this could be effected, the Confederate batteries had forced the fort to surrender, April 12-14, and war was begun. April 15, Lincoln, by proclamation, announced the existence of the rebellion, and called for 75,000 volunteers to suppress it; two days afterwards Jefferson Davis offered letters of marque and reprisal to private armed vessels against the commerce of the United States, and privateers at once began to issue from Southern ports; and on the 19th President Lincoln declared a partial blockade of Southern ports, which was made general on the 27th. May 6, the Confederate Congress passed an act recognizing the existence of war with the United States, and foreign governments immediately began to declare their neutrality between the two belligerents. One immediate result of the outbreak of hostilities was an extension of the area of secession. The border States were willing to remain in the Union, at least temporarily, so long as its voluntary nature was recognized; but the first attempt at "coercion" drove most of them into secession. Their governors refused to obey the call for troops, summoned their legislatures in special session, and thus obtained the State Conventions which the legislatures had hitherto refused to authorize. Ordinances of secession were thus passed, 88 to 55, by the Virginia Convention, April 17, which had hitherto refused to secede; by the Arkansas Convention, May 6, 69 to 1; and by the North Carolina Convention, May 21; and all these conventions proceeded to ratify the provisional constitution and enter the Confederate States. The Virginia Convention was embarrassed by a popular majority of about 50,000, directing any ordinance of secession to be first submitted to popular vote. The convention, therefore, took the extraordinary course of concluding a "military league" with the Confederate States, April 25, thus allowing Confederate troops to swarm over the State, so that the "popular vote" in June became a mere farce. The Tennessee politicians were swift and more radical in following the Virginia device. The legislature itself formed the military league and prepared the ordinance, May 7, which was similarly ratified by popular vote, June 8. In Missouri the State government was secessionist, but the State Convention adjourned in March, refusing to secede. Before it reassembled, July 22, the State government had undertaken war on its own account, had been beaten, and had been driven out of the State. The Convention proceeded to vacate their offices and order a new election, which gave the Unionists control of the State; but the fragments of the old legislature undertook to pass an ordinance of secession, of its own power, and enter the Confederate States. In Kentucky the governor at first attempted to exclude both Federal and Confederate troops from the State; but the Union majority of the State, though always pro-slavery, fought secession with uncommon vigor, and never lost their undisputed control of the State legislature and government. Nevertheless, representatives from particular districts in Kentucky, or from Kentucky regiments, were admitted to the Confederate Congress. In Maryland the whole burden of resistance to secession was thrown on the shoulders of one man, Governor Hicks. The secession of this State in Feb., 1861, would have enormously increased the chances of foreign recognition and the dangers of the situation, by installing the Confederate government at Washington as the *de facto* successor of the United States government. Governor Hicks held the key; no convention could be called but by the legislature, and the legislature was not in session and could only be summoned by the governor. In spite of an attempt to organize a revolutionary convention in February and March, like that of Texas, he staved off the meeting of

the legislature until April 26, yielding then on finding that the legislature was preparing to meet without his summons, but using his prerogative to call the meeting at Frederick, in the Unionist district of the State. By this time Maryland had become a highway for Federal troops in motion toward Washington, and the danger of a revolutionary secession was over. In Delaware there never was any danger; in January the legislature had almost unanimously declared its "unqualified disapproval" of secession and the organization of a Confederate government. Before the meeting of Congress, July 4, 1861, the lines were fairly drawn. The northern boundary of the Confederacy was a line following the Potomac to its head-waters; thence S. W. to Tennessee; thence W. along the northern boundary of Tennessee and Arkansas; and thence S. W. through Indian Territory and along the western boundary of Texas to the Rio Grande. Some forty counties of Western Virginia, repudiating the ordinance of secession, held a State Convention at Wheeling, June 11, vacated the positions of State officers, and provided for an election of a new State legislature. This body gave the formal consent required by the Constitution to the erection of a new State within the limits of Virginia; and the new State of West Virginia was admitted to the Union, June 19, 1863. To counterbalance this loss, the Confederacy had treaties with most of the tribes of the Indian Territory, from which it drew recruits, and had possession of the southern tier of counties in Kentucky and Missouri, to which States it had an inchoate claim, to be perfected, it hoped, at the conclusion of a treaty of peace.

The provisional constitution was to continue in force one year. The permanent constitution was adopted by the provisional Congress, March 11, 1861, and was ratified by the State Conventions, or legislatures, before April 29. It followed the Constitution of the United States very closely, even in form, the following being the most important changes: It formally recognized State sovereignty; used the words "slaves" and "slavery" instead of the various euphemisms of the Constitution; gave the cabinet seats without votes, in Congress; lengthened the term of the President and Vice-President to six years, and forbade the re-election of the former; allowed the President to veto single sections in appropriation bills; forbade Congress to vote money for internal improvements, to pass protective tariffs, or to grant bounties; forbade removals from office, except for dishonesty, incapacity, inefficiency, misconduct, or neglect of duty, the reasons to be reported to the Senate; and directed Congress to recognize and protect in the Territories "the institution of negro slavery as it now exists in the Confederate States." The first Presidential and Congressional election under this Constitution took place Nov. 6, 1861. Davis and Stephens were chosen to the respective offices then held by them, and were inaugurated Feb. 22, 1862, to serve until 1868. At the same time the provisional Congress of one house gave way to the permanent Congress, in which thirteen States were represented, Stephens presiding over the Senate, and Thomas S. Bocock, of Virginia, over the House. The Senate numbered 26, two from each State, the most distinguished members being C. C. Clay and W. L. Yancey, of Alabama; B. H. Hill and H. V. Johnson, of Georgia; A. G. Brown, of Mississippi; Wm. A. Graham, of North Carolina; R. W. Barnwell and James L. Orr, of South Carolina; Wm. S. Oldham and Lewis T. Wigfall, of Texas; and R. M. T. Hunter and Allen T. Caperton, of Virginia. A full House consisted of 106 members, as follows: Alabama, 9; Arkansas, 4; Florida, 2; Georgia, 10; Kentucky, 12; Louisiana, 6; Mississippi, 7; Missouri, 7; North Carolina, 10; South Carolina, 6; Tennessee, 11; Texas, 6; and Virginia, 16. The delegations from Kentucky and Missouri were fictitious and only submitted to as a basis for ulterior claims, but they disappeared in 1864. The sessions of Congress were as follows: *Provisional Congress*: (1) Feb. 4 to March 16, 1861; (2) April 29 to May 22, 1861; (3) July 20 to Aug. 22, 1861; (4) Nov. 18, 1861, to Feb. 17, 1862. *First Congress*: (1) Feb. 18 to April 21, 1862; (2) Aug. 12 to Oct. 13, 1862; (3) Jan. 12 to May 8, 1863; (4) Dec. 7, 1863, to Feb. 18, 1864. *Second Congress*: (1) May 2 to June 15, 1864; (2) Nov. 7, 1864, to March 18, 1865. The cabinets, provisional and permanent, were as follows, the dates being those of appointment: *State Department*—Robert Toombs, Ga., Feb. 21, 1861; R. M. T. Hunter, Va., July 30, 1861; Judah P. Benjamin,

La., Feb. 7, 1862. *Treasury Department*—Charles G. Memminger, S. C., Feb. 21, 1861; James I. Trenholm, S. C., June 13, 1864. *War Department*—L. P. Walker, Miss., Feb. 21, 1861; Judah P. Benjamin, La., Nov. 10, 1861; James A. Seddon, Va., March 22, 1862; John C. Breckinridge, Ky., Feb. 15, 1865. *Navy Department*—Stephen R. Mallory, Fla., March 4, 1861. *Attorney-General*—Judah P. Benjamin, La., Feb. 21, 1861; Thomas H. Watts, Ala., Sept. 10, 1861; George Davis, N. C., Nov. 10, 1863. *Postmaster-General*—Henry J. Ellet, Miss., Feb. 21, 1861; John H. Reagan, Texas, March 6, 1861.

This article does not have to do with the military or naval history of the Confederate States, and from any other point of view its career is but a sorry picture. Its political history is almost an absolute blank, its diplomatic history a series of failures, and its financial history a series of blunders. Such a record demands explanation, and most Southern and Northern writers have found it in the wrongheadedness, meddlesome inefficiency, and obstinate favoritism of President Davis. Some Southerners have not scrupled to express a willingness to enter the conflict again if the Presidents could be exchanged. It must be admitted that Davis' errors were unpardonable. And yet it is hard to trace all the civil misfortunes of the war to him as their only source. A more silent but constantly working influence seems to have been the system of negro slavery and its impression on the political life of the people. For their ninety years of State existence, all their civil honors, all their experience in legislation and in practical government, had been reserved to the single class of slaveholders; and if by chance there was an exception, the first use of his newly acquired wealth was to enroll himself in the dominant caste by the purchase of slaves. No good authority puts the number of slaveholders in 1860 at more than 300,000. What would be the political condition of any people numbering 5,000,000, if its whole civil experience was confined to a fraction of 300,000 of its number, and each one of that number consumed with a desire for command in the army? When the President himself rated his own office far below the real object of his wishes, the command of the Confederate armies, what was to be looked for from subordinates? With some exceptions Congress, the State legislatures, and civil administration generally, became a refuge for incompetent or unworthy men, and the armies in the field were left without any reliable support. From the inception of the provisional government the sittings of Congress were almost continuously secret. Its early decision to exclude from membership those delegates who should accept military commissions deprived it permanently of the services of the ablest men of the Confederacy. In a legislation of second-rate men, the presence of the cabinet was a steady strain upon its judgment, and Congress became a bureau for registering laws prepared by the executive. There is hardly an instance of independent action by Congress until its quarrel with Davis in the closing hours of the war; and then its action was undignified, unpractical, and confined to an unconstitutional substitution of Lee for Davis as commander-in-chief. Public opinion had very little weight with Congress or the President at any time. The suspension of the *habeas corpus*, the extension of the conscription system, so that in February, 1864, it embraced in its terms every white male between the ages of 17 and 55, placed every voter in the country at the mercy of the President, or of subordinates controlled by him, and made the government an executive despotism. It would probably be unfair to look for any lines of political division in a people engaged in what soon came to be a confessed attempt at revolution; but there is a striking contrast between the political life of the two opposing sections during the war. In the North two great political parties continued their ancestral struggle with unremitting eagerness, even down to the smallest village elections; the strongest condemnation of the war, though often suppressed, was still more often passed over unheeded;

the opposition in Congress was always strong; and Congress itself, through its committees, asserted successfully a control over the conduct of the war, which was often troublesome, but always characteristic. In the South, outside of its armies, there was a silence as of death; its Congress was a conclave of "Ja Herrs," with hardly a thought of interference with the President's control of the war; there was no political struggle, excepting a contested election in North Carolina in 1863, and a symptom of another in Georgia in 1864; and there never was any open opposition to the war down to the instant when the veil was finally removed, and it was found that the popular unanimity was fallacious, and that the people were in reality thoroughly tired of the war. For such a contrast no one man can be responsible; a clearer explanation seems to be found in the different social systems of the two sections. For the misfortunes of their diplomatic and financial history, on the other hand, the circumstances of the Confederate States seem to have been mainly responsible. In both cases, however, the relentless blockade established by the Federal government was a powerful factor in determining the result, and the possibility of the blockade and its results was mainly due to the same difference of social systems. In the South commerce and manufactures had been practically impossible with involuntary labor, for the inevitable waste of such a system cut off the small margin of profit. There was therefore no ability to resist the blockade, and, under the blockade, no resource for the government but a grinding system of direct taxation. Both sections appealed to the help of issues of paper money. But in the North the customs revenue was enough to ensure the interest of the public debt, and the whole was supplemented by a high internal revenue tax, mainly on manufactures, which has produced nearly \$3,000,000,000 up to 1882; and gold was thus prevented from rising above 300. In the South customs and internal revenue were equally unavailable, and the paper money had no basis except receipts in cotton, which could hardly be sold; gold therefore rose to 120 in December, 1861, to 300 in December, 1862, to 1900 in December, 1863, to 5000 in December, 1864, and to 6000 in March, 1865, when the paper money had become practically worthless. During this depreciation the financial history of the Confederate States is mainly a series of efforts, by taxation in kind, acts to regulate the prices of produce, and kindred expedients, to delay or evade a process which hardly any statesmanship could have delayed or evaded. Before the spring of 1864 the financial system of the Confederate States was confessedly a chaos; and after that point it is perfectly true that the Confederate armies "supported the rebellion on their bayonets" until April, 1865, with hardly the semblance of efficient support from the civil service. Early in March, 1861, commissioners were sent to the Federal government to negotiate for the transfer of property to the Confederate States, and the peaceful settlement of a separation. They were finally refused any official hearing. A commission of three, Yancey, Mann, and Rost, was also appointed, which was to seek recognition from Great Britain, France, Russia, and Belgium; but the commission was found to be much inferior in efficiency to single ambassadors to individual courts. Such ambassadors, J. M. Mason and John Slidell, were appointed to Great Britain and France respectively in the autumn of 1861, and were taken out of the British mail steamer *Trent*, Nov. 8, while she was on her way from Havana to St. Thomas, by the United States steamer *San Jacinto*. The United States had always protested against any such practice of search and seizure by belligerent vessels in the case of neutrals, and had gone to war with Great Britain in 1812 mainly on that issue. The Federal government was therefore compelled by its own precedents to disavow the seizure and surrender the captives. The disappearance of this speck of war between the United States and

Great Britain neutralized the mission of the ambassadors, though the danger of foreign intervention never wholly disappeared until the idea of intervention had been made odious by the beginning of the emancipation system in September, 1862, and dangerous by the turning of the tide against the Confederacy in the following July. But in the course of the struggle there was a narrow escape from war with Great Britain on another question. The first few Confederate privateers had gone to sea from Southern ports, and had not been very successful. British shipyards were at once made use of by Confederate agents. In March, 1862, the *Oreto* (afterwards the *Florida*) put to sea; in July the *Alabama* followed her; and in April, 1863, and September, 1864, the *Georgia* and *Shenandoah* gained the ocean. All these were built, equipped, and manned by British subjects, and their escape was ascribed by her majesty's government to defects in the neutrality laws. This excuse the United States refused to admit, holding that a neutral nation was bound to have efficient neutrality laws; and a mass of grievances, known in the aggregate as the "Alabama Claims," was gradually made up. Early in 1863 a far stronger case came up. It was found that two rams were building at the Laird ship-yard in Liverpool for the purpose of breaking the blockade; while, in the parallel contemporary case of the *Alexandra*, the Court of Exchequer decided that, under the foreign enlistment act, the selling of a vessel to a belligerent was as proper as the selling of arms. Diplomatic relations were at once tightly strained in appearance. The President informed his representative in Great Britain that, if the law of the Court of Exchequer should be sustained, he would "be left to understand that there is no law in Great Britain which will be effective to preserve mutual relations of forbearance." Earl Russell in Parliament declared, for his government, that the Liverpool builders had "done everything in their power, by fitting out ships, by engaging in contracts for supplying vessels of war to the other belligerent, to give to the United States a just cause of war against this country;" and the calamity of the American merchant marine, under privateer attacks, was a pregnant warning of the certain results of such a war upon British commerce. The whole force of the government was thrown against the builders, who were at last induced, early in 1864, to sell the rams to the British government. The mass of claims against Great Britain, for her lack of "due diligence" in maintaining neutrality, were submitted to arbitration by the treaty of Washington, May 8, 1871; and the arbitrators, sitting at Geneva, awarded a gross sum of \$15,500,000 as damages to be paid by Great Britain, Sept. 14, 1872. (See ALABAMA CLAIMS.)

A civil, diplomatic, and financial history of the Confederate States by a Southern authority, and free from feeling, would be most useful and valuable; but it has yet to be written. The nearest approach to it is A. H. Stephens' *Historical View of the War Between the States*; but this is devoted mainly to the preliminary constitutional questions, and leaves the Confederate History almost untouched. Much may be gained from Pollard's unmethodical *Secret History of the Confederacy*, and more from Jones' *Rebel War Clerk's Diary*, and the collection known as *The Richmond Examiner During the War*. Beyond these sources of information there is hardly anything available. Jefferson Davis' *Rise and Fall of the Confederate States* is almost entirely an apology for the life of its author; and the Confederate public documents are not collected, except the *Statutes at Large*. See also Draper's *History of the American Civil War*, which gives details of secession in the border States; Botts' *Great Rebellion*; Bartlett's *Bibliography of the Rebellion*; McPherson's *Political History of the Rebellion*; Moore's *Rebellion Record*; Buchanan's *Administration*; Cox's *Eight Years in Congress* (for the opposition there); Sterne's *Constitutional History*; Hurd's *Theory of our National Existence*; Spaulding's *Legal Tender Paper Money*; Schuckers' *Life of Chase*; Reports of U.S. Secretaries of the Treasury; *Diplomatic Correspondence, 1861-72*; Cushing's *Treaty of Washington*; *Case of the United States*; *Case and Counter-Case of Great Britain*. (A. J.)

CONFEDERATION, ARTICLES OF. See CONGRESS OF THE UNITED STATES and CONSTITUTION OF THE UNITED STATES.

CONFESSION, in law, a voluntary declaration made by a person who has committed a crime or misdemeanor of the agency or participation which he had in the same.

Confessions are either judicial or extra-judicial. A judicial confession is one made before a magistrate or in court in due course of judicial proceedings instituted against the person confessing in order to convict him of the crime. All judicial confessions are conclusive as against the parties making them. An extra-judicial confession is one not thus made before a court or magistrate, is not necessarily conclusive as against the party making it, and must be proved on the trial like any other fact in the case.

Confessions may in certain cases be inferred from silence or conduct, or they may be verbal or in writing. Where they are in writing they are invested with a peculiar weight, and almost invariably suffice to convict the prisoner.

In order to render an extra-judicial confession admissible in evidence it is absolutely essential that it should be in its nature voluntary. If, therefore, it has been extorted by threats or by authoritative statements that in case of confession the party shall be exempt from punishment, it is inadmissible. But a mere adjuration to speak the truth or advice to do so, the mere holding out of an expectation of compromise or assurance of secrecy as to the facts disclosed, or the mere fact that the confession was made under oath, will not render it inadmissible. Neither will the fact of its having been made to a person in authority necessarily exclude it. All these circumstances may, however, when taken in connection with others, go to show that the confession was made under some duress or restraint; and where such is the case it cannot of course be received in evidence. It is for the court in every case, and not for the jury, to say whether a confession is or is not voluntary.

Where a confession has once been obtained by means of hope or fear, confessions subsequently made may be presumed to come from the same motive, and are therefore inadmissible, even though no improper influence in obtaining them be shown. But if it should clearly appear that the original influence has ceased to operate the confessions are admissible. Although a confession may not be receivable in evidence because not voluntary in its nature, yet if it be attended by extraneous facts which show it to be true, such facts, together with the confession, are admissible. Thus, where a person, influenced by threats, confesses the commission of a murder and designates the place where the dead body has been concealed, and subsequently the body is found in the place indicated, this confession, though not voluntary in its nature, is clearly admissible, together with proof of the finding of the body.

No part of a confession will be received in evidence. The whole must be detailed as it was actually made. Where a confession has been duly made before a magistrate, committed to writing, and signed and sworn to by the party making it, it is the better opinion that no parol evidence as to that confession can be received. If, however, there be any informality about the written confession, such parol evidence is admissible.

A confession can only be used as evidence against a party making it, unless, indeed, the crime in question has been committed by a conspiracy or combination of persons. Where this is the case, and the fact of the conspiracy is first clearly proved, the confession of any one of the conspirators is admissible in evidence against the rest of them. (L. L., JR.)

CONFISCATION denotes the taking of private property by the government or State by way of penalty; the seizure of property as forfeited unto the common treasury. The word is derived from the Latin *fiscus*, which, meaning originally a basket for holding money, came to be used especially for the imperial or

common treasury. In the past the goods of felons were almost always forfeited to the crown by their crime, and the State may therefore be said to have confiscated them. In cases of war the confiscation of the property of the citizens or subjects of the hostile power, wherever found, has been very common; and this has been the case as well with the property of enemies found within the State's limits at the declaration of war as with property subsequently captured on land or at sea by offensive war. It applied moreover to all classes of property—real estate, personal chattels, and mere debts. And it was formerly the law that the mere declaration of war brought about the confiscation; no special act or proclamation was necessary. The opinion of the best authorities, however, and the sentiment of modern times, tends strongly against the right or at least against its exercise, and in favor of the protection of the individual property even of enemies; and it is probable that the mere declaration of war without a special act declaring confiscation would now in no case be held to work confiscation. This modern opinion grows out of the general tendency of the day to mitigate the evils of war, and it is argued that, as the citizens of the hostile State came openly and without objection into the country for a lawful purpose, there was an implied permission to do so, and that they should, in case war arises, be allowed a reasonable time in which to remove themselves and their property from the country. This feeling is also exemplified in the fact that treaties very frequently contain provisions securing mutually such rights to the persons of the respective nations who may be in the other nation at the breaking out of war. Despite the feeling, however, the practice of nations is by no means always in accordance therewith. In America, as early as the war of 1812, the right of Congress to pass such acts of confiscation was expressly recognized by the Supreme Court of the United States, though it was also held that, as no act of Congress had actually declared enemies' goods confiscated, the confiscation which had in that case been attempted by the official act of the United States District Attorney was not valid. At the breaking out of the Mexican war the United States generals were instructed not to interfere with the enemy's private property, except by purchase at fair rates; and during the whole course of the war much respect was shown to private property, although customs duties were levied for the use of the United States in ports occupied by our troops. The right to make levies upon the duly constituted authorities for sums to be used for the maintenance of the invading army seems to be generally recognized as the right of a conqueror. During the late civil war in America, acts of confiscation were passed by both sides. The acts of the Confederate Congress have been held by the Supreme Court of the United States to be utterly void, and that therefore the title of the prior owner was not diverted thereby. Such acts confiscated mere debts as well as personal property; in the case of debts, the debtor paid his debt to the State and received an acquittance which, it was enacted, should be a full and complete defence to any suit for the debt. Acts of confiscation were also passed in the North during the late war by Congress; and cotton was constantly seized and appropriated to the use of the United States; both these proceedings have been held by the Supreme Court of the United States to be a valid exercise of the powers of the Federal government. It seems to be the case that, despite the eloquent arguments against confiscation during times of peace, most nations, during the heat and passion of war, forget their peace-utterances and employ confiscation as one means of aiding themselves and injuring the enemy; and in our Mexican war at least it may be observed that the right of private property was less regarded as the war went on and its needs and the passions engendered by it increased. Privateering and the general liability of private property at sea to capture are subjects of a

nature akin to what precedes, but not to be fully gone into here: it may be stated, however, that the exemption of such property from capture is further from recognition than is that of private property on land.

(W. M. M.)

CONFLICT OF LAWS. See **INTERNATIONAL LAW, PRIVATE.**

CONGREGATIONALISM. American Congregationalism is in part exotic and in part indigenous. The Leyden-Plymouth Church brought it hither from John Robinson, who had, under God, received it mainly from Robert Browne through the modifying hands of Henry Barrowe. Browne interpreted the Scriptures as teaching, and implying, a polity in which, as vicegerents of Christ, believers govern themselves in, and as, the local church. This, although theoretically a Christocracy, became practically a democracy. Alarmed, as it would seem, by the anarchic tendencies which the theory developed in poor Browne's slowly and ill-cultured company, Barrowe conceived that a wiser development of the same polity would be that the general membership elect the eldership "of wisdom and judgment endued with the Spirit of God," and then submit to its governance. But this Presbyterianized their Congregationalism to that degree that it was neither the aristocratic former nor the democratic latter—while less the latter than the former. Robinson reduced this incongruity to its minimum by having but a single ruling officer, with a correspondent exaltation of the practical efficiency of the entire body in the control of its own affairs; so that the Mayflower Church, in point of fact, governed itself under the wise advice of its elder.

The Salem colonists nine years later came over as Nonconformists, not intending to become Separatists. Yet when this wilderness was reached and practical questions pressed, and the impulse of English feeling had grown weaker by three thousand miles of distance, they saw no open way of carrying on their affairs of religion which promised so well as to adopt the Mayflower system; and so they covenanted together into an Independent Church, which they made Congregational by taking the right hand of fellowship from Governor Bradford and the other Plymouth delegates. When, in the next year, Winthrop and his company were leaving Fatherland, they took pains to bid farewell to the Church of England as their "deare mother," and to beg her faithful remembrance as "a Church springing out of her owne bowels." Yet a like stress of combined opportunity and necessity to that which had swayed Endicott's company, soon drifted them into the same current, until Richard Mather and John Cotton, Thomas Hooker and John Davenport, reasoned out in all its minute particulars—which John Robinson had not been spared to do—the New England way; as a name for which, distinguishing it on the one side from the violent and divisive Separatists, and on the other from the National Church plan, Mr. Cotton found "none fitter" than to call it "Congregationall." Barrowe's dread of democracy—which was, in fact, a dread of the age—with that Presbyterian ruling eldership which had grown out of it, remained, however, upon the system still, and the elders loved to have it so. Nor was it until the days of John Wise, and subsequently of Nathaniel Emmons—when the spirit of the Revolution infused the American air—that the aristocratic element, which for more than a hundred years had weakened and confused the New England Congregationalism, was eliminated, and the system settled squarely down upon the solid and self-consistent basis of that democratic principle which recognizes not only every Church as, under Christ, the peer of every other, and supreme over its own affairs, but every covenanted believer as, with his fellows, the equal sharer of all rights and the equal bearer of all burdens, led by officers chosen from and ordained by themselves.

The American Congregationalism of the present century, the outgrowth of this past, recognizes the right

and duty of believers in any locality, who may both wisely and conveniently meet, worship, and work together, to incorporate themselves on confession of faith, and by mutual covenant, as a church; which is made Congregational by the advising, consenting, and recognizing action of the Congregational churches of the neighborhood, publicly admitting it to their fraternity. Each is officered by a pastor and deacons, having also a general committee to aid in laying out and making efficient its work. Each maintains Sabbath and other religious services; through Sunday-school and suitable social evangelistic endeavors, labors to its best ability for the religious awakening and instruction of the entire community in which it is organized; and by the hands of the American Home Missionary Society, the American Missionary Association, the American Board of Commissioners for Foreign Missions, and kindred agencies, seeks at the same time to do its utmost toward the education and Christianization of our own land and the conversion of the world.

As already suggested, American Congregationalism is distinguished from Independency by adding to the principle of the self-completeness, under the Great Head, of the local church, the compensating principle that since all local churches belong to the one family of the Lord, they necessarily owe each other sisterly love and service. The exercise of this takes the name of the communion of the churches. It is commonly manifested through reciprocal recognition, the exchange of members, and the union of labors. Extraordinarily, it has three functions—viz. (1) welcome, on due warrant, of a new church to the fraternity; (2) advice to a sister church asking for it when in need of light or peace, or both; and (3) if a sister church have been overtaken in a fault, the endeavor to restore it in the spirit of meekness, or, if that effort fail, the final withdrawal of the extended fellowship. And inasmuch as neighbor churches can neither conveniently nor wisely discharge these duties of extraordinary fellowship collectively, some of their officers and members are delegated for that purpose, which delegated assemblies are called ecclesiastical councils. It is the belief of American Congregationalists that scriptural warrant is found for such procedure in that action of the early churches which is recorded in Acts xv. 1-31, as well as in the less direct witness of other passages. The results of such councils, while to be received with an antecedent probability that they will convey the will of God upon the point at issue, have yet neither more nor other than a purely spiritual force; the judgment of the wise and devout Amos being universally accepted as voicing the truth: *ita ut tantum valeat decretum concilii, quantum valet ejus ratio*. If a church have cut off a member, as he feels unjustly, and he ask mutual submission to the advice of a council, and be unreasonably refused, he acquires the right to call one for himself, on whose advice sister churches may orderly restore him to their fellowship. Such is called an *ex-parte* council. Councils are unknown to English Congregationalism. But American Congregationalists regard them as of great value in conserving and making practical and efficient ecclesiastical brotherhood in the departments above named. And it is not usual among them to regard as normally within Congregational fellowship any church or any pastor not formally welcomed thereto by council. Nor do they hold that an ex-pastor is in a condition properly to become a candidate for another pastorate unless he have been dismissed from his previous relation by the advice of a council of neighbor churches, and with its favorable testimony to his good character and his doctrinal and other fitness for continued labor.

It is usual for the Congregational ministers of counties, or equivalent divisions of territory, to meet together from two to four times a year in what are called associations, which are purely ministerial clubs for personal and professional intercourse and culture, yet which, in two respects, have acquired a semi-official relation before the churches. It is common for the candidate for the

ministry to offer himself to the examination of some such association for the judgment of its members, as experts, upon his literary, doctrinal, and spiritual qualifications, and only on their favorable certificate to be welcomed to vacant pulpits. On the other hand, the custom extensively prevails of considering as authentically in good standing in the Congregational ministry only such ministers as maintain unblemished membership in some one of these associations, and are so reported in their annual returns. These several district associations are affiliated in State general bodies meeting once a year.

As pastors are thus in neighborly union through associations, so their churches are joined together in district conferences, usually assembling, by pastors and as many delegates as may be convenient, twice a year for purposes of acquaintance, discussion, counsel, prayer, and praise. These district bodies are also aggregated by delegation in one annual State conference, unless included by joint constitution in the annual gathering of the associations just referred to.

It is a fundamental principle of all these delegated bodies that there shall be no attempt at interference on their part in the way of control of the local churches; each one of which, while open to advice, and liable, on cause, to disfellowship, is yet, under Christ, supreme over its own affairs.

The Congregational churches of the United States have been, since 1871, united in a NATIONAL COUNCIL, which assembles once in three years. It is made up by delegation directly from the local churches of the whole land—on the basis of one delegate from every ten churches, and one additional for every fraction of ten over one half; with one delegate also from each State conference, and one for each 10,000 communicants represented in that body, and one for a major fraction thereof; it being intended that such delegates be chosen in equal proportion from ministers and laymen. It met at Oberlin, O., Nov. 15, 1871; at New Haven, Conn., Sept. 30, 1874; at Detroit, Mich., Oct. 17, 1877, and at St. Louis, Mo., Nov. 11, 1880.

The founders of New England Congregationalism were Calvinists, and the churches in 1648, and again in 1680, when by delegation assembled at Cambridge, adopted the Westminster Confession (as slightly modified by the Savoy Synod) as "very Holy, Orthodox, and Judicious." This vote remained unmodified until the Boston council of 1865, in which 2723 Congregational churches in 25 States and Territories, embracing 263,296 members and speaking by the voice of 516 delegates, by unanimous vote substantially reaffirmed it. When, six years after (1871), the National Council was formed at Oberlin, its fundamental constitution included the following doctrinal statement—viz.:

"They [the Congregational churches of the United States, by elders and messengers assembled] agree in belief that the Holy Scriptures are the sufficient and only infallible rule of religious faith and practice; their interpretation thereof being in substantial accordance with the great doctrines of the Christian faith, commonly called evangelical, held in our churches from the early times, and sufficiently set forth by former General Councils." Construed strictly by its concluding words, this pledges American Congregationalism still unfalteringly to the old-time Calvinism. Construed more largely by the clause preceding the last, it releases it to a broader fellowship with all evangelical believers; so that since that date the general understanding has been that evangelical Arminians may have ecclesiastical and ministerial standing in the body, always provided that *the essentials* of the ancient Orthodoxy receive no detriment. The Congregational churches have not reached this doctrinal position without debate and internal conflict. Not all of the children of the first settlers, nor of those immigrants who with them constituted the second English generation on these shores, became church-members. By consequence, by the standing rule, their children could not be baptized. And so it came about

that many who were to compose the third generation were growing up without the seal of the covenant, and so outside of what Cotton Mather called "the Ecclesiastical Inspection which is to accompany that Baptism;" which was the greater grief to the spiritual leaders because the origin and object of the plantation had been so largely religious. Special pains were taken to persuade these delinquents toward church membership, but, while sober in conversation and correct in doctrine, they mostly failed to "come up to that experimental Account of their own Regeneration, which would sufficiently embolden their Access to the other Sacrament." This—not without strong opposition—resulted, on advice of a great council in 1662, in the expedient of the Halfway Covenant, by which well-instructed persons, not scandalous in life, were permitted a semi-church-membership—enough to procure baptism for their children, but not enough to entitle themselves to partake of the Lord's Supper. It is not to be wondered at that, aided by all the various temptations incident to new settlements, and the constant influx and growth of novel ideas on all subjects, this arrangement chilled, depleted, and greatly damaged the churches, bringing on a condition of religious coldness and formality, reaction from which had much to do with the "Great Awakening" of 1734-42, in which Whitefield bore so conspicuous a part. Soon after this latter date, partly in consequence of repugnances toward the old doctrines awakened in these heats of religious discussion, and partly through exotic influence, the germs of the Unitarian controversy began to develop themselves. The political excitements of the Revolution postponed the outbreak, but soon after the beginning of the present century a conflict of opinion arose which resulted in the separation of a portion of the Congregational churches, who had come to reject the doctrine of the divinity of Christ, from those of the sisterhood who retained that faith. When this began there were 361 Congregational churches in Massachusetts. As its result, 96 became Unitarian, with 30 parishes whose affiliated churches did not follow them, leaving 265. So great, however, was the growth stimulated by this controversy that when it was fairly ended—leaving out such as had become merged or extinct—there were found to be 544 Congregational churches in Massachusetts, of which 135 were Unitarian and 409 Trinitarian. Among the former were numbered the first churches of Plymouth, Salem, Boston, and some other of the ancient towns.

Since that date differences of opinion in the Congregational body have mainly respected the philosophy of explanation of the accepted doctrines of faith, seeking their most rational form and defence. Edwards, Hopkins, Bellamy, Emmons, and Taylor endeavored, in turn, some better than previous adjustment of the theories of divine and human efficiency, with cognate inferences. Later, Dr. Bushnell undertook a restatement of the Atonement, which, without repudiating the ancient propitiatory view, laid special emphasis upon the value of its moral influence over men. Later still, differences of judgment have arisen as to the subject of eschatology.

Should a Congregational church fall into denial of the evangelical faith and lapse into Unitarianism, Universalism, Agnosticism, or kindred error, or wilfully tolerate and uphold notorious scandals, any sister church aggrieved thereby may, in a Christian spirit, admonish that church and labor for its restoration. Should this prove without effect, the admonishing church may orderly assemble a council to advise concerning the acts and administrations of the offending body. Finding ground for so doing, this council may fitly admonish the same. This proving ineffectual, such council may advise the Congregational fellowship of churches to withdraw from the erring sister all acts of communion until reformation shall appear. Affirmative response to this advice puts the offending body out of the fellowship of all churches so acting, and, by inference, of all silent churches; and so—by reversal of the process by

which it was first received to the denomination—the lapsed company ceases to be a Congregational church. In the case of gross heresy or evil life in a Congregational minister, the church to which he belongs may begin to deal with him for the same as if he were merely a private member until it reaches full conviction of his guilt. Then, in virtue of the involved fellowship of the churches which helped to make him a minister, instead of proceeding to the final issue, it should call a council and submit the whole case to its advice—should he decline to join in a mutual council for the purpose, calling one *ex-parte*. If satisfied that there is need for such procedure, this council may advise the church to proceed to deposition and excommunication, and may publicly withdraw that fellowship of the churches by which he was admitted to the Congregational ministry. If the church to which such an offender belong cannot or will not take the action here named, any Congregational church may take it; scrupulous regard being had to equity of procedure.

Before A. D. 1800, American Congregationalism had scarcely extended out of New England; Congregationalists emigrating to newer portions of the country, with a willingness more exhibiting their catholicity than their intelligent fealty to the faith of their fathers, almost uniformly became Presbyterians. This took place to such extent that in the Albany Convention of 1852 it was estimated that there were then in the Middle States and at the West at least 2000 Presbyterian churches which should naturally have been Congregational. Besides this, the anti-slavery sentiments held by great numbers of Congregationalists, and avowed by many of their public bodies, for a long time seriously interfered with the progress of the denomination at the South. Since the war of the Rebellion all this is changed, and the polity has extended itself rapidly over territory where it had been before unknown. The *Year-Book* for 1882 contains the returns from 3804 churches, including 381,697 members, situated in 45 States and Territories. In the six New England States are 1475 churches, with 211,775 members. In the four middle States—Delaware alone having none—are 305 churches, with 40,543 members. In the fourteen Southern States are 86 churches, with 5651 members. In the ten Western States are 1719 churches, with 113,805 members. In the four Pacific States are 128 churches, with 7184 members. In the ten Territories—Idaho and Montana having none—are 91 churches, with 2739 members.

It will be seen that—including one Middle State and two Territories in which Congregationalism has not yet taken root—it now has, outside of its original New England home, an average of more than 55 churches in every State and Territory of the nation; which, since it is only sixteen years since it crossed the line between the old free and slave States, is a rapid growth.

The Congregationalists of the United States perform their various missionary work, not, like most of their sister denominations of Christians, through ecclesiastical organizations, but by voluntary associations. There are eight such associations through which—while freely giving also through more general channels—they especially labor. These are as follows—viz.: (1) *The American Board of Commissioners for Foreign Missions*, founded in 1810. This now works 17 missions, having 814 stations, including 1717 laborers, of whom 414 are from this country. It has developed and now has care of 272 native churches—not including those of the Hawaiian Islands, which have graduated from its oversight—with 18,446 members. It manages also 51 institutions of a high grade in which are 1468 young men, and 36 in which are more than 1400 young women, besides 791 common schools in which are more than 30,000 pupils. Its total receipts for 1881 were \$691,245.16; its expenditures, \$693,304.45. A *Woman's Board of Missions* working in connection with this society has also 89 missionaries and 67 Bible-readers, and supports 28 boarding and high schools and five homes for higher education, all including over 1000 pu

pils, with 114 common schools attended by near 3000 children. Its receipts for 1881 were \$119,958.56. (2) *The American College and Education Society*, founded in 1816. This aids in the establishment of Christian colleges and in the education of young men for the ministry. It is now engaged in aiding in the founding of ten colleges, and is assisting in the support of 269 young men. Its receipts for 1881 were \$256,168.53. (3) *The American Home Missionary Society*, organized in 1826, intended to assist in the evangelization of our own country. During 1881 it helped to sustain 1032 missionaries, who preached regularly in 2653 stations, and organized 131 churches. Its receipts were \$290,953.72 in cash, and in supplies \$57,988—a total of \$348,942. A *Woman's Home Missionary Association* is also connected with this, whose receipts for 1881 were \$6402.15. (4) *The Congregational Publishing Society*, founded in 1832 for the work which its name suggests. Its total sales for 1881 were \$84,196.65, and its receipts from churches, etc., \$2657.68. (5) *The American Missionary Association*, established in 1846. It labors chiefly among the freedmen of the South and the Indians. It has under its care 82 churches, 54 institutions of education, 369 missionaries and teachers, 9108 students (of whom 104 are in theology, 20 in law, and 91 in a regular college course), while near 150,000 pupils are under the instruction of teachers which it has graduated, and 13,000 Indians are now under its care. Its receipts for 1881 were \$243,795.23. (6) *The American Congregational Union*, which was founded in 1853, and especially endeavors to aid needy Congregational churches in erecting houses of worship. Its receipts for 1881 were \$55,357.35, with which it gave assistance to 65 churches. (7) *The American Congregational Association*, also founded in 1853, largely to conserve and perpetuate the Congregational literature. It owns a fireproof building at the corner of Beacon and Somerset streets, Boston, and has a library of nearly 30,000 books and over 125,000 pamphlets. (8) *The New West Education Commission*, founded in 1879 to stimulate education on the frontier. It received about \$25,000 in 1881, and has under its charge 5 incorporated academies and 11 other schools, 31 teachers and more than 1000 pupils. There are seven theological seminaries which have been established and are sustained especially for the training of American Congregational ministers. These are: (1) *Andover*, Mass. (1808), having last year 6 professors, 9 lecturers, and 61 students; (2) *Bangor*, Me. (1816), having 4 professors, 1 lecturer, and 28 students; (3) *Theological Department of Yale College*, New Haven, Conn. (1822), having 5 professors, 7 lecturers, and 97 students; (4) *Hartford* (formerly East Windsor, Conn.) (1834), having 6 professors, 2 lecturers, and 30 students; (5) *Theological Department of Oberlin College*, O. (1835), having 4 professors, 1 lecturer, and 41 students; *Chicago*, Ill. (1858), having 5 professors, 2 lecturers, and 43 students; and the *Pacific*, at Oakland, Cal. (1869), which has 2 professors, 5 lecturers, and 9 students. These give a total, for the seven institutions, of 32 professors, 27 lecturers, and 309 students. (H. M. D.)

CONGO REGION. The basin of the Congo is second only to that of the Nile, among the rivers of Africa, and the courses of a great number of the affluents are as yet unexplored. Roughly, it may be said to extend from the basin of Lake Tchad upon the north almost to the Kalahara desert on the south, and to comprise almost the whole of equatorial Africa between the Nile and Zambezi basins and the Atlantic, excepting the comparatively small areas drained by such coast rivers as the Ogowé, Kuilu, etc. This vast area, actually unknown to Europeans till the journeys of Livingstone, Cameron, Stanley, and De Brazza, during the last few years, is inhabited by many millions of natives, and appears to offer considerable inducement to European colonization, as well as an outlet for European manufactures. The greater portion of this region is as yet unexplored, but from what is known it is evident that much of it is of unexampled fertility.

The equatorial forest region descends the main river as far south as the head of Stanley Pool, and the more mountainous district which intervenes between that point and the low strip of coast contains valleys rich in both animal and vegetable life.

Dapper's Map (1676) shows the Zaire or Congo as arising in an immense lake, extending from 5° to 12° N. lat., and from 46° to 49° 30' E. long.

The maps of Livingstone, Speke, and Grant, and others published before 1863, show Lake Tanganyika as separate from the Congo, which is, however, represented as a comparatively insignificant stream. The existence of that great northern curve which takes the main stream parallel with Lake Tanganyika till the equator is crossed, thence westward to about 2° N. lat. and 20° E. long., and thence southwestward to its mouth about 6° S. of the equator, was not suspected when these earlier maps were made, and even Cameron's map (1875) shows the Congo as passing almost directly across the continent from the point where that traveller reached its upper course, to its mouth.

It was Livingstone who first found the Lualaba, ultimately identified with the Congo, while Stanley, in 1876, as forcibly narrated by himself in the second volume of *The Dark Continent*, was the first white man to embark upon the Lualaba, and, undeterred by the dangers of the flood, and the still greater dangers from hostile savages who denied to the white man even the right to camp within their territory, to pursue his course until he reached the ocean.

Like the Nile, and, indeed, like many other African rivers, the Congo has its origin in a chain of lakes, and it is to the affluents of these lakes that we must look for the longest course of the Congo.

One of the principal of these lake tributaries is the Chambeze, which must not be confounded with the Zambezi. The Chambeze rises a little N. of about 10° S. lat. and 31° 40' E. long., and runs southwestward to Lake Bangweolo, or Bemba, a body of fresh water 3688 feet above the sea, occupying from east to west more than two degrees, and some seventy miles in width. From the northwestern extremity of this lake the Lualaba flows northward to Lake Moero, a smaller body of water, the centre of which is crossed by the parallel of 9° S. lat. From the northern end of this lake the great Lualaba or Congo flows northward, with a considerable inclination to the west.

Not far to the eastward of the Lualaba is a remarkably elongated narrow lake of fresh water, occupying a deep depression or fissure. This is Lake Tanganyika, 330 miles long, with a coast line of 900 miles, and as yet unfathomed. Its shores are the scene of some of Livingstone's later wanderings. Its proximity to the Lualaba suggested that probably its overflow reached that river, but the attempts of both Cameron and Stanley to find such an outlet were futile. Both of these explorers discovered an inlet or stream, the Lukuga, which seemed to have no decided current, but which appeared to be so closely connected with water-courses flowing westward that Stanley's conclusion is to the effect that "the ancient affluent is about to resume its old duties of conveying the surplus waters of the Tanganyika down into the valley of the Livingstone, and thence along its majestic, winding course to the Atlantic." The lake, according to both tradition and observation, had been steadily rising, and at the time of Stanley's visit in 1876 only a few inches of mud banks and a frail barrier of papyrus and reeds interposed a barrier to the exit of the waters of the lake.

Three years after Stanley's visit, on Christmas, 1879, Mr. Joseph Thomson reached the Lukuga, and states that when he viewed the noble stream moving westward on its way to the mighty Lualaba, or Livingstone, as Stanley named it, and thought of Stanley's straws thrown in to try to find a current, he could scarcely believe he was in the same spot.

Whether the overflow of Tanganyika is periodical,

or whether, as suggested by Stanley, a comparatively recent cataclysm united the northern end of the long depression to the southern, draining off its waters and thus for a long period reducing its level, it is impossible to say. At any rate the Lukuga is its natural outlet. It has since been ascertained that the level of the lake has been slightly reduced and the current of the Lukuga slackened. The Stanley Falls, seven successive cataracts, are ranged along the Livingstone from about 30' S. of the equator to 15' N. of it. The five upper ones occupy a length of about 15 miles as the crow flies, while the sixth stands some 30 miles lower down, and the seventh about 35 miles distant from the sixth. These cataracts, like those of the lower Congo, do not seem to be anything more than small descents, but between them the waters boil in a succession of rapids, and Stanley was compelled to leave the river. At the last cataract the river is about 1300 yards broad from bank to bank, but its course is divided by an islet 760 yards across, so that the broad stream is at the fall compressed to half its previous width, and rushes over with resistless force. The fall is only ten feet deep. The southern tributaries of the Congo, themselves mighty rivers, are as yet unexplored, though they have been crossed at various points by Cameron and others. Nearest to the Lualaba is the Luafuba or Kamorondo, whose headwaters, the Lufira, Lunfupa, and Luburi, rise near 12° S. lat. The Luafuba is indicated upon Stanley's map as entering the Lualaba a little south of the Lukuga from Lake Tanganyika. The great Lake Kassali, 1750 feet above the sea, lies on the course of the Luafuba.

West of the Luafuba lies the great river Lomame or Lumani, and still farther west flow the Lubi and the Lubilash, which unite in about 4° 30' S. lat. Still farther westward is the Muansangoma, and again west of this flows the great Kasai, which, with its tributaries, seems to be the most important affluent of the Congo. Between 6° 30' and 7° 30' S. lat. it is joined by the Chikapa, the Ruachim, the Chihumbe, and the Ruimbe, all from the south, the main stream flowing somewhat to the east. About 5° 30' the Lulua, flowing from the east, joins the Kasai. The Lulua is a large river, and receives the Luengo, Luebo, Luchach, Lubi, and other streams. It appears probable that the great Mobindu, which enters the Congo near the equator, and is marked upon Stanley's map as the Ikelemba, is the lower course of the Kasai.

The most westerly of the great southern tributaries is the Quango, which, rising at about 12° S. lat., flows almost due north to Lake Leopold II. Less appears to be known of the northern affluents of the Congo than of the southern. The Aruwimi, which enters north of the equator, appears to be one of the principal. Many geographers believe this stream to be identical with the Welle, a large river which has been met with farther to the north, but Dr. Junker believes that the Welle belongs to the basin of Lake Tchad, while the larger river Nepoko, which he has partially explored, and which flows among vast treeless swamps to the south of the Welle, is probably the same as the Aruwimi. The Alima and several other rivers of considerable size flow eastward into the Lower Congo, their head-waters penetrating nearly to those of the Ogové and other rivers flowing into the Atlantic.

The Lower Course of the Congo.—The Congo empties into the ocean by a single mouth, a fact which suggests that the outlet is comparatively new—that the river has not yet had time sufficient to form a delta like those of the Nile, Niger, and Zambezi. Some blind creeks have increased in length within the memory of European settlers on the Lower Congo, and some believe that eventually the river will force a way to the sea at Kabinda.

Near its mouth the Congo widens into a sort of lagoon where ships of the largest size can anchor within fifty yards of the shore. Between this and the sea stretches a strip of lowland through which the river

has broken, and here, on Banana Point, are the European factories, of which the Dutch is the largest. The lower course, to a little above Boma or Embomma, which, previous to the advent of Stanley, was the highest point colonized by Europeans, is swampy and unhealthy, but from Boma to Stanley Pool the river passes through a mountain region, and its course is broken by numerous rapids and falls of small elevation, rendering navigation difficult. In this mountain region the hills are devoid of forest, probably largely in consequence of the bush-fires which sweep over wide areas whenever there is a dry season. The valleys, however, both of the Congo and its tributaries, are filled with fine forest and abound in animal life.

The first settlement of the International Association is Vivi, 115 miles from the sea; 52 miles farther up is Isangila, and 80 miles beyond is Manyanga. A road has been constructed from Vivi to Isanghila, at which point water communication is continued to Manyanga. Between Manyanga and Leopoldville, the chief centre of the International Association, the course of the river is again obstructed by falls, but there is a road on each side, and at the village of Lutété, on the southern bank, the route to Leopoldville follows the old ivory route which, passing from the interior by Lutété, went thence to San Salvador, and terminated on the coast at Ambrizete. The lowest fall of the Lower Congo is a little above Vivi, while the highest are the Ntombo Mataka Falls, and the Father, Mother and Child near Leopoldville. This settlement is about 2 miles below Stanley Pool, which is a fine sheet of water 25 miles long by 16 wide, but is encumbered by many large islands, the largest 13 miles long. At the entrance of the pool is the low cliff called Calina Point, the fortification of which would close the Lower Congo effectively, and opposite to this point is the as yet purely native village of Mfwa or Brazzaville.

At the Pool the mountain region is left behind, and the river is navigable as far as the Stanley Falls, at the western extremity of the great bend in the Congo. The Upper Congo enters the Pool through a rather narrow passage, but widens above and appears to be obstructed with many islands. High-wooded hills fringe the western bank of the river. Msuata, one of the prettiest of Mr. Stanley's stations, is 110 miles from the pool, and is surrounded by friendly natives. Still higher up is the junction of the Wabuma, which flows from Lake Leopold II. and receives the Quango from Angola. After their junction the waters of these rivers remain distinct in color, the Wabuma indigo, the Quango muddy yellow.

The open district of stony hills and patches of forest in the valleys ends at Stanley Pool, the upper end of which is fairly in equatorial Africa, and has plants and animals that resemble more closely those of the distant Lake Tanganyika than those to be found at the first cataract below the pool.

Bólóbó is 79 geographical miles above Msuata; Lukolela is 92 miles farther, and the list of Stanley's principal stations is completed by Equator, 105 geographical miles beyond the last. In 1876 no European merchant had penetrated beyond Boma. In 1880 Stanley commenced his present work, and, without a single battle with the natives, has founded more than 21 stations, so that now the journey up the Congo, for 700 miles, from the ocean to Equator station, at the mouth of the Mobindu, can be traversed as safely as the Rhine. Stanley has recently discovered, north of Lake Leopold II., a lake called Mantumba, the most southern part of which is about 30 miles from the northern end of the former lake. The outlet of the Mantumba is 50 miles south of the equator, and the population upon its banks is extremely dense. The people upon the banks of the Mobindu, at the equator, are much more savage than those upon the Congo, and it will need time to render them amenable to civilizing influences. The peoples upon the Congo, on the contrary, seem to be traders by nature, and wel-

come the merchant as a man who comes to bring silver to them.

The falls and rapids between Leopoldville and Vivi are a serious obstacle to the opening up of the Congo basin to civilization, and in the hope of finding a better road to the coast Stanley has recently sent an expedition to the Kuilu, which enters the Atlantic Ocean north of the Congo mouth. This expedition was successful, and it appears evident that, if a railway is built, it must proceed along the valley of the Kuilu to some point above the rapids. Several stations have been founded on the Kuilu, among them Franktown, Baudouinville, and Rudolfstadt, as well as at Massabé upon the coast. Encouraged by the progress made by Stanley, the merchants of Boma have founded several trading-stations between Boma and Vivi. The Livingstone, Baptist, and Roman Catholic missions have many stations between Stanley Pool and the ocean.

European Claims.—It is greatly to be feared that the good done by Stanley on the Congo may be thwarted by the political aspects of the African question. Where the white man trades, he ultimately claims possession, and the Congo seems destined to be a bone of contention between France, Portugal, and England.

The French claims arise from the explorations of the indefatigable traveller, M. de Brazza. While Stanley was engaged in his hazardous journey across the continent, and down the strangely twisted course of the great river, M. de Brazza, instructed by the French government to find a commercial route into the interior of Africa, ascended the river Ogowé, and planted the French standard at the confluence of the Ogowé and the Passa, at a station which he named Franceville. In an earlier journey he advanced to Okanga, north of the equator, crossing in his route the two navigable rivers Alima and Licona. The hostility of the natives joined to his own lack of resources prevented M. de Brazza from attempting the descent of either of these rivers; yet he persevered in the certainty of ultimate success, for the map of the course of the Congo, as traced by Stanley, proved that the Alima was a tributary of that great river, that the valley of the Ogowé gave convenient access to that of the Alima, and that by following this course a way could be found into the Upper course of the Congo and the interior of Africa, avoiding the 32 cataracts which intervene between Stanley Pool and Vivi.

The area included between the valleys of the Alima and the Ogowé on the north, the Atlantic on the west, and the Congo on the southeast, is a triangle almost equilateral and nearly as large as France. The route along the northern side of the triangle is not only easier than that by the main river, but has the advantage of debouching upon the ocean several degrees nearer to Europe than the Congo mouth. After the establishment of Franceville in 1880, M. de Brazza again endeavored to reach the Congo, and on this occasion met with success. Crossing a branch of the Alima, he descended the Lefini or Lawson, and was guided to the residence of a powerful chief, Makoko, who desired to acquire the friendship of the white man. From this chief was procured a treaty which was interpreted by De Brazza as placing Makoko's states under the protection of France, and granting to France a territory upon the banks of the Congo at any spot that might be chosen. De Brazza claims for his Makoko the sovereignty of the territories on the north bank of the Congo to a point south of Stanley Pool, and as a result of the treaty, as well as of priority of discovery, claims for France the right to the countries extending along that bank. It appears, however, to be more than doubtful that Makoko possesses any jurisdiction over the greater portion of the territory thus claimed in his name. None can deny to France the right, so far as Europeans are concerned, to the route *via* the Ogowé and the Alima to the Congo, but

her claims to sovereignty upon the Lower Congo appear to be without sufficient foundation. If allowed, the route recently discovered by Stanley *via* the valley of the Kuilu would be closed to him, and the only access to the Congo available to the International Association (which he represents) would be by the main river.

The situation is still more complicated by the claims of Portugal founded on (1) discovery in the name of the Portuguese nation, with intention to take possession; (2) actual possession proved by political institutions and acts of jurisdiction; (3) the recognition of the rights of Portugal by other European States. The discoveries of the Portuguese seem, however, to have been limited to the coast or at least to a comparatively narrow area near it. The kingdom of Congo, once the most powerful State of the region, was largely in contact with the Portuguese, and some Portuguese missionaries were located at San Salvador; but the vast interior was never explored by them, nor does Portugal appear to have dreamed of setting up a claim to it until other powers were in the field. The possessions of Portugal have never extended continuously along the S. W. coast of Africa, and the mouth of the Congo is not possessed by the Portuguese. The Dutch are the chief traders there, and their commerce depends upon the good-will of the depraved tribes of the coast.

Stanley, on his part, can show treaties with native chieftains as complete as that of De Brazza with Makoko. Manipembo, prince of Chissanga, has granted to the International Association sovereign rights in his territories. It is certain that the native chiefs do not intend to sign away their rights in the land, and that acquisitions of this kind are fraudulent. It has been asserted in various quarters that the International Association, representing no nation, but being simply and purely a trading company, cannot enter into any save purely commercial treaties. England has recently entered into relations with Portugal and with Stanley, and the ultimate result is uncertain.

Native Races.—The natives of the Congo basin appear to be, both physically and intellectually, as a whole, much superior to those which dwell to the south of them, and appear to belong principally, if not exclusively, to the great Bantu family. The possible exceptions are certain dwarf races, and the coast tribes, which latter are either degraded by the climate, or mingled with an earlier negro population. There are two types on the coast about Loango: the Bantu, with small hands, well-shaped feet, high, thin nose, beard, moustache, and plentiful hair; and an inferior type with splay feet, high calves, thick lips, hairless face, and crisp hair. This mixed people, the Ka-kongo, are found in the Portuguese colonies along the coast as far south as Mossamedes, for they are the servants, sailors, and laborers of the region. The great Bakongo tribe was once the ruling race of the Lower Congo; its kingdom was the kingdom of Congo of Portuguese annals, and its king still lingers at Sao Salvador. Many Portuguese words have found their way into the language. The Ba-shi-kongo, a degraded branch of this tribe, inhabit the southern bank of the Congo near its mouth. Higher up the river are the Ba-sundi and Ba-bwende, who seem less disposed than some of the other tribes to treat with Europeans. At Stanley Pool the Ba-teke are the chief tribe. They appear to have only recently come down to the Congo from the region between that river and the Ogowé, where they were met with by De Brazza. They scar their cheeks with lines, and often wear their abundant hair drawn tightly over a pad into a kind of chignon. Their headquarters may be said to be at the town of Mpumo Ntaba, the successor of De Brazza's Makoko. Intercalating with the Ba-teke, yet on the whole located higher up the river, are the Ba-yansi. This people, from Mr. Johnson's account, appear to be the most intelligent upon the river. He

He says of them: "The Ba-yansi, of Bólóbó, have a decided indigenous civilization. Their houses are large, and fairly high, and divided into three or more rooms; the floor is often covered with clean matting, and the door, made of laths and matting, can be swung backwards and forwards on a rude hinge. Their pottery, their weaving, their wonderful power of artistic decoration, their metal-work in iron and copper, their husbandry and their contrivances for fishing and bird-trapping all show a great advance on the tribes of the lower river."

The Wabuma, on the river of that name, are a gentle and inoffensive race, less intelligent than the Ba-teke and Ba-yansi. They are the great carriers of the Congo, and traffic regularly between the Bangala of the equator and the people of Stanley Pool, who pass the ivory, etc., onward to the coast. The Ba-yansi are described as perfect Greek statues in the development and poise of their forms, and are of a warm chocolate tint. All the natives are very fond of music, and draw harmonies of plaintive tone and perfect rhythm from their five-stringed instruments.

Climate.—The lowest reach of the Congo is somewhat unhealthy, but much less so than the Gold Coast or the Niger. Dysentery is almost unknown above Vivi, on account of the good drinking water from the numberless rills that run alike in dry and wet season. The most prevalent form of sickness is the African fever from over-exposure and sudden chills; but the most dangerous is bilious fever, usually the result of imprudence. At Msuata the temperature ranges from 60° at two in the morning to 87° in the shade at noon; this in the rainy or hot season. If a helmet is worn on the head, or an umbrella carried, it is possible to walk about all through the day. At the mouth of the Congo November, December, February, and March are the wet months, with a short dry season in January, but on Stanley Pool, January is wet, and there are only four dry months.

Natural History.—The plants and animals of the Congo basin are those of Western Africa generally. Monkeys seem scarce on the Lower Congo, though several species occur. The gorilla or the chimpanzee, or both, are found on the Upper Congo, and lemuroids are common. The lion is absent from the lower river, but the leopard is everywhere abundant. Genets are kept as pets. The manatee and a river dolphin occur below the falls. The elephant and the hippopotamus are common, as is the wart-hog or river-hog, but the rhinoceros is absent. There are few antelopes on the Lower Congo. Swimming and wading birds abound, especially at Stanley Pool. The only vulture of the lower river is *Gypohierax*, the Angola vulture, a most expert fisher. The curious bat-eating hawk (*Macharhamphus Anderssoni*) has been shot at Vivi. The gray parrot is everywhere abundant. Snakes seem to be rare below Bólóbó, but lizards, especially large monitors, abound. The common crocodile is the great danger of the rivers. Little is known of the fishes, but *Polypterus* is common, as well as several siluroids. Insects, some beautiful, some troublesome, abound. Cockroaches, red ants, and flies are most annoying, and the jigger or burrowing flea has found its way across from America.

Palms and leguminous plants and trees are conspicuous features in the landscape; and among the floral beauties of the region are the gigantic orchid *Lissochilus*, the papilionaceous *Camoensia*, *Rhyncosia* and *Lonchocarpus*, the *Mussaenda*, and deep blue *Commelynas*.

The domestic animals include the pig and sheep, probably introduced from Asia; the goat; a dog with foxy head and fawn-colored coat, resembling the pariah dog of India; a lean, long-legged, and ugly variety of cat; a small variety of the domestic fowl; and the Muscovy duck, introduced by the Portuguese. The dog never barks, though he howls upon occasion. It is considered very dainty eating, and by unwritten law is reserved for the sex which, lacking gallantry,

asserts itself to be the superior. The natives owe most of their fruits and vegetables to the Portuguese, who introduced manioc, sweet potatoes, corn, pine-apples, ground-nuts, sugar-cane, oranges, and limes.

(W. N. L.)

CONGRESS OF THE UNITED STATES. An elective Legislature, composed of two Houses, to which are intrusted all legislative powers granted by the Constitution of the United States of America. (See CONSTITUTION OF THE UNITED STATES.)

The loose compact, or league, of the thirteen colonies, known as the Articles of Confederation, and administered by the original Congress, had proved barely sufficient to unite the States for the common purpose of obtaining their independence. That object being attained by the treaty of 1783 with England, the close of the war was followed by a reaction toward absolute State independence. The inability of the Congress to meet the obligations it had incurred, and to maintain even its limited authority, diminished the popular respect for it, and promoted this reaction. The people of each State were quick to discover any local and selfish advantage which might result from their isolated sovereignty. The desire to retrieve themselves from the devastations and losses of war was more potent and more universal than the patriotism which sought to lay the foundations of a powerful and perpetual union. This condition of public sentiment was reflected in the evident timidity with which the patriotic statesmen of that period moved toward a more complete union.

On the 21st of July, 1775, Dr. Franklin had submitted to the assembly of State delegates, called a Congress, a plan entitled "Articles of Confederation and Perpetual Union of the Colonies." Nevertheless, they contained a provision for the possible return of the colonies to a connection with Great Britain. This appears to have been the basis of the plan reported to that Congress from a committee July 12, 1776, which is in the handwriting of Mr. John Dickinson, of Delaware, to which as amended the Congress agreed on Nov. 17, 1777, and which they recommended for adoption to the several States. But the ratification by all the States was not completed till March 1, 1781, near the close of the war, when Maryland was the last of the States to give its consent. These articles formed the compact of confederation, and settled the powers of that Congress which continued, very feebly, the Federal Government until the adoption of the Constitution of 1787.

The previous Congress of the Confederation served in no respect as a model for its successor. It was rather regarded as a beacon to warn patriots from the national perils which it embodied, and in the midst of which the new-born republic was already becoming stifled. That assembly could not properly be styled a legislature, owing to its want of power both over States and the people of the several States. The separate States retained their sovereignty, refused at will their quota of contributions for national debts and national expenses, managed foreign and interstate commerce to suit their local interests, and made partial compacts with neighboring States in a manner which produced a general confusion bordering upon anarchy. The situation of the Confederacy invited the contempt of Europe, and especially of England, which profited by domestic dissensions in America to grasp greater dominion on the seas, and greater control of international commerce. The national finances were in disorder, and no power existed to retrieve public credit. There was no federal judiciary. There was no real legislative power. It was an executive government by convention, without power to execute its decrees. It was a single House composed of delegates from States, each of which expressly retained "its sovereignty, freedom, and independence." Each had the right at any time to recall and replace its delegates; and even their compensation was paid by the

States sending them, so that no bond should hold them to the common government. Voting was by States, one vote to each, thirteen in all, and on important questions nine votes were required to the validity of their action.

Behind this powerless body were the separate States, extremely jealous of their local authority, and unwilling to surrender it. Some of them possessed exceptional advantages for foreign commerce, and could tax the consumption of less-favored States. Some profited by the viciousness of a wretched currency. Others were unwilling to submit to national taxation. Others, more patriotic, feared the possible tyranny of a vigorous government in which they had no controlling voice. A common government, with its seat removed to a great distance from most of them, with communication at that time rare and difficult, seemed to them like a foreign power intended to deprive them of the municipal liberties which they had acquired by the recent revolution. The smaller States feared a total sacrifice of their rights and power in presence of the large and populous States. Upon reading the credentials of the deputies from Delaware to the Constitutional Convention, it was observed that they were prohibited from changing the article in the Confederation which established an equality of votes among the States.

The leading statesmen in the convention considered all the models of a free government which history supplied, whether ancient or modern, seeking in all the elements which history approved, and avoiding the weaknesses which had conducted them to ruin. Apart from the peculiar provisions rendered necessary by the municipal conditions then existing, they more nearly followed the securities to liberty established by the British constitution than any other. The Parliament of Great Britain was an institution of their own ancestors. The voice of the people was heard in its halls, and their champions had always been found in one of its branches. The hereditary authority which existed in the other branch, and which tended to the conservation of arbitrary right and privilege, was alien to their ideas of intelligent and progressive civilization. There must be a substitute for this. The conservative force was here specially deposited in an independent judiciary, and in the veto power of an Executive. Instead of the conservatism of an hereditary Senate, they established a body with longer tenure of office than the popular branch, and with a secondary constituency; but renewable by thirds every two years in order that the people, proceeding slowly and with deliberation, might be able also to bring that body into concord with their views. Thus, after a period of four years at latest, the people could bring into harmony with their deliberate purpose the legislative powers of an Executive, of a Senate, and of their House of Representatives.

The jurisdictional powers of Congress may be divided into two classes: the powers specially defined; and the powers embraced by general definition.

In the first class are the following: "To lay and collect taxes, duties, imposts, and excises, to pay the debts and provide for the common defence and general welfare of the United States; but all duties, imposts, and excises shall be uniform throughout the United States; to borrow money on the credit of the United States; to regulate commerce with foreign nations, and among the several States, and with the Indian tribes; to establish a uniform rule of naturalization, and uniform laws on the subject of bankruptcies throughout the United States; to coin money, regulate the value thereof, and of foreign coin, and fix the standard of weights and measures. To provide for the punishment of counterfeiting the securities and current coin of the United States; to establish post-offices and post-roads; to promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries; to constitute tribunals inferior to the Supreme Court; to define and punish piracies and felonies committed on the high seas and offences against the law of nations; to declare war,

grant letters of marque and reprisal, and make rules concerning captures on land and water; to raise and support armies, but no appropriation of money to that use shall be for a longer term than two years; to provide and maintain a navy; to make rules for the government and regulation of the land and naval forces; to provide for calling forth the militia to execute the laws of the Union, suppress insurrections and repel invasions; to provide for organizing, arming and disciplining the militia, and for governing such part of them as may be employed in the service of the United States, reserving to the States respectively the appointment of the officers and the authority of training the militia according to the discipline prescribed by Congress; to exercise exclusive legislation in all cases whatsoever, over such district (not exceeding ten miles square) as may, by cession of particular States, and the acceptance of Congress, become the seat of the government of the United States, and to exercise like authority over all places purchased by the consent of the Legislature of the State in which the same shall be, for the erection of forts, magazines, arsenals, dock-yards, and other needful buildings."

In the second class are the following: "To make all laws which shall be necessary and proper for carrying into execution the foregoing powers, and all other powers vested by this constitution in the government of the United States, or in any department or officer thereof."

The powers denied to Congress are also of two corresponding classes. There is specifically denied the power to suspend the privilege of the writ of habeas corpus, unless required by the public safety in cases of rebellion or invasion. "No bill of attainder, or ex post facto law shall be passed. No capitation or other direct tax shall be laid unless in proportion to the census or enumeration hereinbefore directed to be taken. No tax or duty shall be laid on articles exported from any State. No preference shall be given by any regulation of commerce or revenue to the ports of one State over those of another; nor shall vessels bound to or from one State be obliged to enter, clear, or pay duties in another." . . . "And no title of nobility shall be granted."

By articles of amendment to the Constitution, further prohibitions and limitations upon the power of Congress are imposed as follows: "Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press; or the right of the people peaceably to assemble and to petition the government for a redress of grievances. A well-regulated militia being necessary to the security of a free State, the right of the people to keep and bear arms shall not be infringed. No soldier shall, in time of peace, be quartered in any house without the consent of the owner, nor in time of war, but in a manner to be prescribed by law. The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no warrants shall issue but upon probable cause, supported by oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized. No person shall be held to answer for a capital or otherwise infamous crime, unless on a presentment or indictment of a grand jury, except in cases arising in the land or naval forces, or in the militia, when in actual service in time of war or public danger: nor shall any person be subject for the same offence to be twice put in jeopardy of life or limb; nor shall be compelled in any criminal case to be a witness against himself, nor be deprived of life, liberty, or property without due process of law; nor shall private property be taken for public use without just compensation. In all criminal prosecutions the accused shall enjoy the right to a speedy and public trial by an impartial jury of the State and district wherein the crime shall have been committed, which district shall have been previously ascertained by law, and to be informed of the nature and cause of the accusation; to be confronted with the witnesses against him; to have compulsory process for obtaining witnesses in his favor, and to have the assistance of counsel for his defence. . . . The validity of the public debt of the United States, authorized by law, including debts incurred for payment of pensions and bounties for services in suppressing insurrection or rebellion, shall not be questioned."

A general denial of unconferréd powers is made in the following language: "The enumeration in the Constitution of certain rights shall not be construed to deny or disparage others retained by the people." . . . "The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people." . . . "The right of citizens of the United States to vote shall not be denied or abridged by the United States or by any State, on account of race, color, or previous condition of servitude."

This review of the powers respectively denied and granted to Congress clearly shows that the creating convention sought to avoid on the one hand the legislative omnipotence of the English Parliament, and on the other the weakness of the superseded House of Confederate Representatives from States retaining their separate sovereignty. Within the range of granted powers the sovereignty of the Union was complete and absolute. An army, navy, courts, and civil officers were provided to enforce the authority of the Union. All other powers were left to the several States, or rested in abeyance with the people themselves—regarded as the only secure repository of ultimate authority. By the provision of certain methods for the expression of their will, involving delay and deliberation, they secured themselves against the perils of a rash and passionate democracy on the one side, and on the other against the haste and wilfulness of a single omnipotent convention.

All the legislative functions granted are vested in a Congress composed of two Houses, each independent of the other, independent of the Executive, and having a different elective constituency. A census is taken once in ten years, upon the returns of which Congress decides upon the number of Representatives who shall thereafter compose the House of Representatives. That number is apportioned to the different States upon the ratio of population. The Representative must be an inhabitant of the State from which he is chosen, must have attained the age of 25 years, and must have been a citizen of the United States for at least seven years. The qualification of voters electing him is the same as that required of voters for the most numerous branch of the State legislature. His term of office is two years. This House is the judge of the returns and qualifications of its members, may punish members for disorderly conduct, and may expel any member by a vote of two-thirds. A majority of the whole number is required to constitute a quorum for business, although in practice business may be done by a less number where the absence of a quorum is not developed by a count. The House of Representatives has the exclusive right to present articles of impeachment against a public officer of the United States, and to originate bills for raising revenue, which bills, however, may be amended by the Senate, as in the case of other bills originating in this House. It chooses its Speaker and other officers, and establishes its own rules of proceeding.

Congress has power to fix the compensation of its members in both branches. The first Congress established the pay of Senators and Representatives at the rate of six dollars a day for their actual attendance, and six dollars for each twenty miles usually travelled in going to and returning from the sessions. It was provided that this sum should be increased from March 4, 1795, to seven dollars. It was subsequently established at eight dollars a day. At a later period the per diem compensation was changed to a salary of \$3000 per annum and mileage. With the enlarged wealth and business of the country it was increased, in 1866, to a salary of \$5000 per annum, and mileage at the rate of twenty cents per mile, where it now remains.

In distinction from the House, whose members are chosen directly by vote of the people, the Senators are chosen by the State legislatures, which are themselves elected by the people of the several States. Each State, irrespective of its population, is entitled to two members of the Senate. This provision, intended to preserve the relative equality of the States in one branch of Congress, is the only provision of the Constitution which may not be changed in the mode provided for alterations of that instrument. In the popular branch the great States have a vote proportioned to their population, reaching as high in one case as thirty-three in number, while the smallest have only one member. The equality of State votes in the

Senate is an anomaly of representation, but was rendered necessary by the original fear of the smaller States that their interests and their influence would be lost in an overwhelming voting power of the larger States. The number composing the Senate is, therefore, and must always be, twice the number of the States in the Union. Congress having power to admit new States into the Union, the admission of each new State involves the addition of two new Senators, and of at least one member of the other branch. The term of Senators is six years, but they are so classified that, as nearly as practicable, one-third of the body is renewed every two years, the expiration of the term being coincident with that of the members of the other House. The constitutional qualifications of a Senator are, that he shall be an inhabitant of the State electing him, shall have reached the age of thirty years, and shall have been for nine years a citizen of the United States. The Senate, like the House, establishes its own rules of procedure, and may punish its members for disorderly conduct, and may by a vote of two-thirds expel a member. Its presiding officer is the Vice-President of the United States, voting only in case of equal divisions; but in his absence, or when he shall exercise the office of President, the Senate chooses from its own body its President *pro tempore*, as it also appoints all other of its officers. It also has the sole power to try all cases of impeachment, acting therein upon special oath. It is so far a part of the executive power that all treaties, and the principal officers appointed by the President, must be confirmed by the Senate. The sessions for this purpose are called executive sessions, and are held with closed doors, and a record is kept in a separate journal, which is not published.

The President, in turn, is so far a part of the legislative power that his approval is necessary to all acts of Congress with two exceptions. Where an act being vetoed by him is, upon reconsideration, repassed by two-thirds of the votes of each House, it becomes a law. Where the act remains in his hands unsigned for ten days, Congress being in session, it shall become a law without his signature.

Congress is required to meet once at least every year, and the day of meeting, until otherwise provided by law, is the first Monday of December. Journals of proceedings must be kept and published by each House. Neither House can, without consent of the other, adjourn for more than three days during the session of Congress. The yeas and nays may be required upon any question by one-fifth of the members present. Neither Senator nor Representative can hold any other office under the United States, nor can he be appointed to any United States office created or rendered more lucrative by law during the term for which he was elected.

The communications between the two Houses are by messages in established form, transmitted by one of their clerks. The attendance of a clerk bearing a message from his House is notified by the doorkeeper, who announces "a message from the Senate" (or from the House of Representatives, as the case may be.) The clerk addresses "Mr. Speaker" or "Mr. President" in the Senate.) The presiding officer recognizes him as "Mr. Secretary" (or "Mr. Clerk," if from the House of Representatives.) The messenger then says, "The Senate (or H. R.) has passed" such a bill or resolution, giving its title, with or without amendment, as the case may be, "in which I am directed to request the concurrence of the House of Representatives" (or Senate). Thereupon he bows to the presiding officer and withdraws; and the House, which has suspended the current proceeding to receive the message without delay, resumes its business, and the message and bills accompanying it go upon the table for future disposition. Each House has its own calendar of the order of business, in which preference is given to its own bills which have

been returned with amendment proposed by the other body.

The Senate does not recognize the "previous question," or *clôture*. Debate in that body is unlimited, and certain measures have been, near the close of the session, designedly talked to death. The first response on a roll-call, begun when no senator claims the floor, closes the debate. The hour for closing debate on any question may also be fixed in advance by unanimous consent. Motions to reconsider any vote must be entered before the close of the legislative day next following that on which the vote was taken. The more numerous branch of Congress, however, long ago found it necessary to establish the "previous question" in order to advance their business. A motion for the previous question is not debatable, and can be made after or even before debate on the main question, and can be applied to the bill and to any or all pending amendments—to everything preceding the engrossment and third reading of the bill; and the member in charge of the bill is allowed one hour, after the previous question is seconded, to close the debate. As a majority could second the motion, and so cut off debate on the part of the minority, a practice grew up of causing delay by dilatory motions until the majority should concede to their opponents a reasonable time for debate in cases where it was demanded. It is now provided that when the previous question is ordered on any proposition not previously debated, 30 minutes shall be thereafter allowed for debate, to be divided equally between the advocates and opponents of the measure. There is also a standing rule of the House of Representatives, which permits, on certain days during the session, a motion to suspend all rules and pass a bill or resolution upon a single reading. To do this, however, the concurrence of two-thirds of the House is required. A vote so taken is not subject to a motion to reconsider.

As the body of Representatives became more numerous, and official reporters gave to the government press all the debates in their full extent, it became evident that a remedy must be provided against excessive consumption of time by ambitious and voluble speakers. In 1841, after efforts in several previous years to the same end, the House adopted the peremptory rule—"no member shall occupy more than one hour in debate on any question." The rule has continued in force to this day. Its propriety is no longer questioned. But in practice the House, in its good nature, gives unanimous consent to orators who interest it to overpass this limit of time. By unanimous consent also, all rules of procedure established by the House may be waived.

All bills for raising revenue, and for appropriating money, must first be considered in committee of the whole House, for which a chairman is designated by the speaker to preside during the consideration of a particular bill in the committee. The House alone, not the committee, can limit or close debate therein. No action of the Committee of the Whole is entered on the journals of the House except that which the chairman reports as adopted by the committee when it finally rises and reports the measure to the House. The bill cannot be reported to the House so long as proposed amendments are pending in committee, which therefore often proves to be the grave of important measures. The yeas and nays cannot be demanded in Committee of the Whole.

The Senate is less burdened by rules than the House. It considers certain measures "as in Committee of the Whole," without a change of presiding officers. Its business is more directly controlled by a majority, taking up a certain bill, laying it aside, considering another, or resuming the first.

No member of the executive government having a seat in either House, all measures of legislation must be initiated in one or the other branch of Congress. A draft of a bill sometimes, but rarely, accompanies an

executive communication to one of the Houses. In that case it goes first to a committee charged with the subject. Either House may take the initiative in any legislation, save only bills for raising revenue. The House has claimed, and the Senate disputed, that appropriation bills must also originate in the House. Custom has established it as a rule, while it is disputed as a prerogative of right. To secure careful deliberation of a mass of business so great as that devolved on Congress in the interest of fifty millions of people, each House has classified the subjects of legislation, and distributed their first consideration among 30 standing committees in the Senate, and 42 committees in the House of Representatives, designating also, upon occasion, select committees for particular objects. The members of these standing committees in the Senate are appointed by order of the Senate itself, at the beginning of each Congress, the Senators of each political party consulting and nominating respectively their representative members on each committee. In case of special or select committees it is usual to move that the president be authorized to appoint them. In the organization of the House the speaker possesses an almost despotic authority. He appoints without restraint, except as to number, all standing, select, and special committees, making his own choice from both political parties, and regulating their respective representation on each committee. Custom requires that party representation on committees shall be as nearly as practicable proportioned to their respective numbers in the House; but violations of this usage sometimes occur. The speaker also has the absolute power of recognition of any one among members rising to debate the question, and in this respect has great power to give direction to any discussion. If a member wishes, under suspension of the rules, to bring forward a measure, it is usual for him to notify the speaker, privately, of the particular bill or resolution, and if disapproved by him he will decline to give him recognition. If the speaker distrusts the purpose of the member rising, he will inquire his purpose before recognizing him; and if, being recognized, he makes a surprising motion, the speaker has frequently refused to put the question, saying the member was not recognized for that purpose. Every member has the right to appeal from the decision of the chair to the House, but the latter seldom refuses to sustain the speaker. The resulting effect of the rules and practice of the House is to enable the speaker to exercise a very controlling influence over legislation, and through the chairmanship of committees of chief importance practically to appoint the political leaders of parties. As he is wise or unwise in the exercise of his functions, he directs his party to success or failure.

At the date of this article, forty-seven Congresses of the United States have assembled, performed their functions, and closed their terms of existence. Ninety-five years of this constitutional government have gone into history. It has been tested by the severe struggles of war, foreign as well as domestic, and by the less manifest perils of long periods of peace. It has been tried in adversity and in prosperity, in financial distress, and with a redundant revenue. Through all these trials it has grown stronger in the affections of the people, and in the respect of other nations. The government of the Union is more firmly established to-day than at any other period of its history. The fears originally entertained of its encroachment upon personal and municipal liberties were long ago dissipated, and are now found only in records of the past. The partial independence and proper autonomy of the States have been uniformly respected by Congress. Very few instances are recorded in which the laws of Congress have been adjudged to be transgressions of their constitutional limit of authority by the opinion of the Supreme Judiciary, organized as it was with power to check possible excesses of central legislation. States and their subordinate municipalities move in

REPRESENTATION OF THE STATES IN CONGRESS, ACCORDING TO THE SEVERAL APPORTIONMENTS.

NOTE.—The following table shows the number of representatives in Congress as originally assigned by the Constitution and as apportioned under each census. The apportionment under the first census went into effect, March 4, 1793, and every ten years subsequent to this a new apportionment has taken effect. Numbers in parenthesis show the representation assigned to a State on its admission into the Union after the decennial apportionment had been made.

	Year Adm'd.	By Const.	1793.	1803.	1813.	1823.	1833.	1843.	1853.	1863.	1873.	1883.
Alabama.....	1819				(1)	3	5	7	7	6	8	8
Arkansas.....	1836						(1)	1	2	3	4	5
California.....	1850								2	3	4	6
Colorado.....	1876										(1)	1
Connecticut.....		5	7	7	7	6	6	4	4	4	4	4
Delaware.....		1	1	1	2	1	1	1	1	1	1	1
Florida.....	1845							(1)	1	1	2	2
Georgia.....		3	2	4	6	7	9	8	7	7	9	10
Illinois.....	1818				(1)	1	3	7	9	14	19	20
Indiana.....	1816				(1)	3	7	10	11	11	13	13
Iowa.....	1846							(2)	2	6	9	11
Kansas.....	1861									1	3	7
Kentucky.....	1792		2	6	10	12	13	10	10	9	10	11
Louisiana.....	1812				1	3	3	4	4	5	6	6
Maine.....	1820					7	8	7	6	5	6	4
Maryland.....		6	8	9	9	9	8	6	6	5	6	6
Massachusetts.....		8	14	17	20	13	12	10	11	10	11	12
Michigan.....	1837						(1)	3	4	6	9	11
Minnesota.....	1858								(2)	2	3	5
Mississippi.....	1817				(1)	1	2	4	5	5	6	7
Missouri.....	1821					1	2	5	7	9	13	14
Nebraska.....	1867									(1)	1	3
Nevada.....	1864									(1)	1	1
New Hampshire.....		3	4	5	6	6	5	4	3	3	3	2
New Jersey.....		4	5	6	6	6	6	5	5	5	7	7
New York.....		6	10	17	27	34	40	34	33	31	33	34
North Carolina.....		5	10	12	13	13	13	9	8	7	8	9
Ohio.....	1802			(1)	6	14	19	21	21	19	20	21
Oregon.....	1859								(1)	1	1	1
Pennsylvania.....		8	13	18	23	26	28	24	25	24	27	28
Rhode Island.....		1	2	2	2	2	2	2	2	2	2	2
South Carolina.....		5	6	8	9	9	9	7	6	4	5	7
Tennessee.....	1796		(1)	3	6	9	13	11	10	8	10	10
Texas.....	1845							(2)	2	4	6	11
Vermont.....	1791		2	4	6	5	5	4	3	3	3	2
Virginia.....		10	19	22	23	22	21	15	13	8	9	10
West Virginia.....	1863									3	3	4
Wisconsin.....	1843							(2)	3	6	8	9
Total by Apportionment.....		65	105	141	181	213	240	223	234	241	292	325
Added in ten years.....			1	1	4		2	7	3	2	1	
Ratio of Representation.....		30,000	33,000	33,000	35,000	40,000	47,700	70,680	93,423	127,381	131,425	154,325

their respective orbits with even greater harmony because of the supremacy, in its sphere, of the national legislature. Instead of a disposition to subtract a portion of the powers conceded to Congress, a strong inclination is found among citizens to increase them, with a view to a better control of the financial obligations of States and municipalities, and to meet the exigencies of a vastly enlarged commercial and social intercourse between the States. Many unforeseen conditions have arisen for which Congress has found no prescribed rule of action in the Constitution. But it has been held alike by political and judicial authority that the creation of this defined national sovereignty not only carried with it the powers expressly granted, but all other powers necessary and appropriate to defend this sovereignty against enemies, and to secure the declared objects of its creation. Thus, foreign territory has been acquired by both purchase and conquest, and organized as territorial dependencies of the general government. Insurrectionary and seceding States have been reclaimed to the Union by military force. New conditions have been imposed upon States newly admitted to the Union. Troops have been levied by conscription within the States. Paper money has received a forced circulation in time of war. State bank circulation has been suppressed by national taxation, and a national banking system has taken its place. A tariff has been provided not only for the object of raising a revenue, but also for the avowed object of protecting national labor and production.

The experience of the first century of the American Republic shows that the framers of this system were as wise in their general declarations as they were in their precise definitions of the powers of Congress. No nation, indeed, is wise which does not provide sufficient elasticity in its institutions to allow growth and development alike of its intellect and its interests. The prescribed garments of childhood cannot be worn in the maturity of years. Necessity has sometimes forced Congress to a large interpretation of constitu-

tional powers. Their justification has been found chiefly in the unforeseen conditions. But such action has rarely failed to recognize the principle that this is a "government of the people, by the people, and for the people," and the people in turn have ratified the extraordinary measures. This people, conscious of their ultimate power of control, strong in the possession of that power, and frequently exercising it to rebuke neglect of their interests, have become fearless of usurpation, patient in their consciousness of strength, proud of their liberties, and loyal to their national Congress.

(J. A. K.)

CONGREVE, RICHARD, an English political and philosophical essayist, was born at Leamington, Warwickshire, Sept. 4, 1818. He is the third son of Thomas Congreve, and was educated at Rugby under Dr. Thomas Arnold. He graduated at Wadham College, Oxford, in 1840, with first-class honors in classics. He became a fellow and tutor of his college, and was for a time an assistant master at Rugby. Returning to Oxford, he resumed his tutorship in Wadham College, but finally resigned it in 1857 on accepting the Positive philosophy of Comte as the best solution of the problems of human life. He has published a *History of the Roman Empire of the West* (1855), *The Catechism of Positive Religion* (1858), *Gibraltar* (1860), *Italy and the Western Powers* (1861), *Elizabeth of England* (1862), *Essays, Political, Social, and Religious* (1874). He edited *Aristotle's Politics, with Notes* (2d ed. 1874), and translated the fourth volume of Comte's *Politique positive*, which treats of religion. He resides in London, is the leader of the most active school of the Positivists, and preaches in their church. His essays on historical subjects favor an enlightened despotism. Without belonging to any of the existing political parties, he takes a warm interest in public affairs, and frequently publishes pamphlets and articles on questions of the day. In this way he has urged upon England the policy of conceding the demands of Ireland for home rule and of relinquishing the dominion of India.

CONIFERÆ (cone-bearers) is the name applied to a large and important group of trees or shrubs. The order may properly be divided into six tribes: *Cupressineæ*, illustrated by Cypress, Arbor Vitæ, and Juniper; *Taxodiææ*, illustrated by Sequoia and Bald Cypress; *Taxineæ*, illustrated by Yew and Ginkgo; *Abietineæ*, illustrated by Pine, Spruce, Fir, Larch; *Podocarpeæ*, illustrated by Podocarpus; *Araucariæ*, illustrated by Araucaria. These tribes are founded upon the more important characters of the fruits and flowers, and the thirty-two *genera* into which they are divided are based on less important structural characteristics. Though more numerous as to species and individuals in the north temperate zone, they are well represented, also, in the south temperate; and there are several species in the equatorial regions. Considered as a whole, with *Cycadaceæ* and *Gnetaceæ* they form the naked-seeded division of dicotyledonous plants. Taking the common pine tree as an illustration of the order, the cone represents an arrested branch. The bract under each scale represents the leaf; the scale, the transformed branch, which represents a carpel in Angiosperms; and the seed, instead of being enclosed by a carpel, are naked and exposed on the flat scale, the analogue of the carpellary leaf, as it is called, in other orders. The true leaves of the pine are united with the stem, forming an exterior cuticle to the bark, only the tips being free, and forming the bud-scales toward the end of the growing season. Sometimes these tips are more fully developed, and appear as perfect leaves. This is especially the case in the juvenile condition; in some Coniferæ, especially the arbor vitæ, this perfect foliaceous condition exists for the greater part of the first season of growth from the seed, and in some rare cases a tree will retain this juvenile condition for many years; and, as in the case of some junipers, the condition appears whenever a branch has lost some of its vital power by being shaded by other branches or in some other way deprived of its proper share of food. In the pine a secondary growth of leaves appears from the axis of the primary leaves. These are popularly known as "needles," and are sometimes in pairs, sometimes in threes, and sometimes in bundles of five, and have membranous sheaths at the base of the bundles. In the larch the branches are covered by small spurs, which form in the axes of the true leaves, and the leaves from these spurs are not united to the branch, for indeed it has not developed sufficiently to enable them to do so. The secondary leaves in the pine are evidently homologous with those on the spurs in the larch, and we may therefore say that pine needles are leaves produced from spurs which are not visible above the bark, as in the larch they are. The scales which surround the sheaths also exist in spurs of larches, and are the analogues of the primary leaves. The whole family of Coniferæ are formed on the type thus sketched, with various modifications. In some cases the seeds seem partially enclosed by the scales; at other times, as in the sub-order *Taxineæ*, to which the yews belong, the usually naked ovule is more or less enclosed by the development of a fleshy or more or less hardened disk. The seeds are albuminous, and in those forms in the order which seem to develop fully primary leaves have but two cotyledons; but in those which suppress the primary leaves and develop secondary ones, as in the pines, these cotyledons are usually in fascicles also. The wood of coniferous trees is marked with peculiar circular dots, by which it may be readily distinguished under a microscope even in a fossil state. It abounds with a resinous juice, which yields tar, pitch, rosin, and other commercial products. Of what peculiar use these resinous secretions are in the economy of plant-life has been an interesting question with biologists. De Vries believes they are for the purpose of furnishing a healing covering to wounds. Some of the family are comparatively short-lived shrubs, others form trees of majestic size and live to a great age. In Europe the yew, *Taxus baccata*, is often known to be 1000 years old and

to reach 20 feet in diameter, and there are others which exceed these figures. In the Eastern section of the United States white pines often grow more than 150 feet high and 18 or 20 feet in circumference, but are not believed to be often more than 200 years old.

It is deeply to be regretted that the white pine, which has been of the utmost service to American civilization, has now so nearly disappeared from the Eastern States and is in danger of extinction in Michigan and neighboring States unless measures for its restoration as a forest tree be speedily taken. The rapidity of its growth, the ease of its culture, and the certainty of its finding a market are reasons which should ensure its cultivation and preservation. The conifers of California seem likely also to share the fate of the white pine—the redwood because of the demand for its timber, and the *Sequoia gigantea*, or mammoth tree, because of its very limited range. This disappearance is but a continuation of the history which the sequoia brings to us from the past. In earlier geological times it occupied a wide range in what is now Arctic region, and extended thence south to its present latitudes, both in the Old and in the New World. Associated in size and in home with the sequoias we have the sugar pine (*Pinus Lambertiana*), which derives its name from the sweet exudation furnished when it has been injured by fire. It is remarkable for its beautiful, straight, tapering trunk, its soft wood, and hence the ease with which it is worked—qualities which give it a high commercial value. *Pinus ponderosa*, or the yellow pine of the West, which ranges from Washington south through California and Arizona and eastward to Colorado, is perhaps the most widely diffused and most generally useful of our Western conifers. There are also the noble spruces of the West coast which form the well-known tall timber and long spars of Puget Sound; the Douglas spruce, attaining a height of 300 feet and a diameter of 15 feet. Among the firs of the same region we find *Abies grandis* (300 feet high and 4 feet in diameter), *Abies nobilis* (200 feet high), and *Abies magnifica* (200 feet high). The Coast and Cascade Mountain ranges produce the *Thuja gigantea*, or Western arbor-vitæ, often 250 feet high and furnishing a good, soft, durable timber. Much like this (save in its fruit) is the *Libocedrus*, or white cedar, of California and Oregon.

Among the important conifers of the Southern United States are long-leaved pine (*Pinus Australis*), short-leaved pine (*Pinus mitis*), loblolly pine (*Pinus taeda*).

The trees most useful to mankind are found among the Coniferæ, and they are found in some form or another over every portion of the world, except some of the more tropical parts of Africa and the southern peninsula of India. Nothing compares with them in general usefulness as timber-trees, and in a vast variety of products which serve human purposes no other class of trees will bear comparison with them. The number of species known is about 200, and perhaps it may be said that there is not one among them all but possesses some useful character. (T. M.)

CONKLING, ROSCOE, an American Senator, was born at Albany, N. Y., Oct. 30, 1829. His father, Alfred Conkling (1789–1874), was a member of Congress, afterwards United States district judge for Northern New York, and in 1852 was minister to Mexico. Roscoe, having received an academic education, removed to Utica in 1846, studied law, and was admitted to the bar in 1849. He became district attorney for Oneida county in 1850, and was elected mayor of Utica in 1858. He was originally a Whig, but on the formation of the Republican party became an earnest advocate of its principles. In 1858 he was elected to Congress, in which he was the youngest member of the House. He soon secured a reputation for eloquence and courage in debate, and was re-elected in 1860. Being defeated in 1862, he was employed by the attorney-general in exposing frauds which had been practised in New York

with regard to soldiers' enlistment and bounties. In 1864 he was elected again to Congress, where he was made chairman of the committee on the District of Columbia and of a committee on a bankrupt law. He was also a member of the committee of ways and means and of the special reconstruction committee of fifteen. He strenuously resisted all measures tending to restore the advocates of secession to power in national affairs. After his election for another term by the people in 1866, the legislature of New York, in Jan., 1867, elected him to the Senate, where he took his seat in March. He was immediately placed on the judiciary committee, and during his senatorial career from 1867 to 1881 was a member of most of the leading committees. In 1876 he was a prominent but unsuccessful candidate for the Republican presidential nomination. When Pres. Hayes showed a disposition to adopt conciliatory measures toward the South, Mr. Conkling was foremost in opposing the movement, and organized the "Stalwart" faction of the Republican party. He was a skilful political manager, not only ruling his party in New York, but greatly developing the power of the Senate, so as to control in a measure the President's nominations to office. In the Chicago convention of 1880 he was the champion of the nomination of Gen. U. S. Grant for a third term, but was again unsuccessful. At the opening of Pres. Garfield's administration Mr. Conkling still endeavored by his influence in the Senate to control the President's nominations to office, and finally insisted on the withdrawal of the nomination of Mr. W. H. Robertson as collector of the port of New York. Unable to obtain this, he and his colleague, Thomas C. Platt, resigned their seats in the Senate, and appealed to the New York legislature for re-election as a vindication of their course. In this they failed, Messrs. Lapham and Miller being chosen to succeed them after a struggle which lasted for months. Mr. Conkling has since declined the nomination as justice of the United States Supreme Court, offered to him by Pres. Arthur. He now (1884) holds no public position.

CONNECTICUT. The present constitution was adopted Sept. 15, 1818, and has been declared judicially to be a limitation and not a grant of power. The first article is a declaration of rights; the second divides the powers of the government into three distinct departments, the legislative, the executive, and the judicial. Formerly, the State had two capitals, Hartford and New Haven. This peculiar feature in the original organization was owing to the fact that the State was formed of two colonies, and when the union took place it was agreed that the sessions of the general assembly should be held alternately at Hartford and New Haven. This agreement was observed for many years, but finally an agitation was begun to abolish the capital at New Haven. The agitation was continued year after year; in 1874, however, the constitution was amended, and since that time all the sessions have been held at Hartford. Rhode Island is the only State in the Union having two capitals, but Newport is a capital only in name, as all the sessions of the legislature are held at Providence.

The legislature consists of two branches, a house and a senate. The members of the house represent territorial divisions or towns, thus corresponding in plan with the representation in the Federal Senate. Each town sends at least one representative, and if containing more than 5000 population, two. In no case has the representation been reduced, and all towns which ever sent two representatives have retained the number. Senatorial representation is based theoretically on population. The constitution provided that the basis of representation should be adjusted to conform with the changes in population, and that the adjustment should be made at the time of taking the national census. Fifty years ago the first apportionment was made under this provision of the organic law, but although the greatest changes have since occurred in the movements of the population, there has been no readjustment in representation. The

extraordinary condition of things now existing in consequence of neglecting to regulate senatorial representation in the mode prescribed has been thus set forth: "Districts which were substantially equal fifty years ago to-day show a difference of 4 to 1; others have grown so as to present differences of a less degree, yet quite enough to make equality of representation absurd. Six districts with a combined population of 83,500 balance in the present senate six other districts having a population of 281,500, while ten districts with a population of 411,700 can be out-voted by eleven districts which have a population of 199,000." The senate is composed of twenty-one members; it is therefore possible for eleven of them to control the legislation of the State. Obviously, representation in the lower branch, which has 244 members, should be reduced, while that of the senate should be increased, and thus remove the danger of having the course of legislation impeded by a mere handful of men.

The executive is the second department of the State government. The machinery for executing the laws is very simple, yet effective. No attorney-general or other law-officer is elected or appointed to serve the State, and whenever legal assistance is needed it is paid for specially. There is, however, but little need of employing any one, and the State has never suffered from the want of a permanent law-officer. The governor, like the governors of other States, is vested with the veto-power, but the legislature can pass a bill by a bare majority over the governor's veto, as in the beginning.

Lastly is the judicial department. There are two courts having general jurisdiction in the State—the superior court, where causes are first tried; and the supreme court of errors, where a second trial can be had to correct any errors committed by the other. In the lower court cases can be tried before a jury if either party demands it, but usually, with the exception of criminal cases, they are tried by a judge. The time-honored trial by jury is falling into disrepute, and is likely to disappear, not by virtue of any legislative or constitutional enactment, but by the gentle operation of the causes now at work. The cases tried by juries are constantly diminishing in number, and this is as true with respect to other States as Connecticut.

The remaining articles of the constitution pertain to the qualifications of electors, religion, education, impeachments, closing with a few miscellaneous provisions and with the mode of proposing and ratifying amendments. These must be passed first by the general assembly by a majority vote, and again the next year by a two-thirds vote, after which a ratification by the vote of the majority of the voters of the State is final. The constitution, therefore, carefully guards against innovations, yet provides a way for making them. The constitution has been amended sixteen times since 1828. No constitutional convention has ever been held, though the expediency of calling one was warmly discussed ten years ago.

The laws under which the people live are divided into two branches—statutes and decisions of the supreme court. The former are published annually, and are divided into two parts: the "public statutes," so called, which are enacted for the benefit of the people generally, and the "private statutes," which consist of charters and special grants to individuals. The public statutes soon after their enactment by the legislature are officially published in many of the newspapers of the State. In this way they come to be generally known. Besides the annual statutes which are thus published, there is a collection in a single volume, which are revised from time to time, and all enacted during the interval are incorporated. The last revision, which was made in 1874, was so thoroughly done that the entire body of the public statute law was compressed into a single volume of about 700 pages.

The decisions of the supreme court are contained in a single series of reports numbering forty-eight volumes. These do not include the single volume of Kirby's *Reports*, which is perhaps the oldest legal work of the

kind existing in the country. Nor does this series include the two volumes reported by Root, nor the five volumes of Day, all of which preceded the present series. Five judges constitute the supreme court, and the written opinions delivered by them usually fill about a volume annually.

Besides these courts there are local tribunals, of which nothing need be added to what may be found elsewhere. The system for administering justice, therefore, is very simple yet effective. It may be added that the judges are no longer chosen by the legislature, but are appointed by the governor and confirmed by the senate of the general assembly. This change was introduced in 1880 by constitutional amendment. Their tenure of office still remains unchanged. It may be added that although their term of office covers no longer period than eight years, in

only two cases have judges ever been dropped since the adoption of the elective system in 1856. When once elected they have been continued until reaching the constitutional limit of seventy years, unless they resigned. The two instances to which we have referred happened during the late war, when political feeling was intense. After its close one of them was re-elected by the legislature, and afterward was chosen chief judge by the unanimous vote of the legislature.

The expenditures of the State correspond with its simple government. During the year ending Nov. 30, 1881, the total expenditures were \$1,509,855.28, and the revenue for the same period was \$1,722,160.01. The two largest items of this expenditure were for the judiciary and the common schools. The following is an abstract of expenditures for the last five years, ending Nov. 30, 1881:

	1877.	1878.	1879.	1880.	1881.
Session of the general assembly.....	\$96,813.62	\$88,865.32	\$97,182.85	\$104,896.23	\$105,487.50
Salaries and expenses in executive offices.....	20,223.10	18,969.20	21,162.53	23,443.34	24,880.70
Judicial expenses.....	182,419.83	182,955.61	223,681.84	256,598.93	201,805.30
Board of prisoners in county jails.....	87,358.01	58,749.80	53,696.25	50,656.04	57,417.42
State-house.....	6,619.25	19,855.54	79,574.40	29,422.52	28,009.76
Contingent expenses.....	1,619.31	533.37	2,463.32	7,838.40	16,288.48
State board of education.....	8,382.70	9,077.09	9,253.29	9,944.50	11,221.27
State normal school.....	12,600.00	11,200.00	11,000.00	12,700.00	26,300.00
Common schools.....	207,504.50	211,745.50	210,682.00	213,420.50	219,851.50
State library.....	6,895.02	4,491.97	7,721.52	4,292.19	6,232.87
State prison.....	5,237.09	6,219.62	7,644.95	7,992.87	10,850.68
State reform school.....	34,288.00	29,672.93	32,686.60	49,435.91	51,468.18
Connecticut industrial school.....	19,297.03	20,332.77	21,666.91	34,516.48	45,800.21
State paupers.....	6,156.30	4,965.20	3,882.02	4,055.01	3,876.40
Humane institutions.....	128,436.90	81,727.35	89,851.32	157,705.31	177,680.45
Agriculture.....	8,750.00	13,600.00	13,000.00	13,200.00	13,100.00
National guard.....	82,464.73	65,960.97	150,200.08	113,097.49	119,512.34
Printing and circulating public laws and documents..	29,861.48	23,597.81	20,544.16	28,758.76	32,031.16
Soldiers' children	20,646.75	14,739.60	11,947.21	9,003.02	7,787.16
Fish commissioners	2,104.91	1,605.50	2,416.20	3,521.65	4,718.24
State board of health.....	.....	750.00	3,000.00	3,000.00	3,000.00
Railroad commissioners.....	14,231.06	9,293.70	9,817.40	10,686.02	10,670.58
Bank commissioners.....	3,838.20	3,393.45	4,791.62	4,999.93	5,150.00
Insurance commissioner.....	16,634.63	14,012.93	16,036.92	15,104.15	14,011.13
New State-house	350,000.00	331,500.00	90,000.00	118,131.36	5,041.61
Grading Capitol grounds.....	.....	.....	24,750.00	26,250.00	4,000.00
Account of taxes refunded.....	512.80	359.84	26,058.39	43.00	271.21
State board of charities.....	637.52	.....	.....	.....	262.64
Sundry accounts.....	32,313.69	13,618.40	71.50	1,500.00	10,654.28
Total, not including interest paid on State bonds....	\$1,385,846.43	\$1,241,793.47	\$1,244,783.28	\$1,314,213.61	\$1,217,381.07

The difference between the total given for the last year and the expenditure as previously stated represents almost wholly the interest on the State debt. This is a little less than \$5,000,000, and consists of five loans bearing 6, 5, and 3½ per cent. interest. The bonds bearing the lower rate amount to \$500,000, and were issued in 1882. They were taken at a premium varying from 4 to 7½ per cent.

There is, however, a large debt owing by the towns and cities. Once in four years the comptroller of the State is required to publish the returns made to his office of the indebtedness and expenditures of the towns, boroughs, and counties of the State. In 1880 these returns were published, from which we present the following interesting statement:

COUNTIES.	Total funded indebtedness.	Total floating indebtedness.	Total debt.	Amt. actually raised by taxation during year.	Amt. actually expended for int. on total indebtedness during year.	Amount actually expended for roads.	Amount actually expended for paupers.	Amount actually expended for salaries.	Amount actually expended for schools.	Amount actually expended for police.	Amount actually expended for fire department.
Hartford.....	\$2,078,294.10	\$535,044.29	\$2,613,338.39	\$1,168,668.23	\$122,808.43	\$69,923.08	\$100,258.12	\$36,724.00	\$188,268.06	\$63.57	\$5,150.98
New Haven ..	1,339,553.77	188,767.00	1,528,320.77	654,816.10	94,962.80	93,954.63	123,482.30	25,214.24	322,713.54	235.75	526.38
New London..	1,107,807.94	363,040.71	1,470,848.65	400,120.63	90,548.42	53,254.25	58,313.90	13,488.72	100,635.09	5,400.48	2,460.40
Fairfield	978,534.40	205,856.61	1,184,391.01	500,369.86	66,349.32	54,992.38	70,939.30	19,027.37	205,174.21	1,579.15	1,135.18
Windham	43,055.00	109,103.31	152,158.31	155,172.12	8,734.73	37,953.85	26,695.98	7,847.36	60,020.85	.....	.....
Litchfield	589,150.54	145,857.42	735,007.96	290,042.58	47,610.52	61,469.50	28,717.96	14,388.08	84,799.95	144.99	.....
Middlesex.....	1,839,900.00	72,623.65	1,912,523.65	205,248.64	114,134.44	24,153.22	26,163.30	6,025.86	48,392.72	66.20	.....
Tolland	242,187.60	58,907.99	301,095.59	124,145.20	19,555.80	23,883.81	16,605.32	4,935.64	35,631.87	183.00	1,177.54
Total, towns..	8,218,483.35	1,679,200.98	9,897,684.33	3,498,583.36	564,704.46	419,584.72	451,176.18	127,651.27	1,045,636.29	7,673.14	10,450.48
Total, cities..	6,693,592.34	148,250.00	6,841,842.34	1,240,172.71	414,210.41	242,663.75	.....	90,113.75	186,467.05	.....	148,889.81
Total, boro's.	451,800.00	98,283.12	550,083.12	85,643.50	28,960.58	22,430.13	.....	4,937.09	.....	4,745.98	23,491.58
Tot'l, counties	24,500.00	41,889.50	66,389.50	90,346.40	3,093.79	.....	.....	13,618.22	.....	.....	.....
Total.....	\$15,388,375.69	\$1,967,623.60	\$17,355,999.29	\$4,914,745.97	\$1,010,969.24	\$684,678.60	\$451,176.18	\$236,320.33	\$1,045,636.29	\$198,886.17	\$182,331.87

Though the State and county indebtedness is small, the cities and many of the towns are heavy debtors. Not all of the towns have discharged their war obligations, and many of them have incurred new ones in furnishing aid to railroad enterprises. The cities have sometimes borrowed money for the same purpose, but

more generally to make local improvements, build sewers, bring in water, widen and pave streets, and the like. The aggregate indebtedness increased \$204,672 during the four years mentioned, and the era of borrowing seems to have come to an end. Great benefits have come from this large outlay of money, but it may be

questioned whether the expenditure should not have been made more slowly, and a larger portion of the sum required to make the needful improvements been drawn directly from the tax-payers at the time the expense was incurred.

It will be noted that the largest item, with one exception, among the State expenditures was for the support of the common schools. Connecticut has always been among the foremost States in establishing and maintaining a system of general education. The present system originated with the early settlers long before the union of the Hartford and New Haven colonies. A school existed in New Haven in 1639, and three years afterward an appropriation of £30 was granted to a school in Hartford which was then existing. The first code enacted by the Connecticut colony, which was in 1650, provided that every township of fifty households should appoint a teacher to "instruct all such children as should resort to him to read and write." A township of 100 families was required to maintain a grammar school. Subsequently, grammar schools were organized in each of the eight counties into which the State is divided, and land was granted to sustain them. In 1766 the towns were divided into school districts, and in 1798 school societies were created, which were invested with power to manage schools. This experiment did not prove successful, for the money granted to support the schools was not equally distributed, and the standard of education fell to a lower point. The system was afterward changed. All children from eight to fourteen years of age who are competent in body and mind must attend some public or private day-school at least three months every year. Of this period, six weeks must be consecutively spent in this manner, or else instruction must be given at home for an equal length of time in common-school branches. No child within this age can be employed in any business unless he has been taught for at least sixty days during the year preceding. School visitors are required to examine annually concerning the children employed in manufacturing establishments, and to report all violations of the law to one of the grand jurors of the town. It is also the special duty of the agent of the State board to require the observance of this law. The schools are supported by local taxation; by the income of the State school fund, with the addition of \$1.50 for each child from four to fourteen years old; by the income of the town deposit fund; and by that of any other town fund established or appropriated for the support of public schools. In order to receive their proportion of the public money, districts must have a suitable school-house, and must keep a record of all the children in the district between the ages mentioned, the place, year, and month of each one's attendance. The schools must also have been taught at least thirty weeks in districts with twenty-four or more children of school age. Any town neglecting or refusing to provide for the support of its schools forfeits to the State a sum equal to the amount which it was required to raise for this purpose. Elsewhere will be found an account of the school fund and the other means whereby the schools are sustained.

Not only has the State been solicitous for the education of the children living within its limits, but it has encouraged the habit of saving by providing safe places for the deposit of surplus money. Saving banks have been in operation for many years, and they are very numerous, and but few instances have occurred of mismanagement. The trustees have always served without reward, yet citizens have never been wanting who were willing to serve in that capacity and to devote the needful time to discharge their duties efficiently. The best citizens of the State have always been officially interested in managing these institutions. On Oct. 1, 1881, the total resources of these banks were \$84,243,135.46. Of this amount \$80,522,300.87 represented deposits, \$3,435,385.60 interest and surplus, and the remainder, \$284,448.99, other liabilities. The following statement

of the number of depositors and the amount deposited by them will show what a large proportion of the population are interested in the saving banks—a proof of their general good management and far-reaching usefulness.

Number of depositors having \$500 or less	176,963	
Amount of their deposits.....		\$21,705,964.19
Depositors having over \$500 and less than \$1000	24,915	
Amount of their deposits.....		17,236,940.10
Depositors having over \$1000 and not over \$2000	17,792	
Amount of their deposits.....		24,541,644.48
Depositors having over \$2000.....	5,696	
Amount due to them.....		17,037,752.10
Total number of depositors.....	225,366	

At this date, therefore, over one-third of the people of the State were depositors in these institutions, having an average deposit of \$357.70. The dividends declared during the year aggregated \$3,047,014, or a fraction over 4 per cent. The expense of managing this vast sum was less than one-third of 1 per cent. of the amount of the deposits. Four banks still exist under the State system, besides a considerable number of trust companies. All the other State banks adopted the national banking system, and their history is given under the article BANKING.

Though a large amount of the wealth of the State is invested in the manner described, no small sum has been expended in railroad enterprises, 958 miles having been built in the State by various corporations, whose capital stock on Nov. 30, 1881, was \$46,348,350. Of this amount, \$15,212,700 are held in the State. The funded debt of the railroads was \$19,316,378, and the floating debt \$5,349,515. The total stock and debt of these companies were \$71,014,243.65. There are three railroad commissioners, appointed by the governor and confirmed by the senate, who hold their office for three years, on whom considerable powers are conferred. The lay-out and location of railroads must be approved by them, also the place and manner of connecting with or crossing other railroads, the crossing of highways and water-courses, the construction of fences, cattle-guards, warning-boards, speed of trains, and the establishing of stations. Not only must the commissioners examine into the condition of the railroads, their bridges, rolling-stock, and property generally, but they are clothed with authority to make many recommendations to the companies, which it is expected they will heed. The railroads are required to make full returns annually of their operations and financial condition, and these furnish a basis for the tax which is levied on them. The amount of taxes paid for the year ending Oct., 1881, was \$479,818, and the dividends were \$2,575,071. Of this latter sum, \$1,550,000 were paid by the New York and New Haven Railroad.

Turning now to the agricultural interests of the State, it may be remarked that, like all the New England States, a large portion of the soil is not very productive nor very easily tilled. The Connecticut Valley, however, forms an exception, for there rich crops are raised and farming is a profitable business. Tobacco of excellent quality has long been cultivated throughout this section. In 1880, 8666 acres were devoted to this crop, and 14,044,652 pounds of tobacco were produced. The value of the crop in the hands of the producers was estimated at \$1,929,982. The cost of production per 100 pounds has been reckoned at \$5.25, and \$9.14 as the value of the product. The number of farms in the State in 1880 was 30,598, an increase of 20 per cent. during the preceding ten years. Of these, 27,472 were occupied by their owners, 1920 were rented for a fixed money rental, and 1206 for shares of the product. The minuter subdivision of the soil is an indication of better cultivation. The cereal production is small compared with that of many other States, yet is worth giving:

Crops.	Acres.	Bushels.
Barley	575	12,286
Buckwheat.....	11,231	137,563
Indian corn.....	55,796	1,880,421
Oats.....	36,691	1,009,706
Rye.....	29,794	370,733
Wheat.....	2,198	38,742

With respect to manufactures, those of Connecticut have long been noted both for their variety and value. In Litchfield county is the celebrated Salisbury iron ore, which has been used for 150 years. As early as 1734 a bloomery-furnace was erected near the location of this ore-bed. Fourteen years later another furnace was erected at the village of Lakeville in the same county, which was in active operation for many years. In 1768 it was sold to Richard Smith of Hartford. He was a royalist, and fled to England after the war of the Revolution broke out, but his furnace produced large quantities of cannon-balls, shells, etc., for the Continental army. Twenty-seven furnaces have been built and operated within a radius of thirty miles of Lakeville. "At the close of the eighteenth century Litchfield county contained fifty bloomery-forges making iron directly from the ore, and three slitting-mills. At the same time the county was so prominent in the manufacture of nails that only Plymouth and Bristol counties in Massachusetts, of all the nail-making districts in the country, exceeded its production. The iron of Litchfield county is now entirely used for foundry purposes, and most of it in the manufacture of car-wheels." The number of establishments in 1880 was 19, and the amount of the capital invested in the business was \$2,682,000; 685 persons were employed, their annual wages amounting to \$331,184, and the value of the products sold was \$1,998,698. During the year 38,061 tons of iron were produced.

In manufacturing firearms and ammunition Connecticut leads every other State in the Union, though Massachusetts is nearly as large a manufacturer. For a long period the former State has been engaged in this branch of manufacture. The ingenuity of persons thus employed for many years was devoted to making arms with exchangeable parts. By many this was regarded as impracticable. But long ago all difficulties were surmounted. It is stated that Col. North of Middletown in that State commenced the manufacture of pistols whose lock-parts were made so uniform that it was not necessary to assemble and fit them soft as had been the usual practice. Of the 38 establishments in the country when the last census was taken, 12 of them were in Connecticut, having a capital of \$8,315,289, employing 4579 persons, and paying in total annual wages \$2,560,089. The value of their products was \$5,618,636. Of the \$834,000 of capital invested in the manufacture of ammunition, \$724,000 is invested in Connecticut. The products for 1880 amounted to \$1,706,852.

Connecticut is extensively engaged in the manufacture of cotton and woollen goods, but from an early date she has taken a peculiar interest in the production and manufacture of silk. Legislation even so early as 1732 showed that the industry had already made some progress. The first coat and stockings made of New England silk were worn by Gov. Law in 1747; the first silk dress was worn by his daughter in 1750. Dr. Ezra Stiles, president of Yale College, began a long series of experiments in 1758 by planting three mulberry trees. He kept a record of the growth, treatment, and product of the silkworms, which has been preserved. The experiments were continued until 1790, and during this period Dr. Stiles liberally distributed seeds, eggs, and advice. "He was successful in planting mulberry orchards at New Haven and Mansfield, and laid the foundation in the latter town of an industry that lasted three-fourths of a century, and paved the way for the present silk manufacture in this country." From these undertakings the industry arose, and though periods of depression have occurred, yet in 1880 Connecticut ranked as the third silk-manufacturing State in the Union,

surpassed only by New Jersey and New York, and nearly approaching to the latter in the amount of capital employed. There were 28 establishments; \$4,436,000 of capital were invested in the manufacture; 3766 persons were employed, who received annually as wages \$1,026,530. The value of the products of these establishments was \$5,438,075.

To describe even briefly all the industries of the State would require many pages. The fishing industry, however, is worth mentioning, for 3131 persons were employed in it during the year 1880, and the capital invested amounted to \$1,421,020. The oyster trade forms a very prominent feature. New Haven, including the places in its immediate vicinity, is the chief point whence the trade is carried on. At the date last mentioned 1006 persons were engaged in the business.

During the decade from 1870 to 1880 the population has increased from 537,454 to 622,700. Of this number, 492,708 were native born, the rest, 129,992, were foreigners. The division by sex was—305,782 males and 316,918 females, an excess of more than 3½ per cent. of females. Classified by race, there were 610,769 whites and 11,547 colored persons. The voting population by counties was as follows:

	Native.	Foreign.	Colored.
Fairfield.....	21,970	9,260	625
Hartford.....	22,313	12,123	781
Litchfield	11,592	3,384	297
Middlesex.....	7,796	2,652	106
New Haven	27,326	16,725	1,043
New London.....	14,669	5,456	465
Tolland.....	4,949	1,914	61
Windham	8,132	3,498	154

(A. S. B.)

CONNECTICUT RIVER, the largest river in New England, rises on the borders of New Hampshire and Canada, flows in a general southerly course, and empties into Long Island Sound at Saybrook, Conn., in 41° 10' 15" N. lat. and 72° 21' W. long. Its Indian name, Quonektacat, means "Long River." Its source, 1600 feet above the level of the sea, is near the border of Coos co., N. H. One of its branches forms the boundary between Canada and New Hampshire to the 45th parallel of N. latitude. The main stream passes through Second and Connecticut lakes, after which it flows W. and S. W. to the border of Vermont, where it is 150 feet wide. Thence it flows generally S. S. W., forming the boundary between Vermont and New Hampshire and soon attaining a width of 390 feet. It flows through the western part of Massachusetts, being there from 450 to 1000 feet in width. It divides Connecticut into nearly equal portions; below Middletown its direction is S. E. Its entire length is over 400 miles. There are numerous falls in its course, the chief, in order from N. to S., being Fifteen-Mile Falls, White River Falls, Bellows Falls, those at Montague and South Hadley in Massachusetts, and at Enfield in Connecticut. The abundant water-power furnished by the falls is utilized in numerous factories. Several canals have been made around the falls, and boats of 8 tons burden can thus ascend the river over 250 miles. Above Hartford there are many bridges. The entire valley of the river is about 300 miles long and 40 miles wide. It is noted for its beautiful scenery. In the lower part the meadow-lands are annually overflowed, and thereby are rendered highly productive. The tobacco from these lands is especially noted. (See Vol. I., p. 122). The principal affluents of the Connecticut are the Upper and Lower Ammonoosuck, in New Hampshire; the Passumpsic, the Wells, White, Black, and Williams, in Vermont; the Deerfield, Westfield, Miller's, and Chicopee, in Massachusetts; and the Farmington, in Connecticut. The Connecticut was long noted for the excellence and abundance of its shad and salmon. In this century the latter disappeared and the former were greatly diminished in number. In recent years considerable success has attended efforts to reintroduce them.

CONNELLSVILLE, a borough of Fayette co., Pa., is on the Youghiogheny River, 57 miles S. of Pittsburgh and at the intersection of the Baltimore and Ohio Railroad, the Fayette co. branch of the Pennsylvania Railroad, and the Pittsburgh and the Youghiogheny Railroad. It is connected with the village of New Haven by a suspension bridge. It is the centre of a bituminous coal region, and its coke is unsurpassed in the world. It has 2 banks, 2 weekly newspapers, 8 churches, several schools, locomotive-works and car-shops of the Baltimore and Ohio Railroad, several foundries, a paper-mill, pottery, and a woollen-mill. Col. William Crawford, one of the first settlers here, was a friend of Gen. Washington, and purchased for him large tracts of land in this vicinity. The borough was incorporated in 1806. Population, 3609.

CONNERSVILLE, the county-seat of Fayette co., Ind., is on the Whitewater River and Canal, 60 miles S. E. of Indianapolis, on the Cincinnati, Hamilton, and Indianapolis Railroad, the Fort Wayne, Muncie, and Cincinnati Railroad, and the Whitewater Valley Railroad. It has a fine court-house, 3 hotels, 2 banks (1 national), 2 weekly newspapers, 5 churches, 2 schools, gas- and water-works. It has 2 flour-mills, 4 furniture factories, a knitting-mill, and a foundry. It was settled in 1814, and incorporated as a city in 1869. The property is valued at \$2,000,000, and there is a public debt of \$11,000.

CONQUEST. See ANNEXATION.

CONRAD, ROBERT TAYLOR (1810-1858), a Philadelphia dramatist and orator, was born at Philadelphia, June 10, 1810. While a student of law he produced a tragedy, *Conradin of Naples*, which was highly successful. In 1832 he became editor of the *Daily Intelligencer*, a paper which he afterwards merged in the *Philadelphia Gazette*. In consequence of ill-health he was obliged to give up his editorial labors, and resumed the practice of law. In 1835 he was appointed recorder of Philadelphia, and two years later was elected judge. He again returned to practice at the bar, and took a prominent part in politics, acquiring a high reputation as an eloquent and effective public speaker. His tragedy of *Aylmere; or, The Bondman of Kent*, became famous through the personation of the principal character, Jack Cade, by the eminent actor Edwin Forrest. After it had been performed several years it was published in 1852, together with several poems, including sonnets on the Lord's Prayer. In 1854, Judge Conrad was elected first mayor of the consolidated city of Philadelphia by the American party. He died at Philadelphia, June 27, 1858. In 1862 his *Devotional Poems* were edited by his friend, Mr. George H. Boker.

CONSCIENCE. (Latin—*conscientia*, from *con*, together, and *scio*, I know.) By derivation this word denotes *knowledge whose object or content is held in common*. At first its meaning may have been identical with *consciousness*; but, historically, the import of the latter word has moved towards a larger extent, while the application of the word *conscience* has been narrowing itself. *Consciousness* has thus become the name of the flow of experience, which is concrete in the individual subject. Its form is universal; its content is subjective-objective. On the other hand, the word *conscience*, in its historical evolution, has excluded from its range of application other forms of knowing and objects of knowledge, and always refers to those peculiar experiences which are now called *moral*. Its etymology implies that the transient or ephemeral in human knowledge has been sifted out, and that the imperishable *residuum* is a common human possession. But while the word *conscience* is often used in this large and loose sense, as covering all moral experience whatever, actual or discoverable, it is also used in a narrower sense by many systematic thinkers; and differences of opinion and disputes as to its application have been numerous. Of course under ethical systems radically distinct, the difference in the application of the term is likely to be more than verbal; yet even

here, perhaps, the word might be retained to indicate something held in common by the utilitarian, intuitionist, evolutionist, or even sentimentalist.

Every one must approach an inquiry into its meaning with certain preconceptions, with certain psychological notions. An endeavor must be made, therefore, to harmonize these preconceptions, to find some firm common ground whence to extend our outlook. We shall attempt, first, an analysis and description of moral facts, and then see how variously and to what different elements of this description the word *conscience* has been applied, and to what it is wisest and best to apply it. Even this may turn out to be a vain endeavor. The German philosopher Richard Rothe, in the revised edition of his *Theological Ethics*, excludes this term (*gewissen*) from his work, though in the previous editions he had attempted to describe it, declaring it to be "scientifically inadmissible, inasmuch as it is devoid of accurately determined logical contents, and is but a popular expression for the collective nature of man." Yet by showing the various senses possible for the term, and fixing a clear thought for each, we may see distinctly what we have to choose between and thus strengthen the right usage.

I. Under all ethical theories it is acknowledged that there is some rule or standard by virtue of which a man finds that a distinction between actions possible for his freedom, or seeming freedom, exists, in consequence of which he applies the words "right" or "wrong" to the two sides of some alternative. That all men make and think these distinctions all acknowledge, even though they differ entirely as to the ground or as to the origin of the distinctions themselves. Such a faculty, which apprehends, no matter why, whence, or how, this rule, standard, criterion, norm (whichever word may turn out to be the best to express it), whereby a distinction between actions actual or proposed is acknowledged, may have a name, and we will call it, provisionally, *x*. That it exists is not a reflective judgment. If a judgment at all, it is spontaneous, and that would bring up an inquiry as to its genesis. Such an immediate apprehension or spontaneous judgment is an *intuition*. If the word may not be applied here, to this direct envisaging, it is useless, and should be discarded altogether.

Whatever differences may be among intelligences, as to mental power or insight, there does not seem to be any difference whatever in this one respect, the consciousness and acknowledgment of the existence of a standard of comparison, any more than there is any difference in their perception by sense of distinctions in color. All are alike then in this respect; and the most untutored savage is as firm and undoubting in his apprehension as the philosopher, while they may absolutely contradict each other in asserting that this or that action is in correspondence with the standard. The acknowledgment of the existence of such a standard or norm is entirely independent of all questions as to its origin, and also of all degrees of clearness in the understanding of its content. These degrees are not in the apprehension as a relation, or as a mode of immediate soul-activity, but in that which is apprehended. The savage may only know it as an obscure feeling or presence, or he may have some thoughts about it. At the other extreme of intelligence, it may appear as a well-defined ideal state, to be reached at some point of future time, or possible to be reached. Since, thus, there are degrees in the distinctness of that which is apprehended, the growing, enlarging content of that which is intuited, it is evident culture and reflection may improve this insight. Under such discipline the mental gaze, though no more real, may become steadier and more penetrating and productive. In all concrete humanity the fluctuations of this object of the moral intuition are indubitable, inevitable, oscillating, retrograding, or progressive. It is a *fact*, as the changing flow of consciousness is a fact, and the resultant of the entire human

experience, and of all modes of soul-activity whatever. This consciousness, thus changeable as to the clearness or the fullness of the content of the moral norm, is manifestly quite another thing than the consciousness of the mere existence of a norm, and should have another name. As we called that x , let us call this, provisionally, y .

When, however, we undertake to scrutinize actions, actual or proposed, in order to pronounce them right or wrong; endeavoring, in order to understand the action, to discover the motive—*i. e.*, the purpose or end, the thing or state sought to be attained—and the motive spring, *i. e.*, the reason why we propose to seek it or attain it, then it is evident that we are engaged in a precise and definite inquiry, in a process in which there may be all degrees of skill and proficiency. This differing facility will depend largely upon the native or acquired ability to trace the results of actions, and to see whether they have been done or proposed with the foresight of these results, or with forecasting of some other result. Thus there will be, also, differing degrees of skill and proficiency in comparing the action thus described with the standard or norm, variant not merely with the understanding of the action but with the understanding of the norm, though the kinds of variation in the latter be few, while in the former they will be unlimited. That the proposed action is thus brought into relation with the norm, that the norm is held up before it to furnish the condition for judging it, is an activity not identical with x or y , and which we will call, provisionally, z . The acquired skill in making a correct and trustworthy judgment, derived from the three-fold sources of understanding (1) the action, and (2) the norm, and from the habit of bringing them into relation, and the mode of consciousness derived from and including this acquired skill, is another fact or condition, not identical with x , y , or z , which we will call, provisionally, m .

Again, we may note among men a difference in the propensity or the willingness to undertake this comparison, and hence degrees of acquiescence or satisfaction in the result of it; or degrees of avoidance of the contemplation of such result; that one is apt and quick to try his conduct, and that the other postpones or shuns the trial; that one accepts the decision and acts upon it, while the other turns a deaf ear and endeavors to escape it. These are differences in character which have their own origin and explanation, and are called by familiar names. In our description this is not identical with what we have named before, and so, in our symbolical language, we may call, provisionally, the disposition to make the comparison and to acquiesce in or avoid the results, n , and $n+$, and $n-$. Or we may seize the feeling which accompanies this act of going forwards or retreating, of seeking or shunning (for the feeling accompanies, and is not identical with the propensity, nor is measured by its degrees, and moreover has its own analysis and description), and indicate it as o , and $o+$, and $o-$; or we may abstract the feeling (not identical with that just referred to), which accompanies the discovery that the action done or proposed is in correspondence with the norm, of complacency, or in violation of it, of disturbance, and call it severally p or q .

These modes of consciousness which we have called y , z , m , and n , are not only not identical, but they do not run *pari passu* with each other; that is, the skill in tracing the consequences of actions, in coming to understand them more or less completely, and thus the attainment of results of value in making comparison with the norm, is not measured accurately by the degrees of propensity to make the comparison, nor even by the degrees of distinctness with which the norm and its implications are perceived; although these powers, propensities, and determinations must, of necessity, act upon and modify each other, helping or hindering. A man inclined to examine himself, and with whom the task of moral scrutiny has become

habitual, will indeed come to see the ideal standard more distinctly, and will grow in ability to make correct comparison of actions with it. Here is room for unlimited training. Not only may the will, the power of quick and persistent movement, be trained by such discipline, but the intelligence may be amplified by the search for and the use of favorable conditions, inasmuch that all knowledge whatever may help moral knowledge. And besides, the habit of obedience to the requirements of the moral standard or rule of action has the effect to lay the mists of prejudice, to calm the perturbations of the soul atmosphere, to clarify the same, and open out the distances, as well as to give an increased power of penetrating vision.

We have here appealed to observation, to the common unbiased human consciousness, and endeavored to describe the states, activities, facts, accurately, independent of any inquiry into their origin; without even claiming the existence of authority or using the word "law," in order to see if we could not reach conclusions admitted and valid under any, or independent of all ethical systems. Every conscious subject must compare his own with the consciousness of the past, as reported, and with that of his contemporaries, having faith more or less in the veracity of either, in the trustworthiness of human testimony. The utmost success that can ever be attained in the endeavor to penetrate the pre-historic period is the venturing forth of an hypothesis, which must undergo the trial to see whether it can be adjusted to everything else that we know. To attempt to discover the origin, and to trace the development without the clearest and fullest analysis and description of the developed and contemplated object, is an evident *hysteron proteron*. How accurately to make this description is entitled to be one of the first inquiries of the human mind: one essential to man's welfare, one to which men are driven by practical expediency or necessity, and which by no means can be postponed to take its place in a purely intellectual system. Men are urged to it by an impulse so imperious that it is no wonder that some have called it a *law* and others an *instinct*. The language invented by men at the early periods of their history, and under the *naïveté* of primitive conditions, before overmuch swayed or perverted by systems, or by mental prejudices, should be carefully noticed. The words *right*, *duty*, *obligation*, *remorse*, etc. (equivalents to all, or some, of which are to be found in all languages), exhibit a somewhat advanced stage of mental development, beyond which we have ourselves no whit proceeded. We have no intenser conviction of the truth of what is meant by these terms than those who invented them; though, indeed, very slowly light has been shed upon their implications, as they have moved out of the dim but unclouded twilight into the morning of sunshine, and storms, and obscurations. The theory of Mr. Herbert Spencer, that these intuitions, or spontaneous judgments and feelings, have been derived through tendencies to prudential or harmful actions, slowly strengthened or weakened, modified and inherited; or the theory of Prof. Alexander Bain, that they are inferences and habits of thought engendered by the existence of authority in the family and the social structure; these are theories which, if claiming to be sufficient, can never be proven, though there may and must be elements of truth in each which give them plausibility. The failure of either to account exhaustively for our entire moral experience is conspicuous. Whatever be the origin and the history of our moral consciousness, the existing condition of the same has as good, nay, a better right to be considered as valid and true than any prior condition, could the latter be fully recovered and examined. Indeed, the more advanced the development, the easier to discover the meaning, to conjecture the final cause, to forecast the possible end to be reached. It is the end or result to which the human race is tending which alone can give us the key to un-

derstand its present or its past; and of this no one is more convinced than the philosopher of evolution. The category of "final cause" is implied and acted upon in the very attempts made to disprove it by those who deny it.

II. Supposing then our observation of the moral consciousness to be so far correct, and our analysis and description complete enough for the purpose, how shall we apply the word *conscience*? To what determination of consciousness, to what faculty or mode of soul-activity, to what judgment, sense, or feeling shall we adjust and confine it? Or shall we use it in an inaccurate and clumsy way, to be so wondrously elastic as to mean any of these, or all of them together? Before making this endeavor one truth must be recalled and pronounced. Conscience, as a concrete faculty, state, or fact, cannot be found to be merely a mode of knowing, or a mode of feeling; it cannot be either, the other being abstracted, but must be both, for there is no divorcing knowing and feeling. The very attempt to make the abstraction is vain. In applying the term *conscience*, then, we must be prepared to give it as a form of knowing, a mode of activity, inseparably accompanied by, enveloped in a form of feeling. As the former grew out of the latter it never loses the trace of its birth.

After all, the popular use of the term may be the wisest and truest, the most in accordance with the naïve notions in which the word originated; therefore entitled to be adopted by the most profoundly thinking philosopher. And surely the most frequent use of the term, and the essential element implied, even when it is used in a looser sense, is to denote that mode of soul-activity which we have denominated *z*; that is, the active process of comparing the action done or proposed with the norm to discover whether it will meet the test of conformity to its requirements, thus to form a judgment. This process includes, of course, the completest possible understanding of the action itself: (a) in its purpose, or motive, or end; (b) in its motive-spring, that is, the reason why such a purpose is set; (c) in its tendency or results so far as they can be traced, and (d) the clearness or certainty with which such results have been or can be perceived by the doer. The making of this comparison becomes facile, and increasingly successful from habit; since, thereby, from frequent and constant scrutiny the norm itself, the law, the moral ideal is by degrees illumined, and comes to be more clearly and fully understood.

If *conscience*, then, be used to denote the activity of the soul in making such comparison to reach a judgment therefrom, it would seem that there will be many degrees of ease and success in this endeavor, arising from various causes, and thus, with this signification, it will be true that conscience may be trained, cultured, and improved. This legitimates the familiar use of such epithets as "a blind conscience," "a seared conscience," "a dull conscience," etc.

At first sight this might be taken to be the use of the word by Kant when he calls it "man's practical reason, which does in all circumstances hold before him his law of duty in order to absolve or condemn him," for it would seem that in order to absolve or condemn him it must have knowledge (1) of the action, and (2) of the standard of comparison. Yet this sense of the word "conscience" is not that indicated by Kant's other words shortly following: "An erring conscience is a chimera, for although in the objective judgment whether or not anything be a duty, mankind may very easily go wrong, yet, subjectively, whether I have compared an action with my practical (here judiciary) reason for the behoof of such objective judgment does not admit of any mistake; and if there were any, then would no practical judgment have been pronounced. He who knows within himself that he has conducted himself agreeably to conscience, has done all that can be demanded of him relatively to guilt or innocence. His obligation can extend only

to the illuminating his understanding as to what things are duty, what not. But when it comes to the act, or when a man has acted, conscience speaks inevitably. We cannot for these reasons say that a man ought to obey his conscience; a case where he would require a supplemental conscience to control, and take cognizance of the acts of the first. The only duty there is here room for is to cultivate one's conscience, and to quicken the attention due to the voice of a man's inward monitor." In all this the word seems to mean simply the holding up the standard for comparison, and condemning or acquitting thereby. If, however, it mean only this, as before, how can it condemn or acquit unless the action be understood? If it be misunderstood, then conscience may go wrong in its acquittal or condemnation. So, too, if the norm itself be imperfectly or wrongly apprehended. Kant's "conscience" is thus a purely subjective thing, even though the moral idea or law be objective and universal; and not to "err" means only to be true to its subjectivity, which, however, by his own acknowledgment, may be quite other than the objective "conscience" of the universe. This use of the word can never be adjusted to popular thinking, and it is not a necessity or an aid for philosophers so to use it.

The propensity to use it in this sense is to be found among all intuitionists of one class (those who hold *good* to be a simple idea), and all sentimentalists, believers in a *moral sense*, whether simple, or derived and compound. The immediacy of most moral judgments, and the acknowledged unerringness of many judgments, strike these philosophers so forcibly that this, the ready word, is seized to indicate and express it; and hence the conviction "conscience cannot go wrong." But inasmuch as there are wrong moral judgments (which even these philosophers confess), the word in such case comes to be inadequate, lacks universality of application; and the task of accounting for such judgments is for them more difficult, requiring a circuitous phraseology, than for other classes of philosophers—the utilitarians, or those rational moralists who hold *good* to be a complex idea; who therefore are rather inclined to use the word in the sense first indicated.

III. To give here the exact sense, as used by every, even distinguished, author, would be impossible or needless. But we can indicate the use in the great representative systems, as modified in its meaning more or less, by the essential peculiarities of such system. We shall therefore briefly advert to (1) the system which holds to a moral sense (Shaftesbury, Hutcheson); (2) the system of instinct (Adam Smith); (3) the autonomic system of Kant, and its supplement by Fichte; (4) the system of pure intuitionism (Price, Calderwood, *et al.*); (5) egoistic hedonism (Hobbes, Bentham); (6) altruistic hedonism (Mill, Sidgwick, *et al.*); (7) the theory of Prof. Bain; (8) evolutionism (Herbert Spencer); (9) those rational systems which hold *good* to be a compound idea, and give various definitions of it (Malebranche, Jouffroy, *et al.*); and (10) a possible eclectic system which aims to detect, preserve, and combine the elements of truth in each and all of the foregoing. Besides this we shall advert to the views of certain great writers among the Greeks, and the moderns, and to the modification of the idea expressed by the word in Judaism and Christianity.

The view advocated by Shaftesbury, Hutcheson, and others, the phraseology of which is frequently met with in unsystematic writings, which holds to the existence of a special sense, called the *moral sense*, acting with the precision and unique application of the physical senses, may and does call this sense, or its activity, by the name *conscience*. Bishop Butler has been accused of holding this view, but it is easier to interpret his language as implying a rational solution. The system of Hume, too, which is a compound of utilitarianism and sentimentalism, acknowledges that the discovery of the utility of an action, or the opposite,

appeals to a particular capacity of feeling which can thus be affected agreeably or disagreeably. If the word "conscience" is used under any of these systems, it must always mean the sense itself as a capacity, or potentiality, or as an activity.

If the refutation of this theory of a moral sense be accepted, as showing that good and evil are not thus infallibly detected, and that differing moral judgments cannot be accounted for thereby, of course the correctness of this use of the word can no longer be maintained. The ease and quickness with which moral judgments are formed in most cases, the intense conviction of their truth, and the almost universal acquiescence in the same, indicating both a uniform standard of comparison and an entire agreement in the understanding and definition of the action judged, all this shows that a habit has been formed, inherited, and cultured, of judging with such alertness as to elude the ordinary unphilosophic, or even the philosophic, consciousness; that the actual process, discoverable by patient analysis, has been slipped over, and the whole state or activity wearing thus the appearance of spontaneity, has come to be called a sense in action, or by others an immediate intuition.

The above criticism will apply also to the system of Mackintosh, who differs from the writers just named only in his endeavor to trace the origin of this same moral sense or conscience, looking upon it as a derived and secondary sense, the result of the association and mutual modification of many attractions and aversions.

The system of Adam Smith seizes the altruistic instinct, sympathy, and endeavors to show that in judging the conduct of others we are governed by a preponderance of sympathy; and that in judging our own conduct we hypostatise the common sympathy, as that of an impartial spectator, who thus judges, and acquits or condemns us. *Conscience*, with him, then, is the feeling of sympathy, in minimum or in overplus, thus fortified by the general sympathy. The conspicuous fact that we sometimes judge an action to be right or wrong when the general sympathy is entirely the other way, shows that Smith has overlooked the true criterion, and that the system does not give a correct account of moral experiences, and, therefore, our term "conscience" cannot be legitimately applied to any such phantasmal process; nevertheless, had Smith pushed his examination somewhat deeper, and scrutinized more closely this wonderful fact of sympathy, and discovered that it implies the organic unity of the human race, and in a lower sense, but one no less real, the unity of all animal life, he might have reached an important and essential element of the ultimate and eclectic system of ethics: a sort of mediating principle between utilitarian and intuitionist schemes.

We have already alluded to the function of conscience as given by Kant, which consists in holding up the Categorical Imperative, the Will's own legislative and judiciary norm. But if, as his critics assert, this is a form without content, and we are still left without the means of making absolutely trustworthy moral judgments, the function of *conscience* is too much narrowed, and we insist upon having the word for other and more valuable and indispensable use. All this does not ignore the important service done to moral philosophy by Kant, which consisted in giving, even in its autonomic form, a kind of objectivity to the moral idea, making it to be something more than a means to the end of individual happiness, making it an end *per se*. Thus with him it becomes the presupposition and basis of all speculation upon the supersensuous, and hence also of rational religion. With him the universal validity of the moral law became the formal principle of morality. Its material principle, the exhaustive content of the moral idea itself, he did not set forth, though hovering always on the edge of the solution. Hence the possible or seeming inconsistency in his use of the word "conscience" to which we have referred above.

Fichte endeavored to supply the material principle to the Kantian Ethic, this principle being the assertion and endeavor after absolute self-dependence, hence an end to be approached by an infinite process. But this looks like the denial of any moral organism, seems the very extreme of individualism. The conditions for a true ethic exist not, and the common instinct of men recoils from this absolutism of the individual subject, as the very contradiction of the moral idea. *Conscience* with him, then, would be the immediate feeling of harmony between the natural tendency and this tendency to absolute freedom.

The system of pure Intuitionism, which was first in England carefully formulated by Richard Price, not illumined by Reid, but confusedly reuttered by Dugald Stewart, has reached its clearest expression in Prof. Henry Calderwood. With him "conscience" is "that power of mind by which moral law is discovered to each individual for the guidance of his conduct."

"In discovering to us truth it is seen to be a cognition or intellectual power. Either it does not discern truth, or if it does, it is not a form of feeling or combination of feelings or affections or emotions or desires." Thus, in discovering law, "it has authority over all other springs of activity within us." . . . "From its very nature it cannot be educated." Now this language of Calderwood, though seeming precise, yet may be thought to be otherwise, provided the correctness of our analysis in the early part of this article be admitted. At one time his words seem to make *conscience* identical with the intuition of the criterion, standard, moral idea, which we named provisionally, *x*. In asserting, however, that it has authority, which authority may be recognized, he seems to be inconsistent with his other assertion that it is not a form of feeling, for the recognition of such moral law contains within itself complacency, satisfaction. The judgment cannot escape from this transfused feeling. With this omission rectified, however, the word "conscience" would be used to indicate an acknowledged fact or experience, and such use would not be, and could not be, false.

With this class of philosophers, as with the believers in a moral sense, it seems so self-evident that men know so certainly that some dispositions and acts are wrong, and certain others right, that they feel justified in asserting that "conscience, from its very nature, cannot be educated." But the utilitarian is quite as well convinced, and another class of intuitionists is also convinced, that such discoveries cannot be so easily and infallibly made; and that while agreement might be reached in affirming what sort of character, disposition and activity in a perfect ideal state would be right, would meet the approval of mind and heart, would be acquiesced in by the spontaneous moral judgment, which in that case would also be identical with the æsthetic emotion; yet that when actions in the mixed and imperfect state are scrutinized, a judgment of them trustworthy can be formed only as we are fully and unmistakably acquainted with their motives and their motive-spring, and are able also to trace their consequences, and therefore that no such unerring judgment of every concrete action as is claimed for conscience is actual or even possible. Therefore it may be questioned whether it is wise to use the word in the sense under examination, seeing that it can have universal application and true validity and objectivity only under the presupposition that we are or can become perfectly acquainted with the character of the action, and also with the requirements of the norm. The system which prefers this use of the word does not furnish mankind with what they want most, an unfailing rule of action. Perhaps no system can supply this. But that one is preferable which does not leave us in a fixed and helpless state, sometimes searching after intuitions which do not come, or their phantasms which deceive us; but shows us some mode of approximation towards the perfect

knowledge which still eludes us, and makes applied morality a work of progressive induction rather than of precise deduction.

This is the claim and the endeavor both of utilitarians of the altruistic kind and of the other class of intuitionists. Not all utilitarian writers have been careful in the use of the word. Some have been quite willing to use the phrase "moral sense," meaning thereby a form of feeling, which may be called reverence for moral distinctions or for one alternative of the same, acquired from foregone experiences of utility. Sometimes the pain-giving power of conscience has been recognized, and made the prominent thing in its definition and use. Utilitarians are very little given to use the word to indicate any kind of knowledge, or any form of knowing. The discovery that certain actions in their results are pain- or pleasure-giving, and therefore that prudence counsels or warns, is not by them called "conscience." The word "obligation," which implies a law superimposed and made known, does not usually find place in utilitarian systems; though a form of that solution is quite possible which can consistently use both words, and in the highest sense ever claimed for them. Ordinarily, however, among this class of writers, the word "conscience" is not used to indicate the relation of an action to a superimposed law, but to mean a feeling of content or discontent with the actual as compared with some ideal or state desirable for the individual, or the community, or mankind in general, which has been set up as possible to be attained. This will be the customary use of the word in both forms of hedonism. The use of the word, then, will be correct so far as it goes. Its inadequacy still arises from the grave fault of most utilitarians in misapprehending the norm. Hence the system which relies upon its ability to trace the consequences of actions in order to discover their moral quality, finding that in the search it soon plunges into darkness, confesses that it cannot supply an adequate guide for human conduct, which must still stumble on, often in the gloom.

With Prof. Bain, conscience is a power gradually manifesting itself in the individual consciousness from observation of the government without us, parental, civil, religious. The fear of encountering pain, the desire to win complacency and kindness from those having power over us, is at length supplemented by the discovery of the young mind that the punishments and rewards of those in authority are bestowed or threatened wisely and for ends subserving the general welfare; and thus the child acquires not only a standard of comparison, but the feeling of dread or satisfaction. This intelligence, thus gradually expanding, with the accompanying feeling, is "conscience." It is evident, however, that this conscience thus formed in childhood cannot continue to meet the test of matured knowledge, unless it appears that the authority is wisely used, and does subserve the general welfare. And thus, to be logically self-consistent, this theory must merge into or be supplemented by the utilitarian, and is liable to the same criticism. However, this endeavor of Prof. Bain to show the rise and growth of the moral intelligence contains important truth. That the existence of authority external to us does afford the stimulus of the young mind to examine the moral idea within itself, to make its outlines start into light and display their ramifications; that this is the way not only that every child has been educated, but the way in which the human race has been educated, is precisely the teaching of the Jewish and Christian Scriptures, and the key to understand their progressive moral utterances.

The theory of Mr. Herbert Spencer is very subtle and very ambitious, and is woven into his general philosophy of evolution. In the early periods of the history of the human race the discovery of the beneficial effects or mischievous results of certain acts, to one's self immediately, or to others immediately, and

thus to one's self mediately, generates habits of doing or avoiding such acts, of seeking or shunning opportunities of doing them. The accompanying feeling of attraction or repulsion grows stronger by use. The habit and the feeling are transmitted to the succeeding generations, acquiring minute and incessant modifications, till all memory of its origin is lost; and the man comes to think that this thing is to be done, and that to be avoided, he knows not why; so that it has become an instinct, and has the immediacy of appetite, or acts like a sense, or seems an intuition. This spontaneous proclivity or avoidance then may be called "conscience." Really it is made out to be a judgment, of the conditions for which the mind has lost all trace, till it attempts by difficult and almost hopeless thought to recover its obliterated history.

Though this theory cannot be proven, it may be made probable. It may be accepted as hypothetical history without misgivings. But it is not exhaustive, it will not account for all of our moral experience. This possible evolution may have served the same purpose exactly as Prof. Bain's "education." It has been the occasion, and has furnished the stimulus to the infant human race to look within. It has made it sure that actions are not indifferent, and caused it to betake itself to the task of introspection in order to discover what kind of actions, and what dispositions or character will meet its ultimate approval. The soul has found itself possessed of egoistic and altruistic instincts. Life requires that these shall be mediated somehow, reconciled, and harmonized. This can only be done by comparison with a represented state or condition, carried as far into the future as the intelligence will allow, and which owes its birth to imagination; that is, to the soul's self, kindled to the fullest intensity of its power, and transfusing itself into that ideal state which can alone satisfy all the requirements of being, intellectual, physical, ethical, and, in the harmony of all, æsthetical.

Even under this derivative theory of morality, then, the word "conscience" can be legitimately used to indicate correspondence or contradiction of an action with the preconceived norm, the imagined ideal state. But, alas, the ideal state that hovers before Mr. Spencer's vision, of improved and harmonized instincts, is impossible in this world of tempests and agonies. Hence the endeavor to contemplate something so shadowy, to which the onward march of necessity, of molecular action, is carrying us, leaves us in a pessimistic frame of mind; and we cannot help thinking that it is the grimmest of self-mockeries to think that we are free, when we are not, and to take any pains in the matter.

While the one class of intuitionists who hold the idea of *good* to be simple show a preference to use the word "conscience" to indicate the soul's possession of a norm, and the inevitable approbation or condemnation of an action resulting from the comparison; the other class, who hold *good* to be a complex idea, giving various definitions (Wollaston, Clark, Montesquieu, Malebranche, Wolf, Jouffroy, *et al.*) show a disposition to use it to mean the process of comparison of the action with the norm, where the approbation or condemnation, though sure, and having authority, yet is not unerring, but may be susceptible of all-degrees, and various kinds of improvement. It is not necessary to criticise the various attempts at explanation of the moral idea given by these authors; the definition of conscience we have given will hold good for any or all of them.

An ethical system is possible and to be desired which shall bring together into a consistent whole the ineffaceable aspect of truth, the imperishable element in each of these systems we have brought up for brief inspection, and which has given to it its vitality. It may seem strange that the human intellect has not succeeded yet in doing this, though haunted by a sense of its possibility. Were the task accomplished,

it would still be a question whether to retain the use of the word "conscience," or to reject it with Rothe; and, if retaining it, to what mode of consciousness strictly, consistently, and uniformly to apply it. Perhaps the safest and wisest course is to use the word to indicate the intelligence displayed in comparing an action with an ideal standard, together with the accompanying feeling, of complacency or its opposite, elicited by the comparison. This ideal exists. The endeavor to account for its origin and development has given rise to such schemes as those of Adam Smith, and Bain, and Spencer. The endeavor to account for the immediacy of its apprehension has given rise to pure intuitionism, and the notion of a moral sense. The endeavor to analyze the ideal itself gives rise to utilitarianism. The success of this endeavor has not been recognized, the analysis is thought to be superficial and unsatisfactory, probably because for the most part utilitarianism has been fettered or blinded by what is called the philosophy of empiricism.

The idea of the *good*, the attitude of the reason towards which is expressed by the word *obligation*, still awaits analysis and reconciliation with the ultimate philosophy, with the Ideal Realism which is gradually constructing itself out of the imperishable masses or fragments of truth contained in previous systems, and all the labors of the past will be found to have cleared the way and simplified the problem, bringing more and more distinctly before us for intensest scrutiny the unique experience, called moral, which no philosophy has been able to think away. Whatever be the result of this scrutiny, that complex, far-reaching, and many-sided experience will, either in its totality or in one of its essential elements, continue to be called by the name—"conscience."

IV. To know the exact sense in which this word, or its equivalent, has been used by every notable philosopher, from Socrates and his predecessors downward, it would be necessary to reproduce their thought. We can only mention a few representative names to indicate such actual variations of thought as have corresponding uses of the word.

In Socrates we find a number of moral rules, with no attempt to exhibit their unity. Morality consists in subordinating the sensual to the rational, and *conscience* would be the faculty detecting the degree of subordination. His ideal standard is that of a well-ordered civil state, and is lacking in universalistic conceptions. With Plato, virtue means both wisdom and strength, and shows itself in these, and in manliness, temperance, and justness. It requires for its field, however, the community life, the state. Only as a citizen, and as contributing to the perfection of this organized machine, can the individual realize true morality. Thus the lower classes cannot be fully developed. They exist only for those above them. Plato's system does not do justice to the category of the individual, and his ethic is devoid of universalistic conceptions, and what we call moral obligation is not comprised in it. With him, conscience must mean the faculty detecting correspondence of action and character with his definition of true wisdom and virtue.

The idea of the state, of the moral community life, appears again in Aristotle, and is still more profoundly treated. There is no recognition of humanity as a moral whole. Virtue is still to be had by the free citizen alone. There is, however, in Aristotle a clearer recognition of moral freedom than in Socrates or Plato; hence, that knowledge and practice do not always go together. The facts of dereliction, accusation, and condemnation would, therefore, receive greater emphasis, and this function of conscience be more clearly seen, and somewhat more dwelt upon. With the Greeks in general, however, even in the most ideal systems, morality is the product of a wise and rational calculation, thus a form of utilitarianism, and something quite other than the Kantian ethics. Very little stress

is laid upon the judiciary function of conscience, for the reason that the sense of sin, of moral discordance was not deep, and hence the feelings arising therefrom, though existing, and not entirely extinguishable, yet were weak, and not distressingly painful.

In Epicurism, with its tendency to the external, to an ideal of joyous voluptuousness, and in Stoicism, with its tendency inward, its pride and intense self-satisfaction, its ideal of spiritual strength, of course, *conscience* would vary in its signification accordingly; and a man's failure to reach the one end or the other, would inspire in the one way of thinking *pity*, in the other *contempt*; and the work of conscience would be narrowed down to this. Both systems are still only forms of selfishness.

All the functions of conscience, and all the elements of any possible moral experience, short of the Christian, make their appearance in the ethics of Judaism. Here the element of feeling receives great intensification. While, to be sure, the standard or criterion appears as a positive, objective, historically revealed law, such as parents set forth to their children, and is gradually adapted to their advancing intelligence, still there is taken for granted all the while its coincidence with the inward norm, and no contradiction between the same is thought possible. Strictly and scientifically speaking, conduct and character are *moral*, only as they are compared with the inner norm. Their relation to the outwardly propounded law is more correctly termed *religious*; as coming under the same head with ceremonial observances prescribed by positive enactments, they are part of a *cultus*; which, however, may be a means to an end properly moral. Conscience, then, in Jewish ethics, may and does usually mean religious conscience, the intelligence contemplating the relation of the action to the external law.

In Christianity the absolute coalescence of morality and religion is proclaimed; which, however, does not mean that the first exhausts the significance of the second, but that it finds its ground in it. The New Testament writings contain an ethic so profound that all the labors of Christian moral philosophers have been needed for its display and elucidation, and the vindication of its absolute rationality. If the result of human labor in pure ethical science shall succeed in exhibiting the identity of the ultimate moral theory or solution, comprising all its facts and implications, with that which underlies the Christian consciousness, it will be proof that the highest achievements of human intellect were by Christianity anticipated, and thus men be led to conclude afresh, and on profounder grounds than ever, that it is a revelation indeed.

The labors of Bishop Butler in moral science deserve high commendation. Under other names his investigation goes to establish, by careful observation, the "predisposition to good" and the "bias to evil" in human nature,—the conclusion reached by Kant,—and his definition of "conscience" is coincident with that we have approved above, "a principle of reflection in men, whereby they distinguish between, approve and disapprove their own actions," which alone should cause him to be reckoned among rational moral philosophers, and not among sentimentalists; for his use of the phrase, "a principle of reflection," implies a rational standard of comparison. He did not, however, set himself to analyze the moral idea, nor to investigate its origin, or the *modus* of its development.

It is hard to find a system of ethics in Hegel. Freedom and necessity are, indeed, different aspects of a concrete whole, but with him self-determination is so thought as to appear rather self-necessitation than what we ordinarily call *freedom*; whereas most moral philosophers hold to the naïve sense of the latter word as a primary of thought, and therefore not to be abandoned. Yet, in holding that in the family and the state human personality rises into higher definitions, we have in Hegel the material principle of altruistic morality implied, though it does not clearly appear

that he took the further step of regarding the Church, the true ethical commonwealth, whose very idea is universality, as alone affording the ultimate definition and reach of personality. Hegel seems to use the word "conscience" as the faculty detecting contradiction to the principle of abstract right, which is, the assertion of one's own personality and respect to the personality of others; hence shows itself at the appearance of the Bad; a use easily adjusted to the adopted definition.

Cousin and Jouffroy use the word in the sense we have given.

McCosh treats the subject of Conscience with great vigor, using the word, however, in a larger sense than we have indicated as preferable, making its function not only to reveal the moral idea as law, but also to judge of actions as conformed to it, and laying great stress on the emotions which may accompany it, which may become something powerful and fearful.

Compte bases his ethical theory upon the idea of the family, the true social unit, and it is not a theory of personal conduct according to which each individual is a separate factor. But as actions originate with the individual, there must be a law of such personal action. We find in Comte much morality, but no moral philosophy. With him, however, conscience would mean the agreement or disagreement of actions with the rationalized social sentiment. Thus, in spite of his denial of "introspection," and disclaimer of the need of a psychology, the final reference is to the acquiescence in the æsthetic demand, for which this rationalized social sentiment is only another name. Thus the clear truth peers up and shows its face under the cloudy verbiage of any or all systems. (J. S. K.)

CONSCIENCE, HENDRIK, (1812-1883), a Belgian novelist and poet, born at Antwerp, Dec. 3, 1812. His father was a Frenchman, who, after long employment in naval affairs under the First Empire, had removed to Antwerp, where he became a speculator or trader in the construction and purchase of ships. Conscience received very little care and education in early life, but was a great reader, and became an instructor at the age of seventeen. Immediately after the Belgian revolution in 1830 he enlisted in the army, and was soon known as the soldier-poet, his patriotic songs, written in French, being on every tongue. He rose to the grade of sergeant-major, and was honorably discharged in 1836. His father, incited by an unkind stepmother, treated him very harshly, and, thus estranged from his family, it was with difficulty that he could gain his bread. He was obliged to take whatever work he could get, and was at different times and in rapid succession gardener's boy, register of an art-academy, employé in the department of archives—anything for a livelihood. In 1845 fortune seemed to smile on him; he was appointed assistant professor in the University of Ghent and tutor to the children of King Leopold in the Flemish language and literature. A little later he was commissioner of the arrondissement of Courtrai. Incident to the Belgian revolution there had been a growing desire among scholars to restore or reconstitute a Belgian literature, which, in union with the Catholic Church, should be opposed to French ideas and the *libre-penseurs* of the eighteenth century. Conscience devoted himself to this service, and saw in it the restoration of the ancient glories of his country. His first important work, published at Ghent in 1837, was *The Year of Miracles* ("In het wonder jaer"). It presents in a spirited series pictures of the former days when Spanish tyranny was confronted and resisted by Flemish daring and love of liberty. Somewhat crude in its handling as a first effort, it was well received by the public, but increased the anger of his father, who did not wish him to pursue a literary career. The estrangement was now complete, and he was in very straitened circumstances when, through the agency of his friend Wappers, a painter, he received a small grant from the king which enabled him to continue his literary work. In the same

year (1837) he published *Phantasia*, a volume containing Flemish poems and legends. In 1838 appeared *The Lion of Flanders* ("Leuw van Vlandern"), or the history of that Robert de Bethune who resisted Philippe le Bel of France and succeeded in establishing his power as count of Flanders. Having thus laid the foundation of Flemish claims in history, Conscience employed his pen in portraying more modern times. His descriptive novels are very numerous; between 1839 and 1845 he wrote *Evening Hours*, *The Executioner's Child*, *The New Niobe*, *The Conscript*, and *The Poor Gentleman*. In 1845 appeared his *History of Belgium*, written from the ancient chronicles. In 1846 he wrote *Hugo de Craenhoven*, *Quintin Matsys*, and *Some Pages from the Book of Nature*; in 1849, *Jacques de Artevelde*; in 1851, *Rosa, the Blind Girl*. As all these are in the Flemish language, and are considered as protests against the French, while they were at once translated into English, German, Danish, and Italian, it was not till very lately that they have appeared in French versions. In 1858 his *Mémoires* were published in the *Revue contemporaine*. Among his latest works were *The Road to Fortune* (1870), *The Lost Glove* (1872), *The Pale Young Woman* (1872), *The Blue House* (1874), *The Substitute* (1875). Not only in his avowed histories, but in many of his novels, he was an historian, so that whoever would read the history of Flanders must have recourse, in part at least, to the varied and patriotic works of Henri Conscience. He died at Paris, Sept. 11, 1883. (H. C.)

CONSCIOUSNESS is the name of an inward state and of an inward activity. It is the condition of all other inward states and activities, and is inseparable from them except in abstraction. There are no feelings or perceptions which are not conscious feelings and perceptions. On the contrary, it is only in virtue of their possessing the attribute of consciousness that they become real feelings and perceptions. Consciousness, as a state, is thus the common attribute of all particular internal states, but is to be completely identified with none of them. On the other hand, there is no consciousness except in and through particular internal states. Consciousness is therefore the common state of all internal states. It is with reference to them, as the one in the many. Such a relation is, and can only be, ideal and organic. And, like all organic relations, it can exist in the form of a state only as the result of a sustained process, by which its existence is actively maintained.

Considered, now, purely as a state, and without reference to the active process on which the state depends, consciousness is absolutely *sui generis*, and hence incapable of being defined. It "coexists invariably" (in the language of Prof. Wundt) with physiological processes and states, on which it is functionally dependent. In the lower animals it exists in germinal and implicit, rather than in explicit and developed, form. Their internal states are predominantly particular, immediate, and objective. In other words, their psychical life is pre-eminently absorbed in the sensations of the immediate present. The "common state of all states"—to repeat the phrase by which we have described the state of consciousness—is mostly lost in the shadow of the immediately passing and more vivid particular states. But its real, implicit presence is indicated by facts which prove that brutes have the power of memory and some power of reflection. For memory and reflection are impossible except where various internal states are held together by a common bond, such as the state of consciousness.

What is thus true of brute consciousness is also true concerning the lowest and earliest phases of human consciousness. But with increasing maturity and reflection consciousness acquires a definiteness and a degree of development whereby it is revealed in a character corresponding more exactly to the etymological meaning of the word itself. The word means co-knowledge. It denotes a knowledge that accompanies another know-

ledge, and has this latter, as well as itself, for its object. I may, for example, be thoroughly absorbed in the contemplation or investigation of any object, and then all my thoughts and perceptions will be related to and suggested by the object. The conscious state will still be present in form, but reduced to a minimum in intensity. But now, by a distinct act of reflection, I may become expressly aware that I am having the aforesaid thoughts and reflections, that they are all *my* mental possessions, that they all cohere or are associated in *one* field of living mental vision which is exclusively my own. The express form and nature of my knowledge will now be *conscious*. It will be a knowledge whose object is the thoughts and perceptions which just before engaged all my attention, together with the knowledge of their being livingly united in one mind or "consciousness," which is exclusively my own. This act of knowledge is an *act* of consciousness. This act is at once reflexive and objective. Consciousness as a *state* represents, as above indicated, the aspect of unity in the multiplicity of particular internal states. In the *act* of consciousness this unity, in the form of a cognitive activity, is aware both of itself (reflexively) and (objectively) of the particular states or acts which are comprehended within it. It is at once self-consciousness, or subjective consciousness, and objective consciousness.

The theory of consciousness is of decisive importance for the theory of knowledge; and so for the theory of Being (ontology, the science of the real object of knowledge). In this relation the conception and the theory of consciousness are especially a modern growth. The tendency of nominalistic sensationalism—notably in Great Britain—has been to regard consciousness exclusively as a state, or rather as only a name for the indefinite sum-total of all individual internal states. Thus viewed, it is like a moving panorama, which reveals itself and nothing more. The real object of knowledge (especially the "external world") and the real subject of knowledge (the Ego or Self, or knowing mind) are in this way beyond knowledge, and the resulting philosophical doctrine is Subjective or Sceptical Idealism, or Phenomenalism. Kant demonstrated that the state of consciousness is essentially dependent on a synthetic activity, whose highest form and indispensable pre-condition is explicit or implicit self-consciousness. The successors of Kant found in the triadic law of the process of self-consciousness—whose terms are Subject, Object, and the living organic Synthesis of Subject and Object—the law of all intelligence and of all the objects of intelligence.

The Greek etymological equivalent for consciousness (*συνειδησις*) occurs but rarely, and only in works belonging to the later phases of Greek philosophy. Contributions of no slight consequence were nevertheless made by the ancients to the comprehension of the subject under other names. (Cf., for example, H. Siebeck, *Der Begriff des Bewusstseins in der alten Philosophie*, in the *Zeitschrift für Philosophie*, vol lxxx., No. 2, 1882.) The Latin word *conscientia* was in far more prevalent use, but especially in the sense of *conscience*, or moral self-knowledge.

Monographs on the subject of consciousness have been published by J. F. Busch (*Theorie des Bewusstseins*, Strassburg, 1864), J. Bergmann (*Grundlinien einer Theorie des Bewusstseins*, Berlin, 1870), F. Micheli (*Philosophie des Bewusstseins*, Bonn, 1877), and others. See also Mansel's Bampton Lectures, *Limits of Religious Thought* (5th ed. 1868). (G. S. M.)

CONSHOHOCKEN, a borough of Montgomery co., Pa., is on the east bank of the Schuylkill River, 13 miles N. W. of Philadelphia. Two railroads pass through the town: the Norristown branch of the Philadelphia and Reading; the Schuylkill Valley branch of the Pennsylvania Railroad; the former has a connecting branch to Plymouth and Abington. The borough has 2 banks (1 national), a weekly newspaper, 6 churches, good public-schools, a free library, an engine-house with a steam fire-engine, a public-hall, and

market-house. It has water-works and gas-works, 4 rolling-mills, cotton-mills, print-works, boiler- and car-shops, iron-pipe foundries, and a planing-mill. Here Lafayette, in May, 1778, crossed the river and escaped from the British army, who had endeavored to surprise his camp at Barren Hill. A bridge still bearing the name of Mattson's Ford connects this borough with West Conshohocken, on the main line of the Philadelphia and Reading Railroad. Here there are 2 blast-furnaces, a woollen-mill and a worsted-mill, 1 church, a public-school and a free library. The post-office is named Mingo. Population of Conshohocken, 4561; of West Conshohocken, 1462.

CONSIDÉRANT, VICTOR, a French Socialist, born at Salins, Jura, Oct. 12, 1808. He studied at Paris in the Polytechnic school, entered the army as an engineer officer, but resigned his commission in 1831. He took part in the socialistic experiment of 1832 at Condé-sur-Végre, and was associated with Fourier as editor of *La Phalanstère*. In 1834 Considérant published *La destinée sociale*, one of the ablest socialistic works ever written. When Fourier died, in 1837, Considérant became the chief of the Fourierites; was editor of *La Phalange* (1836-43), and of a daily paper, *La Démocratie Pacifique* (1843-50). He was chosen to the Republican constituent assembly of 1848 as representative for Loiret. In 1849 he was returned as member for Paris for the Legislative corps, but on account of certain indiscreet acts he was soon compelled to retire from the country. He went to Belgium, and thence, in 1853, to Texas, where he afterwards organized the unsuccessful socialistic colony of La Réunion. He was naturalized and stayed in Texas till 1869. Among his works are a *Manifeste de l'école socialiste* (1841); *Exposition abrégée du système phalanstérien* (1841); *Théorie de l'éducation naturelle* (1845); *Principes du socialisme* (1847); *Théorie du droit de Propriété et du droit au Travail* (1848); *L'apocalypse, ou la prochaine rénovation démocratique* (1849); *Mexique: quatre lettres au maréchal Bazaine* (1868).

CONSIDERATION, in law, the motive or matter of inducement to a contract. It may be either an advantage or benefit inuring to the promisor, or a loss or privation sustained by the promisee at the request of the promisor.

In the Roman law a contract without consideration was termed a nude pact, and was not enforceable unless made with proper words and formalities—*pactum verbis prescriptis vestitum*. In such case a nude pact was allowed to be enforced upon the ground that the circumstances disclosed a deliberation, caution, and fullness of assent on the part of the promisor in entering into the contract which prohibited him from subsequently withdrawing therefrom. By the rules of the common law, a somewhat similar effect is given to contracts under seal. The seal in such cases is said to import a consideration, and the promisor therefore can in no case escape liability. By the rules of the law merchant, bills of exchange, checks, and promissory notes also import *primâ facie* the existence of a consideration. But this presumption is capable of being rebutted.

At common law, simple contracts cannot be enforced without consideration, and the burden of proving the consideration lies on the party seeking to enforce the contract.

Considerations are either valuable or good. A valuable consideration is marriage, money, or money's worth. A good consideration is blood-relationship. As a rule, a contract must, in order to be enforceable, be based on a valuable consideration.

Valuable considerations embrace, as has been said, anything which is money's worth. Forbearance, therefore, to sue, or the prevention of threatened litigation, or the waiver of any legal or equitable right, is held to constitute a valuable consideration.

Moral considerations are such as consist of an obligation to do or not to do some particular thing which is

binding in morals though not in law. Much question has been raised as to whether or not a moral consideration is sufficient to support a contract. In England it has been decided that it is not, but a contrary conclusion has been reached in many of the United States.

Considerations are also either executory or executed. An executory consideration is one which is to be performed in the future. An executed consideration is one which has been performed at the time of making the promise. An executed consideration is not sufficient to support a contract founded thereon.

Considerations are also legal or illegal—i. e., they are either in accordance with or opposed to the policy of the law. A contract founded upon an illegal consideration cannot be enforced. *Ex turpi contractu non oritur actio.*

Concurrent considerations are those which arise at the same time, as if A promise B that if B will go to Rome, A will go to London. In this case either party, having performed his part of the contract, is at liberty to enforce performance on the part of the other. In order, however, that concurrent considerations should constitute a valid and binding contract, they must be both legal and possible. (L. L., JR.)

CONSPIRACY, under the American law, is a combination of two or more persons, by concerted action, to accomplish some criminal or unlawful purpose, or to accomplish some purpose not in itself criminal or unlawful, by criminal or unlawful means. This offence consists not in the accomplishment of any unlawful purpose, nor in any one act moving towards that purpose, but in the actual concert and agreement of two or more persons to effect the unlawful thing so concerted or agreed upon. Mere concert in itself is not a crime, for associations to prosecute a felon have been held to be lawful; but it is the object or purpose of the concerting that make the offence. Where the object or intent if carried into effect would be a wrong, then concert is indictable, as an act in itself tending to produce it; as, for instance, to support a cause, in itself just, by false testimony. A combination to do a criminal act is indictable; also an agreement or confederation to do a lawful act by unlawful means; because, in the first instance named, the act being in itself criminal, a conspiracy to do it must in the very nature of things be also criminal, whilst in the second instance, the means being unlawful, it matters not what may be the act to be done. The combination is criminal whenever the act to be done has a necessary tendency to prejudice the public or to oppress individuals, by unjustly subjecting them to the power of the confederates, and giving effect to their purposes, whether of extortion or mischief. By the law all are held responsible who combine or confederate and agree to accomplish such illegal purpose. As the gist of a conspiracy is the unlawful confederacy to do an unlawful act, or a legal act for an unlawful purpose, the offence is therefore complete when the confederacy is made.

Under the United States laws the following are the things a concerting to do which made between two or more persons constitutes the offence of conspiracy: (1) An agreement to overthrow the government of, or levy war against, the United States; to overthrow, put down, or destroy by force, or oppose the authority thereof; by force to prevent, hinder, or delay the execution of any law of the United States, or by force to seize, take, or possess any property of the United States, contrary to the authority thereof. (2) To deter a party or witness from attending or testifying in a court of the United States, or to injure one on account, or to influence a verdict or indictment by grand or petit jury, and to impede the due course of justice with intent to destroy equal protection of laws. (3) To hinder or prevent any person from voting or qualifying to vote at any election, or to injure, oppress, or intimidate any citizen in the full exercise or enjoyment of

the right or privilege secured by the Constitution or laws of the United States. (4) To hinder by force or intimidation any person from occupying or holding office under the United States, or to injure such officer on account. (5) To induce any officer of the United States to leave any State, or to injure such officer on account. (6) To defraud the United States by obtaining approval of any false claim against the same. (7) To cast away any vessel with intent to defraud the underwriters. The act of Congress upon the subject of conspiring to cast away vessels with intent to defraud underwriters presented the following punishment to be inflicted upon those convicted for the offence—a fine of \$10,000 and an imprisonment and confinement at labor not exceeding ten years. Under this act it has been held that the combination with the intent consummates the offence, though neither the vessel nor cargo be injured. It has, however, been further held that in such cases the intent to injure the underwriters is an essential ingredient of the crime, and without an averment of such intention no offence is described in violation of the act of Congress.

The things a concerting to do which constitute the offence of conspiracy in the several States of the United States are as follows: To seduce and carry off a female under the age of 16 years is indictable under the laws of the State of Virginia. In South Carolina to combine to injure a person because of political opinions is an indictable offence; also a combination for the purpose only of getting possession of lands by means of an extorted deed in favor of the legal owner. In Illinois to agree to obtain goods under false pretences; to combine to seduce a female, whether the means resorted to are lawful or not; also to procure criminal process for improper purposes. In North Carolina to combine to intoxicate a person for the purpose of cheating him at cards. In this State the offence of conspiracy to cheat and defraud is not embraced within the exceptions of the act limiting the time within which prosecutions for misdemeanors shall commence. In Maine it is conspiracy to combine to do injury to the person of an individual, or to do an unlawful act injurious to the administration of justice. By the laws of the State of Massachusetts it is conspiracy to manufacture spurious indigo with intent to sell at auction as good, to defraud whoever may be defrauded without having any particular person in view; to commit a felony or misdemeanor or any other act that is criminal; to defraud individuals or corporations of property; also to charge any person with a crime, though there be no intention to procure an indictment or legal process against him. In California to combine to burn buildings with the intent to defraud the insurers is a conspiracy. The laws of Michigan make it a conspiracy to combine to defraud an individual of real or personal property. In Texas it has been held that, where a person and others started on a fox-chase, but subsequently went to chasing cattle which were killed, the case came within the rule of law that, when a number of persons met together for a different purpose and afterwards join to execute one common purpose to the injury of the property of a third party, it is a conspiracy. In Maryland it is conspiracy to combine to defraud a third person, accomplished by means of an act that would not amount to an indictable cheat if done by an individual; also to combine to commit a felony or any act that is criminal. In New Jersey a combination to defraud an incorporated bank of issue so that the securities held by the public are impaired, is an offence of so public a nature that it is indictable at common law; to maliciously indict another; to combine to defraud others of property; moving, by false testimony, an act injurious to public health, or by making war on other States of the Union. The common law conspiracy in this State is not abolished by statute, but such a conspiracy as was indictable before the statute, at common law, is so still. In New York all who accede to a conspiracy are guilty, for they com-

mit the offence, when they become a party to it. By the laws of this State the offences are as follows:—to agree to commit a felony or any other criminal act; to defraud individuals or corporations of property; to injure others by obstructing public justice by fabricating or suppressing evidence; to combine for the purpose of destroying a will with a view of cheating devisees; to falsely and maliciously indict a person; to falsely move or maintain a suit. By the laws of the State of Pennsylvania it is enacted that if two or more persons shall conspire or agree, falsely and maliciously, to charge or indict any other person or cause or procure him to be charged or indicted in any court of criminal jurisdiction, the person or persons so offending shall be guilty of a misdemeanor, and on conviction be sentenced to pay a fine not exceeding \$1000 and undergo an imprisonment either at labor or in separate or solitary confinement not exceeding 3 years; to petition against the appointment of a school-teacher if instigated by malice; to make real sales and pretended purchases of stock in order to induce brokers to advance sums of money on such purchases, and then defraud them, is indictable as a conspiracy; to combine to destroy a will in order to cheat devisees. Conspiracy in this State is not the subject of a criminal action unless some act be done to give effect to the purpose of the conspirators, either by extortion or mischief. It makes no difference at what time any person comes into a conspiracy: every one who enters into the common design is in law a party to every act which had been previously done by any of the others in pursuance of it. All the States of the United States, independent of the statutory provisions for the offence of criminal conspiracy, provide an adequate civil remedy for the offence, which partakes of the nature of damages for the injury which the party has sustained, or been subjected to, by reason of the acts of the conspirators. It seems to be the universal opinion, however, from the authorities, that the damages claimed in the civil courts must be of an actual nature, as the foundation of the civil action is the damage done to the plaintiff, and not the conspiracy.

A very important element now enters into the consideration of the subject of conspiracy; *i. e.*, the relationship existing between the employer and the employés. That relationship has at times, instead of being reciprocal in its action, assumed the form of persecution against the weaker—the employés—with the avowed purpose of reducing and holding them in a state of absolute subjection. The establishment of large industries naturally commends them to the special protection of the laws, against any undue encroachment on the part of labor that might tend to retard or injure the growth of their commercial importance, and so, also, does even-handed justice demand a like protection for labor against the oppression of capital, on the principle that the law knows no distinction, but, treating all alike, protects and punishes without discrimination. Yet the American legislatures, forgetful of this principle, have lent their powerful aid to the side of the employer, and passed oppressive laws for the government of labor that fully justified the employés in combining for their own protection, making such rules for their own government as the emergencies of the moment required, and for the regulation of and defining the prices at which they shall work. With the laws thus opposed to them, declaring their protective combinations to be conspiracies, and punishable as such, it would seem that labor could do but little for itself; yet their efforts, combinations, and strikes have resulted to their advantage by compelling the employers to ameliorate the condition of the employé, by either acceding to their demands or effecting such compromises as were acceptable to them, which, coupled with a public sympathy that had been aroused by the intrepid perseverance on the part of labor to better its condition, led the legislatures of several of the great States to modify the laws, so that

the condition of the laboring classes should be rendered better than that of serfs, and afforded them substantial protection against the oppressive tyranny of overgrown capital. Many of the States, and some whose claim to enlightenment would have promised better acts, have still upon their statute books these shameful laws; notably, in Massachusetts, it is enacted that a combination of journeymen and workmen of any trade or handicraft to raise their wages, and compel journeymen or master workmen in the same trade to conform to rules established by the combiners for the purpose of regulating the prices of labor, and to carry such rules into effect by overt acts, is a conspiracy, and punishable.

The State of Texas has partly legislated in favor of the workman, and proscribes only that action which in itself is injurious. There, a combination among workmen of a particular trade to prevent other workmen from laboring at a less rate of wages than that prescribed by the union is declared as contrary to public policy, and may amount to a conspiracy. But an agreement among the workmen that they will not themselves work for less than a stipulated price, confined in its operation to those who agreed to it, and enforced only as a bylaw of an association, is not contrary to law. Such associations have a right to make such by-law, and impose a penalty for violating it. In New Jersey a combination of workmen to agree to quit their employer in a body unless certain other workmen are dismissed, and to notify the employer of such agreement, is a conspiracy; also to advise others and encourage them into any combination for or against leaving or entering the employment of other persons.

The States of Pennsylvania and New York take the lead in entire protection of the workmen in their rights, and view them with as much concern and consideration as the employers. In Pennsylvania, by the act of June 14, 1872, Trades Unions are made lawful; the act provides that it shall be lawful for laborers, workmen, or journeymen, acting either as individuals or as members of any club, society, or association, to refuse to work or labor for any person or persons, whenever in his, her, or their opinion the wages paid are insufficient, or the treatment of such laborers, journeymen, or workmen by the employers is brutal or offensive, or the continued labor of such laborers, journeymen, or workmen would be contrary to the rules, regulations, or by-laws of any club, society, or organization to which he, she, or they belong, without subjecting them in so refusing to work or labor to prosecution or indictment for conspiracy under the criminal laws of the State; provided that the rules of such society shall not conflict with the constitution of the State, also that the act shall not prevent the prosecution and punishment under existing laws. This act was supplemented by the act of March 22, 1877, which in order to provide for the better protection of passengers upon railroads, and insure the prompt transportation and delivering of freight, enacts, that in case of strikes by locomotive engineers and railroad employés, and the abandonment by them of their engines and trains at points other than their schedule destinations, endangering the safety of passengers and subjecting shippers of freight to great inconvenience, delay, and loss, it shall be a misdemeanor for any engineer or other employé to abandon engines and trains at points other than their destination, with a view to incite others to strike, or to refuse to give aid in the movement of cars of other companies, or to interfere with other employés, or to obstruct tracks or injure property of the company, and upon conviction punishes with fine and imprisonment. In New York, by the act of 1870, Labor Unions are made lawful; also the peaceful and orderly combinations in any trade or profession to secure an advance in rates of wages or compensation, or maintenance of such; but combination of workmen to raise their wages by conspiring to compel journeymen to conform to rules established by the conspirators for the purpose of regulating the

price of labor and to carry such rules into effect by overt acts, are indictable, and not within the scope of the act. Several attempts have been made to do away with the operation of this act, by the enactment of others tending against the workmen, that were simply outrageous, and had they passed would have reduced them to a state of absolute serfdom; but happily they were choked ere they came to blossom, and the fair name of the State saved the indelible blot of having such disgraceful laws on its statute books.

This equitable spirit is gradually spreading into the other States, and the rights of the laboring classes are receiving that proper consideration which in the end will redound to their advantage, by securing for them that protection which the importance of their position as the great mass of the people demands. (F. H.)

CONSTABLE. Blackstone, in his very inadequate account of the office of constable, says: See Vol. VI. p. 263 Am. ed. (p. 294 Edin. ed.). "Considering what manner of men are for the most part put into these offices, it is perhaps very well that they are generally kept in ignorance of the extent of their powers." This observation may help to account for the general ignorance and disrepute into which this ancient and once honorable office has fallen. The time was when the best men in an English parish held in rotation the office of constable. He was once the head man of his village community. The constable and four chief inhabitants of a parish constituted its board of local government. They represented the parish or the township in the courts of the hundred and of the shire. The constable was elected by the local community, but he was regarded as the connecting link between the community and the state. He was responsible before all men for the keeping of the king's peace. He could call upon any or all of his fellow-townsmen to aid him in the pursuit of criminals or in the execution of the law. He carried out the mandates of the higher courts and of the parish meetings, over which he once presided. He assessed taxes and collected them. He viewed or kept the parish armor, raised the local quota of troops, and led it to muster or to the king's host.

The duties of an English parish constable in the early part of the sixteenth century, when the older American colonies were founded, have been abridged as follows from an old warrant issued in 1632 to the constables of the parish of Wendover, county of Buckingham, and brought over to Dorchester, Massachusetts, by one of its first settlers. The petty constables in every parish, town, and hamlet were to report the names of all Popish recusants and of all persons not ordinarily attending church. They were to certify what felonies or robberies had been committed, whether hue-and-cry had been made and watches kept. They were to state what vagrants had been arrested and who had been sent to the house of correction; to inquire what cottages had been erected contrary to the statute of Elizabeth; how many taverns, inns, and ale-houses were in the parish, whether licensed or unlicensed; who had been drunk since the last assize; who had been ingrossers, fore-stallers, regrators, or malsters; what servants had been put out to service, and what unmarried persons live out of service; what bridges or highways were in decay; what provision the parish had for setting the poor to work; what apprentices had been bound out by the justice of the peace; what bastards had been born; what riots committed and how punished. All these points, and many more, were to be reported by the petty constable of the parish to the high constable of the hundred.

The constabulary law of the English colonies in America is well illustrated by the following enumeration of duties, which has been abridged from scattered references in the early statutes of Massachusetts. Constables had power to whip and punish; to speed away all hues-and-cries; to convey vagrants or offenders from constable to constable; to apprehend, with or

without warrant, all intoxicated persons, profane swearers, vagrants, and night-walkers; to search for such persons in suspected places; to command the services of any one to assist in making arrest; to carry a black staff in execution of his office; to take notice of common coasters, unprofitable fowlers, idlers, and tobacco-takers, and of such as harbored young people, children, servants, apprentices, students, or scholars, without hastening them to their employments; to aid custom house officers in their search for wines; to levy all fines and collect all town rates; to clear accounts with the county treasurer; to register all lost goods and stray animals, and to cry them at town-meeting or on lecture day; to present the names of all persons refusing to watch and ward; to arrest and commit any inhabitant or stranger behaving suspiciously after ten o'clock at night; to provide and maintain the standard weights and measures for the town; to warn inhabitants of town-meeting; to make returns to the general court of the names of representatives; to warn jurymen; to summon coroners; to notify town authorities when husbands were living apart from their wives; to inform the court of all newcomers; to pursue runaway servants and, if necessary, to press men, boats, and horses into such service and bring back such runaways, if need be, by force of arms. Finally, to refuse the office of constable made one liable to a penalty of five pounds.

Such were the leading features of old English constabulary duty as it was instituted in the older colonies in America. Everywhere self-government was established in old English ways, in towns or parishes, in counties or in hundreds; and everywhere appeared the constable with his tip-staff and ancient functions of office. The constable and the local assembly are the very germs of American institutional life. It is a principle of the common law of England that wherever there is a constable established there *ipso facto* exists a parish or a township, i. e., a locally organized community. Historically and legally considered, the constable is the organic power by which the community is brought into relations with the state, whether for raising revenue or troops, or for keeping the public peace, or for executing the law. Wherever there is an appointed constable, there the common law reigns in the person of the local representative. The modern constable may have fallen in some communities from his ancient high estate as local embodiment of the majesty of the law, but even in the most tranquil communities there often survive traditions of ancient constabulary power. One of the most remarkable features of this power, which in some States has been handed down to our own times, is the authority of the local constable to speed away all "hues-and-cries," and to pursue, on foot and if need be by horse, a thief, robber, or murderer, or any violator of the public peace. This authority connects modern communities and their elaborate police systems with old English parish usages, and with the most primitive methods of executing justice. A parish constable could let loose an entire village by his word of command, and the offender or outlaw could be pursued from tithing to tithing and from hundred to hundred until the whole shire was aroused. In this ancient office of petty constable there still lurks a latent power which, in times of sudden emergency, such as a local riot or conflagration, modern towns and cities sometimes find it convenient to revive.

For a more detailed treatment of the institution of "constable" and for its historical significance, see *Johns-Hopkins' University Studies in Historical and Political Science*, Vol. I., No. 4, on *Saxon Tithingmen in America*, and No. 8, *Norman Constables in America*.

(H. B. A.)

CONSTITUTION OF THE UNITED STATES.

Although the suggestion, the adoption, and the inauguration of the Constitution of the United States date respectively from the years 1787, 1788, and 1789, it is

essential, for many reasons, to begin by describing the conditions out of which the Constitution grew. In doing so, it will not be necessary to go into minute details of the events which preceded it.

The beginning of the fifteen years (1760-75) of peaceable struggle between Great Britain and her colonies on the Atlantic coast of North America, on the question of government without representation, found the colonies joined, but hardly united. Originally separated not simply by distinct organization, but by long stretches of wilderness filled with savage enemies, they had by degrees grown together, and had even come to have common interests and to take common action. The French and Indian War, in which all the colonies joined with the consciousness that they were struggling for a common prize, the vast territory between the Mississippi and the Alleghanies, was a political education for the colonies. The fact that they had acted together against the foreign enemy in the Mississippi valley prepared them for a more formal combination against any enemy whatever, even the king or parliament of the mother country, if either should prove hostile to the newly felt national interests and instincts of America. And yet it was very difficult to put this formal union into intelligible language when the necessity for it became imperative. The new nation fought its first war practically through without a government, with only such a substitute for a government as could be found in a body of delegates, chosen by the State Legislatures and recalled at pleasure, without any formal grant of powers from any source, and practically with only such powers of legislation as a general popular acquiescence and obedience might validate. A body thus constituted necessarily fell into disrespect just as rapidly as it fulfilled its function of getting rid of the invading force. An autocratic power would have brought the British face to face with the insurmountable difficulties of their undertaking in the second winter of the war; under the Continental Congress the war dragged along for seven years. Obedience was only accorded to it while the enemy was at the gates; and thus, with a firm hold on only New York and Newport, the British were able to put the country to the expense and danger of a general war, and even to carry on a formidable Southern campaign.

All through this period the Continental Congress was engaged in the effort to transform itself into a formally constituted body. The effort was burdened with enormous additional difficulties, through the practice of the State legislatures of recalling their delegates at pleasure. Not only was the final document of union to be ratified by the legislatures, but, even in framing it, any delegate who showed himself too little actuated by respect for his own legislature's interests or prejudices was liable to summary recall and replacement by a more pliable instrument. It is no matter for surprise that the result of such deliberations was a document which was far more advantageous to the State legislatures than to the people at large. The "Articles of Confederation and Perpetual Union" gave Congress, in reality, no powers of government; all these were reserved to the legislatures. Congress was to lay no taxes, foreign or domestic, equip no armies, and exercise no control whatever over commerce, individuals, or the States. In all such matters of actual legislation, Congress was empowered only to make recommendations to the States, which the legislatures would pass upon finally and each for itself. Congress was, it is true, empowered to make treaties and borrow money, and the faith of the separate States was solemnly pledged that they would observe the one and repay the other; but these pledges proved to be of about as much value as such naked pledges usually are. Finally, no amendment or alteration was ever to be made without the ratification of every State legislature.

The Articles were adopted by the Continental Congress and recommended to the States, Nov. 15, 1777.

Eight of the States, by their delegates, ratified them, July 9, 1778; and three more fell in before the end of the year. Delaware held out until February, 1779, and only Maryland refused. Her action was due to the appropriation by a number of the States of the western territory, which had been the prize of the French and Indian war. The charters of Massachusetts, Connecticut, Virginia, North Carolina, and Georgia had no defined western boundary; Virginia further asserted that her northern boundary ran north-west, instead of west, so that her territory continually widened as it advanced, and embraced the whole north-west; South Carolina claimed a narrow strip of territory running west from her north-west corner; even New York had vague claims to a western extension, and New Hampshire to the present State of Vermont. All these claims were in fact equally preposterous. Wolfe's successful battle on the Plains of Abraham had given this territory to the British Empire, and the successful struggle of the Revolution had transferred it to the United Colonies, not to any individual colony. It required nearly ten years, however, to convince the claimant colonies that this was the case, and they were influential enough to secure the insertion of a clause in the Articles by which the United States were prohibited from taking any territory from a State, though the power was given to decide land disputes between States. Maryland alone was sufficiently far-sighted to enforce her veto on the final ratification of the Articles until it was certain that the claimant States would not be allowed to appropriate the coveted territory. New York afforded Congress the opportunity to checkmate the troublesome claims. The Six Nations of New York Indians had long held a semi-feudal supremacy over the territory and Indians between the Mississippi and the Alleghanies. This had passed, if such an undefined right can be said to pass, to New York by conquest; and New York, in consideration of the recognition of her doubtful western boundary, transferred her western claims to Congress, March 1, 1781. On the same day Maryland ratified the Articles, for Congress had already pronounced in favor of the validity of the New York Six Nations claim, and the Confederation was therefore committed to the Maryland view. All the claimant States ceded their western claims within a few years thereafter, Georgia not until 1802. Maryland's action secured to the United States a general form of government, albeit a useless one. It was soon found that it secured to the United States neither order, nor revenue, nor an assured bond of union. The individual States exerted their full autonomy for almost exclusively selfish purposes. Their taxes were protective against one another; the requisitions of Congress for money were postponed, ignored, or tendered in the State's depreciated paper money; every amendment to the Articles calculated to give Congress more power was vetoed by one or more States, and there seemed to be no present utility or hope of future improvement in the Articles of Confederation. The principal and interest of the public debt, the running expenses of the government, were unpaid; and there was a period of some months when Congress itself dissolved without any effective substitute, and there was no longer even an appearance of a national government. There was reason in Hamilton's summary: "A nation without a national government is an awful spectacle."

As the regulation of commerce was a strictly State affair, the commerce of Chesapeake Bay fell under the management of Virginia and Maryland. A proposition for a meeting of State Commissioners to settle disputes was turned by Virginia to national account. Her call was addressed to all the States, with the object of framing a commercial amendment to the Articles, to be ratified unanimously or not at all. Only five States sent delegates to Annapolis, Sept. 11, 1786, and the convention limited itself to debate and the recommendation of another convention, to be held at

Philadelphia in the following year. Congress approved the call in the following February.

When the day assigned for the meeting of the new convention (May 14, 1787) arrived, all the States but Rhode Island had appointed delegates, though the New Hampshire delegates did not attend for several months. The better success of the second convention in this respect is to be largely attributed to the appearance of internal disorders in the States, the most startling being Shays's rebellion in Massachusetts, in the critical winter of 1786-87. To most of the leaders of the time there was but one consideration, order, which was superior to the claims of State independence, and the Massachusetts disorder, and the evident impotence of Congress, were thrown into the balance just in time to turn the scales in favor of the Constitution. When Washington, who was a delegate from Virginia, took the chair as president of the convention, the feeling of the delegates seems to have been much the same as that of Congress when it threw upon him the whole responsibility of the war in the trying times of the previous decade.

The peculiar difficulties of the convention can hardly be well understood without a reference to the division of the States into large and small States. There were at no time more than eleven States represented in the convention, for Rhode Island sent no delegates, and those of New Hampshire only attended after those of New York retired. Five of the eleven, Massachusetts, Connecticut, Virginia, North Carolina, and Georgia, were "large States," either on account of their present population or on account of their expectations of future western expansion. Pennsylvania was at various times on one side or the other, holding the balance of power. The large States came prepared with a plan of their own, which was presented by Edmund Randolph, of Virginia. It substituted a Congress of two houses, with real legislative powers, for the feeble Confederation Congress of one house, and introduced the germ of an executive and judiciary. But the plan was fatally marred by the evident determination of the large States to so arrange the new scheme of government as to throw all the power into their own hands. Both houses of Congress, though differing in numbers, were to be chosen proportionally by the States, so that the large States, which had been the claimant States, could combine and control both houses. When it is added that Congress was to choose the President and the judiciary, it will be seen that the "small States" had very considerable reason to take exception to this so-called "national plan." In opposition to it, they introduced, through William Paterson, of New Jersey, a plan of their own, continuing the Confederation Congress, giving it the power to control commerce, and adding the power to coerce States which should refuse to obey requisitions. Almost all the results of the Constitution were compromises between these two plans; the great chasm between the North and the South, which was to control the first century of the Constitution's active operation, appeared very little in the framing of it, except in the matters of slave representation and the slave trade.

The debates of the convention were held in secret, and, until they were published by order of Congress in 1818, it was not well known how nearly the country had approached a great catastrophe. Several times in July and August the convention, evenly divided and unable to advance or retreat, was on the point of dissolving and giving up its task in despair; but in each instance the appointment of a committee of one from each State brought to light some road of compromise. The result was that the Constitution, which can now hardly be lauded sufficiently, which Mr. Gladstone describes as the most wonderful work ever struck off at a given time by the brain and purpose of man, was in reality the product of no purpose at all, except the hereditary Anglo-Saxon purpose to compromise conflicting opinions. It satisfied nobody and no State.

Its most outspoken defenders advocated it only as the best thing that could be obtained under the circumstances; and the violence of its assailants was evidently tempered by the consciousness that it was not fully what its advocates had desired.

The first great compromise gave us the present constitution of the Senate. Proportionate representation in the lower house of Congress was agreed to by the small States, in return for an equal representation in the upper house, the Senate; and the special power of confirmation of appointments and treaties was reserved to that body. Safe in this respect, the little States had gained their point, as Patrick Henry bluntly expressed it, and could afford to be generous in other matters. The Southern States demanded representation for their slave population; they received representation for three-fifths of it. They demanded a continuance of the slave trade; it was granted for twenty years. Almost in the closing hours of the convention the electoral system and the office of Vice-President were introduced, and the salient features of the Constitution were complete.

The most serious innovation of the convention was in the manner of ratification and amendment. It will be remembered that, under the Articles of Confederation, both were to be the unanimous work of the State legislatures to be valid. But the convention left the legislatures no voice in the matter of ratification; this was to be decided by State conventions. Further, and more important, the ratifications of nine States were to be sufficient to put the Constitution into force, without regard to the other four States; and it actually went into effect while two of the States, Rhode Island and North Carolina, were in the anomalous position of being included within the national boundaries of a country whose form of government they had formally repudiated. Lastly, and most important, an indefinite power of amendment was given to two-thirds of each house of Congress and three-fourths of the States. A more radically national feature could hardly have been introduced; nor has any advocate of State sovereignty ever succeeded in reconciling his doctrine with this power of amendment. A "sovereignty" which grants to another power the right to fix and alter its rights, powers, and relations without limit cannot longer be classed as a sovereignty without a stretch of language of which English is not yet capable. As a corollary to this power of indefinite amendment, to Congress was given the power to admit new States without limit. Under this provision, the original thirteen States have already been nearly trebled—there are thirty-eight States in 1884; and, if fourteen States should be added, an amendment could be passed over the unanimously adverse vote of the original thirteen States. If State sovereignty can survive such a constitution of things, it can only be by supposing that the States made the Constitution with the purpose of violating it if it proved disagreeable to keep their pledges, a supposition which is practically involved in the doctrine of secession.

In addition to all this, the fundamentally national nature of the Constitution is expressed, as plainly as the language is capable of expressing it, in the following clause (Art. VI.; Sec. 1): "This Constitution, and the laws of the United States which shall be made in pursuance thereof, and all treaties made, or which shall be made, under the authority of the United States, shall be the supreme law of the land; and the judges in every State shall be bound thereby, anything in the constitution or laws of any State to the contrary notwithstanding." It would be impossible here to go into the question whether this clause was an abrogation of a previously existing State sovereignty, or an emphatic recognition of the fact that no State sovereignty had ever existed; in either case, the non-existence of State sovereignty under the Constitution is an assertion from which this clause removes the need for argument. To fasten it more firmly still, the

Constitution provides that an oath to support it shall be taken by the members of the legislative, executive, and judicial departments of each of the State governments.

On the other hand, the controlling and universal desire of the people for the maintenance of State rights, as distinguished from State sovereignty, is written in almost every section of the Constitution. Not only are the States a recognized instrumentality in the execution of the provisions of the Constitution, essential to the election of President and Vice-President, to the election of the Senate, to the internal extradition of criminals, and to the power of amendment itself; the continued existence of the States is secured by the provision that no State shall ever be deprived of its equal suffrage in the Senate, without its own consent. It is difficult to see what stronger guarantees for State rights could be asked. Unless the spirit of the system be radically changed, the rights of Delaware, for example, become only more secure as the national power grows stronger; they are actually far more secure, under the guarantee of a powerful national protector, than if their only guarantee were the "sovereignty" of Delaware. In fact, the principal enemy of State rights under the Constitution is the advocate of State sovereignty under the Constitution.

Taking the Federal Constitution as the organic law of the land, the State constitutions are the autonomy guaranteed to the States by the national power. But there is this fundamental difference in the operations of the Federal and State governments, that the former exercises such powers as are granted to it by the Federal Constitution, while the latter exercise such powers as are not denied to them by the Federal or State constitutions. The former is a government of stipulated, and the latter of residual, powers. But it must be remembered, also, that a state of war, particularly if it is dangerous or within the limits of the country, will always result in the assumption of very doubtful powers by the Federal government, and the consequent peril of a radical alteration in the conception of the system, an alteration the more perilous because it must of necessity take place without calm consideration. The general perception of this underlying danger has made the nation one which is already very averse to war, and its tendency for the future seems to be increasingly in the same direction.

Passing from the nature of the Constitution to its practical features, we find the most prominent to be the legislative department; this has been treated in a separate article (see CONGRESS). Notwithstanding its prominence, it has, thus far in its history, encroached less upon the other departments of the government than in any other country in which a parliamentary system of any kind has been attempted. The other departments are the executive and judiciary, each of which has characteristics which are peculiar to the American system.

The *Executive Department* consists of the whole body of officers to whom is assigned the duty of enforcing the laws of the United States. At their head is the President, the only one of them who reaches his position by election; the others are appointed by the President, subject to the approval of the Senate, or their appointments are regulated by law. "Congress may by law vest the appointment of such inferior officers as they think proper in the President alone, in the courts of law, or in the heads of departments" (Art. II., Sec. 2). The President must be a natural-born citizen, of the age of thirty-five years, and resident in the country for fourteen years. He is chosen not by popular vote, but by the electoral system (explained in the next paragraph). There is nothing in the Constitution to prevent his indefinite re-election; but the popular prejudice against a third term is so strong as to amount to a practical prohibition. He is commander-in-chief of the army and navy; has the

power to grant reprieves and pardons for offences against the United States, except in cases of impeachment; makes treaties, with the advice and consent of two-thirds of the Senate; and, during a recess of the Senate, makes temporary appointments to fill vacancies, expiring at the end of the next session of the Senate. He sends messages to Congress from time to time, giving information of the state of the Union, and recommending measures for consideration. He may call together both houses, or either house, in special session; and, if the two houses cannot decide on the time of adjournment, he may decide it for them. He, like the Vice-President, and all other civil officers, is removable on impeachment by the House of Representatives, trial by the Senate, and conviction by two-thirds of the senators. All the officers under the executive are organized into as many departments as may be provided by law; and the President has the constitutional right to call on the head of any department for his written opinion on any subject relating to the duties of his department. Out of this has arisen the extra-constitutional term "cabinet," applied to these heads of departments collectively.

The electoral system controls the election of the President and Vice-President. Each State appoints, in such manner as its legislature may direct, a number of electors equal to the whole number of senators and representatives to which the State is entitled. Until about 1828 the legislature usually appointed the electors itself; since that year they have been chosen by popular vote, except that South Carolina only made the change in 1868. The electors meet in their States, and vote by ballot for President and Vice-President, one at least of the two names to be from some other State than their own. Their votes are sent to the President of the Senate. He opens all the certificates in the presence of the two houses, "and the votes shall then be counted." The persons having a majority of the electoral votes for President and Vice-President are elected. If there is no election for President, the House of Representatives chooses a President, voting by States, each State having one vote. If there is no election for Vice-President, the Senate chooses a Vice-President, voting as usual. At first the electors simply voted for two persons, without distinguishing the votes for President and Vice-President; for it was presumed that the electors were to exercise an intelligent choice among the candidates, and no one saw anything improper in the action of Gerry, a Democratic elector, in voting on personal grounds for Adams, a Federalist, against Jefferson, the head of his own party. Just before the election of 1800 the electors became fixed in that nullity which has since been characteristic of them; it became a point of honor that each elector should vote for the two candidates of his own party. The inevitable result was that, whichever party was successful, its two candidates would have a tie vote, unless some one of its electors should throw away one of his votes on a rank outsider. The result took place in 1800-1, when Jefferson and Burr were a tie in the electoral vote, and the Federalist majority in the House of Representatives very nearly elected Aaron Burr to the office of President of the United States. To meet the new conditions, the twelfth amendment, which fixed the system as above given, was ratified in 1804. Though the Vice-President is chosen at the same time and in the same manner as the President, he is no part of the executive department. His only function is to preside over the Senate, where he has no vote except in case of a tie. Should the President be impeached, the Chief Justice of the Supreme Court is called to preside over the Senate during the trial. The Vice-President is purely a stand-by, in readiness to take the Presidency in case of the President's removal, death, resignation, or inability; and in practice is rarely admitted to any great influence on the administration.

Thus far the Constitution provides the general outlines of the executive department, the election of its head, and the appointment of its subordinates. These outlines were to be filled up by the legislative department. Various acts of Congress have divided the executive officers into seven departments, and each department into bureaux, such as the internal revenue bureau in the treasury department, and the census and pension bureaux in the department of the interior. The departments are as follows, with the year of their erection into a distinct department: department of state (1789); of the treasury (1789); of war (1789); of justice (1789); of the navy (1798); of the post-office (1829); of the interior (1849.) The duties of the officers of these departments are so clearly defined by law that the work of the officials is purely executive. In like manner the outlines of the electoral system have been filled up. Acts of Congress have designated the day on which the popular vote is to be cast for electors, the day on which the electors are to meet and vote, the manner in which the votes of the electors are to be transmitted to the President of the Senate, while copies are to be kept of record. But Congress has gone further and asserted a judicial power in the count of the electoral votes which has never been successfully defended. This asserted power has but two arguments in its favor: the fact that no agent is intrusted with the power to count the electoral votes; and the direction that the certificates of the votes are to be opened by the President of the Senate "in the presence" of the two houses of Congress. On this slender foundation, since 1817, congressional authorities have built up an indefinite power over the electoral votes, a power to pass judgment on defects of form or substance, to decide between rival votes from the same State, and even to reject the electoral votes which seemed invalid to the majority of the two houses. Nothing would be easier than to frame and pass general laws defining the forms of certification of the electoral votes from the State authorities, and guiding the President of the Senate in his function of opening the certificates. But to do so would be an abandonment by Congress of a power which might be of controlling force in a presidential lottery, and it has never been done. The special absurdity of the claim lies in the fact that the electoral count is to be made, and disputes are to be decided, by two absolutely independent agents—the two houses—which must be either unanimous under the control of the same party, or hopelessly at odds. In the latter case, where the two houses are controlled by different parties, there is no hope of the two judges coming to an agreement, and recourse must be had to some such extra-constitutional shift as the Electoral Commission of 1877. It would be proper to characterize this last agency as a clumsy device to cloak the inherent absurdity of a "canvass" by two absolutely independent agents.

The *Judiciary Department* has in the Constitution only a few bold outlines: most of the organization has been left to legislation. The Constitution only provides for one Supreme Court, and for such inferior courts as Congress may from time to time ordain and establish, and directs that the judges shall hold office during good behavior. The inferior courts which have been established are the district courts, whose jurisdiction covers a State or part of a State, with an appeal to circuit courts, whose jurisdiction covers several States each, with an appeal to the supreme court. There are district judges for the 115 districts, circuit judges for each of the nine circuits, and nine supreme court justices, each of whom presides over a circuit. In cases in which ambassadors, other public ministers, or consuls are concerned, or in which a State is plaintiff, the supreme court has original jurisdiction; in cases of admiralty or maritime jurisdiction, cases to which the United States is a party, cases between citizens of different States, or "Federal cases" (explained in the next paragraph), the supreme court has appellate ju-

risdiction. Process runs through the United States, but trials for crimes are to take place in the State in which the crimes are committed. For crimes committed out of the jurisdiction of any State the place of trial is fixed by statute.

"Federal cases," as they are commonly called, are "all cases, in law and equity, arising under this Constitution, the laws of the United States, and treaties made, or which shall be made, under their authority." The grant of such a jurisdiction, under a written constitution, has made the Federal judiciary the arbiter of the constitutionality of the laws passed by Congress, and even of State constitutions and laws, so far as they are alleged to be in contravention of the Federal Constitution. Such a jurisdiction was really unprecedented when it was framed, but it cannot be said that it has proved dangerous in practice. When the supreme court has decided that a law is not warranted by the powers granted to Congress by the Constitution, State courts follow the decision, and it is practically impossible to punish any one for violating the law. It is certainly remarkable to see the legislative and executive, with the physical force of a nation of 55,000,000 behind them, quietly yielding to the decisions of nine men assembled in the supreme court chamber at Washington; but it is not quite true, as it is usually stated abroad, and sometimes at home, that the supreme court is the final arbiter of all constitutional questions. The court has always held that it has no jurisdiction of purely political questions, questions whose decision came fairly within the province of Congress or the President, and whose decision seemed likely to bring the court into open conflict with the other branches of the government. Thus, while Congress was enforcing reconstruction of the Southern States in 1867-8, the supreme court refused to allow the constitutionality of the reconstruction laws to be brought up for decision. Theoretically the court is as much at the mercy of the other two branches as the House of Lords is in Great Britain, and could be swamped at any time by the creation of new judges; but no such measure has ever been confessedly employed, though it has been alleged to have been the motive of some changes. As a very general rule the court has been so intrenched in popular regard that no political party would willingly be responsible for an attack on it.

Limitations on the United States.—The writ of *habeas corpus*, according to the supreme court, can never be suspended in the United States by any power. The *privilege* of the writ is only to be suspended in case of rebellion or invasion, in regard to soldiers, sailors, or prisoners of war; and even in such cases the courts, when open, are still to issue the writ, and decide on the hearing whether the party has lost the privilege of the writ or not. No bill of attainder or *ex post facto* law can be passed. Direct taxes can only be laid in proportion to the census. No export duty can be laid, nor can any commercial regulation give a preference to the ports of one State over those of another. No money is to be drawn from the treasury except by appropriations. No title of nobility is to be granted. Treason is to consist only in levying war against the United States, or in adhering to their enemies, giving them aid and comfort. It is to be proved only by confession in open court, or by two witnesses to the same overt act. Its punishment is to be defined by law, but cannot work corruption of blood, or forfeiture, except during the life of the criminal. No new State can be formed within a State, or by the junction of two or more States or parts of States, without the consent of the legislatures of the States concerned, as well as of Congress.

State Privileges.—The public acts, records, and judicial proceedings of each State are to receive full faith and credit in all the other States, and Congress may by general law prescribe the manner of their authentication. The citizens of one State are entitled to

all the privileges and immunities of citizens in all the other States. Persons charged with crime, fleeing from one State to another, are to be delivered up for trial by the governor of the State to which he has fled on requisition from the governor of the State from which he fled. A similar provision with regard to fugitive slaves has become obsolete with the abolition of slavery. To each State a republican form of government is to be guaranteed by the United States, and each is to be protected from invasion by the same power. In case of domestic violence against the established form of the State government, the State legislature, or the governor, if the legislature cannot be convened, can apply for and receive Federal force for its support.

Limitations on the States.—The States are absolutely prohibited from entering into any treaty, alliance, or confederation, granting letters of marque and reprisal, coining money, emitting bills of credit, making anything except gold and silver a legal tender, passing any bill of attainder, *ex post facto* law, or law which impairs the obligation of contracts, and granting any title of nobility. They are prohibited, unless Congress pass a consenting statute, from laying any duties on exports or imports above what is necessary for executing the inspection laws of the State, from laying duties of tonnage, from keeping troops or ships of war in time of peace, from entering into agreements or compacts with another State or with a foreign power, and from engaging in war, unless actually invaded or in imminent danger. Even if Congress consent to the laying of duties on imports or exports by a State, the net produce is to be for the use of the treasury of the United States, and the laws are to be subject to the revision and control of Congress. There are also certain concurrent powers of the States which may be suspended by the exercise of the corresponding powers by Congress: the making or altering by Congress of regulations as to the times, places, and manner of holding elections for senators and representatives supersedes State laws on those subjects, except as to the places of holding elections for senators, and State insolvency laws are superseded by a national bankrupt law.

The Territories are under the control of Congress, and have only such powers of self-government as Congress may see fit to grant them. In practice, however, the whole territorial system of the United States has been controlled by the purpose of developing the Territories into States: their powers of self-government have been increased just as fast as they have grown in population, and they have been treated as inchoate States.

Amendments become valid as parts of the Constitution when proposed by two-thirds of both Houses of Congress, and ratified by legislatures or conventions (as Congress may decide) in three-fourths of the States. Instead of the original proposition by Congress, Congress is directed to call a new Federal convention for proposing amendments, if it is called for by two-thirds of the State legislatures. The first method of amendment alone has been employed up to this time, and has resulted in the adoption of fifteen amendments which are not incorporated in the Constitution, but are added to it as a supplement. They are as follows:

(I–X.) The first ten amendments were an outcome of the struggle over the adoption of the Constitution. Many of the States which ratified it did so with a strong recommendation of amendments; and one State (New York) desired to make her ratification conditional on the prompt consideration by Congress of the amendments proposed by New York. The supporters of the Constitution would accept nothing but unconditional ratification, and yet there seemed to be a necessity for some amendments as a means of removing the apprehensions of the more moderate of the opposition. When the first Congress met under the Constitution, twelve amendments were proposed

by Congress, and ten of these, having been ratified by three-fourths of the State legislatures, became the first ten amendments. They are guarantees of popular rights: (I) to freedom of religion, speech, the press, and petition; (II) to keep and bear arms; (III) to be free from the quartering of soldiers in their houses, except by statute in time of war; (IV) to be secure against unreasonable searches and seizures, and against general warrants; (V) to be held to answer for capital or infamous crimes only by indictment, or presentment by a grand jury, except under martial law; not to be brought twice into jeopardy of life or limb for the same offence; not to be compelled to bear witness against one's self; not to be deprived of life, liberty, or property without due process of law; and not to be deprived of property without just compensation; (VI) in criminal trials, to speedy and public trial by jury, in the district, previously ascertained by law, where the crime was committed, and to have counsel and compulsory process for witnesses; (VII) to trial by jury in suits at common law, where the matter in dispute is valued at more than twenty dollars; (VIII) to be secure from excessive bail and fines, and from cruel and unusual punishments; (IX) to retain their reserved rights without disparagement or question from the rights granted in the Constitution; (X) to have secured to themselves or to the States the rights not granted to the United States or prohibited to the States by the Constitution. These amendments were proposed by Congress Sept. 25, 1789, and declared ratified Dec. 15, 1791.

(XI) The Constitution gives the supreme court jurisdiction of cases to which a State shall be a party. The supreme court at once construed this to give to individuals the right to sue a State. To avoid this construction, the eleventh amendment was proposed by Congress March 5, 1794, and declared ratified Jan. 8, 1798. It prohibited suit against a State in the Federal courts by citizens of another State or of a foreign state.

(XII) The twelfth amendment was proposed by Congress Dec. 12, 1803, and declared ratified Sept. 25, 1804. It altered the electoral system into its present form, as previously described.

(XIII) The thirteenth amendment was proposed by Congress Jan. 31, 1865, and declared ratified Dec. 18, 1865. Pres. Lincoln's Emancipation Proclamation of Jan. 1, 1863, had simply freed the slaves in the States which had not abandoned armed resistance to the laws. It had committed the army and navy to the maintenance of the freedom of such persons; and it necessarily excepted from the operation of the proclamation parts of Louisiana and Virginia, and the States of Kentucky and Delaware. Missouri and Maryland had begun an emancipation of their own; but, as to the other former slave States, there was nothing to prevent the practical or open transfer of legitimate slaves from Kentucky and Delaware, and the re-establishment of slavery. The thirteenth amendment cut the difficulty out by the roots, by forever forbidding slavery within the limits of the United States. During the summer and autumn which followed Pres. Lincoln's assassination, the conventions of the various Southern States, assembled under the lead of Pres. Johnson, ratified this amendment as their first step to re-entering the Union. The amendment thus obtained a three-fourths ratification with comparatively little difficulty; and, when Congress met in December, Secretary Seward proclaimed the amendment ratified, as if to commit Congress to the Southern conventions which had ratified it. Congress, however, declined to be so committed, or to recognize the applicants for seats from the States reconstructed under "the President's policy."

(XIV) The fourteenth amendment was proposed by Congress June 16, 1866. It comprised the terms of readmission offered by Congress to the States which had been in insurrection. It was in five sections.

(1) All persons born or naturalized in the United States, not having transferred their allegiance, were declared citizens of the United States and of the State of their residence. This was to avoid the Dred Scott decision of the Supreme Court in 1857 (see that title). No State was to make any law to abridge the privileges or immunities of citizens of the United States, or deny to any person the equal protection of the laws. (2) If any State should refuse the ballot to any portion of its male citizens over 21, the State's representatives in Congress were to be reduced proportionally. (3) The higher classes of Confederate office-holders, who had previously taken an oath to support the Constitution of the United States, were not to hold any office, civil or military, under the United States or the State until their disabilities should be removed by a vote of two-thirds of both houses of Congress. (4) The public debt of the United States was not to be questioned; that incurred in aid of insurrection was to be forever void. (5) Enforcing powers were given to Congress.

The terms offered were rejected; the Southern legislatures refused to ratify the amendment, and without them a three-fourths ratification of the amendment was out of the question. The Congressional elections of 1866, for members of the Congress of 1867-9, gave the Republicans a two-thirds majority in both houses, sufficient to override Pres. Johnson's veto for the remainder of his term of office. During the opening months of 1867, therefore, the majority in Congress framed and passed the Reconstruction Act, to be carried out by the succeeding Congress; and the new Congress, which met in March, passed supplementary acts to strengthen it. The reconstruction acts divided the insurrectionary States into military districts, each under command of a military officer, who was to repress disorder and execute the act. The commanding officer in each district was to register the voters of the State, including freedmen, and excluding all persons who would be unable to hold office under the (proposed) fourteenth amendment. This was the essential feature of the Congressional plan of reconstruction; those who were to be excluded from office under the third section of the fourteenth amendment were to be excluded from reconstruction, from registration, from voting, and from membership in the conventions which were to frame the new State constitutions. When these conventions should frame constitutions which should seem to Congress republican, and when their legislatures should ratify the fourteenth amendment, Congress promised to admit their Senators and Representatives. This plan of reconstruction was followed out, the fourteenth amendment received a three-fourths vote of the States, and it was declared ratified July 21, 1868.

(XV) The second section of the fourteenth amendment, reducing a State's representation in Congress in proportion to its exclusion of any class of voters from the right of suffrage, was not found satisfactory in practice. It was not easy to secure any initiative in enforcing it, and it has really been a dead letter since its passage. To reach its object more directly, the fifteenth amendment was proposed by Congress Feb. 27, 1869, and was declared ratified March 30, 1870. It forbade the United States or any State to deny or abridge the right of citizens to vote, on account of race, color, or previous condition of servitude, and gave Congress enforcing power. Educational or property limitations could still be imposed by the States, but they must be imposed on whites and blacks alike. This closes the list of alterations in the Constitution up to the present time.

Party contest in the United States, and to a large extent in the States also, turns on the construction of the Constitution. The instrument, as has been stated, is framed in outline only, and the outlines are necessarily to be filled out with legislation. If legislation had been restricted, as under the Confederation, to powers

expressly granted, every invention, every development of society, would have been only a new danger and difficulty to the unfortunate government of the United States. It would have been a strain to make the express power to establish post-offices and post-roads cover the new case of railways; an impossibility to stretch it to cover the later case of telegraphs. But the Constitution, after enumerating the powers of legislation, adds the power "to make all laws which shall be necessary and proper for carrying into execution the foregoing powers, and all other powers vested by this Constitution in the government of the United States, or in any department or officer thereof." It is true that the Supreme Court has decided that the word "necessary" may mean "absolutely necessary," "very necessary" or simply "necessary;" that Congress is the judge as to whether proposed legislation comes under any of these heads; and that "an act of Congress is not to be pronounced unconstitutional unless the defect of power to pass it is so clear as to admit of no doubt." These rules might seem to lead to absolute government by Congress; but a more abiding guarantee is found in the influence of this question of construction on the votes of constituents and the action of their representatives. All admit that Congress has both express and implied powers. Some admit only such implied powers as can be deduced *directly* from the expressed powers; others are willing to deduce implied powers from implied powers; while others, acknowledging the legality of both, have a strong aversion to any but the more direct powers. There is thus opportunity for the formation of two great parties, for an indefinite variety of individual opinions, and for party contest in every form. The general line of division has been into strict constructionists and broad constructionists, the latter being usually called loose constructionists by their opponents. The former have been represented by one party in our history—the Democratic party, usually called Republican from 1792 until about 1815. The latter have been represented by three parties—the Federal party (1789-1817), the Whig party (1832-52), and the Republican party since 1854 (see the names of the parties). But one result of an accession of the strict construction party to power has always been that it has adopted and put in practice on its own account various points of broad construction, which, when reaffirmed by its opponents on returning to power, have passed beyond question. The general drift of American constitutional law has thus been toward a broad construction, but the drift has not been unhealthily rapid.

See Bancroft's, Hildreth's, and Von Holst's *Histories of the United States*; Story's *Commentaries on the Constitution*; Kent's *Commentaries*; *The Federalist*; Curtis's and Bancroft's *Histories of the Constitution*; Elliot's *Debates*; Poore's *Federal and State Constitutions*; Farrar's *Manual of the Constitution*; Cooley's *Constitutional Limitations*; Hurd's *Theory of our National Existence*; Lalor's *Cyclopedia of Political Science*.
(A. J.)

II. STATE CONSTITUTIONS.—Under this head is presented a synopsis of the present political organization of the several States, together with the dates of their ratification of the Constitution of the United States, or their admission as States, and of their successive constitutions. The numbers prefixed indicate in case of the original thirteen States the order of their settlement; in case of the other States the order of their admission into the Union:

22. *Alabama*.—Organized as a Territory March 3, 1817. Admitted as a State Dec. 14, 1819. Its successive constitutions bear date Aug. 2, 1819; Dec. 20, 1865; July 13, 1868; Dec. 6, 1875. Elections are held biennially on the first Monday in August of even years. A voter must be a male citizen of the United States, or one who has declared his intention to become such, 21 years of age, 12 months a resident of the State, and 3 months of the county. The legislature meets biennially on the Tuesday after the second Monday in No-

member in even years. Its session is limited to 50 days. A representative must be a qualified voter in the county. A senator must be 27 years of age and a qualified voter in his district. The term of a representative is 2 years, of a senator 4 years. Judges are elected by the people. Their term is 6 years. They may be removed by impeachment, or by the governor on the address of two-thirds of the general assembly. The governor must be 30 years of age, 10 years a resident of the United States, and 7 years of the State. His term is 2 years and his salary \$3000. He has the veto power, but may be overruled by a majority of the whole number of members of each house. He has also the pardoning power.

25. *Arkansas*.—Organized as a Territory March 2, 1819. Admitted as a State June 15, 1836. Its successive constitutions bear date Jan. 30, 1836; Jan. 19, 1864; Feb. 11, 1868; Oct. 13, 1874. Elections are held biennially on the first Monday of September. A voter must be a male citizen of the United States, or one who has declared his intention of becoming such, 21 years of age, a resident of the State for 12 months, of the county for six months, and of the precinct for 1 month. The legislature meets biennially on the first Tuesday after the second Monday in January in odd years. The session is limited to sixty days. A representative must be 21 years of age, a citizen of the United States, a resident of the State for 2 years, and of the county or district for 1 year. A senator must be 25 years of age, and must have the other qualifications of a representative. The term of a representative is 2 years, that of a senator is 4 years. The judges are elected by the people. Their term of office is in the supreme court 8 years; in a circuit court 4 years; and in a county court 2 years. The judges of the supreme and the circuit courts may be removed by the governor on the joint address of two-thirds of the general assembly. The governor and lieutenant-governor must each be a citizen of the United States, 30 years of age, and for 7 years a resident of the State. The governor's term of office is 2 years and his salary \$5000. He has both veto power and pardoning power.

31. *California*.—Formerly included in Mexico, it was ceded to the United States Feb. 2, 1848, and admitted as a State Sept. 9, 1850. Its successive constitutions bear date Nov. 13, 1849; May 7, 1879. Elections are held annually on the first Tuesday of November. A voter must be a male citizen of the United States, 21 years of age, not a native of China; he must have been a resident of the State 1 year, of the county or district 90 days, and of the precinct 30 days. The legislature meets biennially on the first Monday after the first day of January in the odd years. The session is limited to 60 days. A representative must be 21 years of age, a citizen and inhabitant of the State, and of the county or district 1 year before the election. A senator must be 25 years of age, and must have the other qualifications of a representative. The term of a representative is 2 years, that of a senator is 4 years. The judges are elected by the people. The term of a judge of the supreme court is 12 years, of a superior county court 6 years. A judge may be removed by a concurrent vote of both houses of the legislature, adopted by a two-thirds vote of each. The governor and lieutenant-governor must each be 25 years of age, and for 2 years a citizen of the United States and resident of the State. The governor's term of office is 4 years and his salary is \$7000. He has the veto power, but may be overruled by a two-thirds vote. He has also the pardoning power.

38. *Colorado*.—Organized as a Territory Feb. 28, 1861. Admitted as a State by act March 3, 1875, which took effect Aug. 1, 1876. Its constitution bears date July 1, 1876. Its elections are held on the first Tuesday in November. A voter must be a male citizen of the United States, or a person who has declared his intention to become a citizen 4 months before he offers to vote; he must be 21 years of age and a resident of the State for 6 months. The legislature meets biennially on the first Wednesday of January in odd years. The session is limited to 40 days. A representative must be 25 years of age, a citizen of the United States, and for 1 year a resident of the county or district. A senator must have the same qualifications. The term of a representative is 2 years, that of a senator 4 years. The judges are elected by the people. Their term of office is in the supreme court 9 years; in district courts 6 years; in county courts 3 years. They may be removed by impeachment. The governor and lieutenant-governor must each be a citizen of the United States, 30 years of age, and for 2 years a resident of the State. The governor's term of office is 2 years and his salary \$3000. He has the veto power over acts of the legislature, but may be overruled by a two-thirds vote. He has also pardoning power.

8. *Connecticut*.—Ratified the Constitution of the United States Jan. 9, 1788. On becoming a State in 1776 it contin-

ued its charter of 1662 in force as the organic law, but a new constitution was adopted Oct. 5, 1818. Elections are held on the Tuesday after the first Monday in November. A voter must be a white male citizen of the United States, 21 years of age, a resident of the State for 1 year, and of the district 6 months, sustaining a good moral character, and being able to read any article of the constitution or any section of the statutes of the State. The legislature meets annually on the first Wednesday of January. Both senators and representatives must have the same qualifications as voters, and their term is 1 year. The judges are elected by the general assembly on nomination by the governor. Their term is 8 years. They may be removed by the governor, and no person may hold a judicial office after reaching the age of seventy. The governor and lieutenant-governor must have the same qualifications as voters. The governor's salary is \$2000 and his term is 1 year. He has the veto power, but may be overruled on reconsideration by both houses of the assembly. He has also the pardoning power.

6. *Delaware*.—Ratified the Constitution of the United States Dec. 7, 1787. Its successive constitutions bear date Aug. 27, 1776; June, 1792; Nov. 8, 1831. Elections are held on the Tuesday next after the first Monday in November. A voter must be a free white male citizen of the United States, 21 years of age, a resident of the State for 1 year, and of the county for 1 month; he must have paid a county tax 6 months before election. The legislature meets biennially on the first Tuesday of January in odd years. A representative must be 24 years of age, a citizen of the State for 3 years, and an inhabitant of the county or district for the last year of that time. A senator must be 27 years of age, with other qualifications of a representative, and must have a freehold estate of 200 acres, or an estate of £1000 at least. The term of a representative is 2 years, and of a senator 4 years. Judges are appointed by the governor and hold their offices during good behavior, but may be removed by impeachment. The chancellor receives a salary of \$1100, chief-justice of supreme court \$1200, and associate-justice \$1000. The governor must be 30 years of age, a citizen and inhabitant of the United States for 12 years, and of the State for 6 years. His term of office is 4 years, and his salary is \$2000. He has a veto power on acts of the legislature, but may be overruled by a two-thirds vote. He has also the pardoning power.

27. *Florida*.—Formerly belonging to Spain, it was ceded to the United States in 1819. Organized as a Territory March 30, 1822. Admitted as a State March 3, 1845. Its successive constitutions bear date Dec. 3, 1838; Nov. 7, 1865; May, 1868. Elections are held biennially on the first Tuesday after the first Monday of November in odd years. The session is limited to 60 days. A voter must be a male citizen of the United States, or one having made declaration of his intention to become such; he must be a resident of the State for 1 year, and of the county for 6 months. The legislature meets on the first Tuesday after the first Monday of January biennially. Senators and representatives must be duly qualified electors in the respective counties or districts which they represent. The term of a representative is 2 years, that of a senator 4 years. Judges are appointed by the governor and confirmed by the senate. Judges of the supreme court hold their office for life or during good behavior; judges of the circuit court 8 years, and of the county courts 4 years. Judges of the supreme court receive a salary of \$3000, and of the circuit courts \$2500. They may be removed by impeachment. The governor and lieutenant-governor must each be a qualified elector, a citizen of the United States for 9 years and of the State for 3 years. The governor's term is 4 years and his salary \$5000. He has a veto power on acts of the legislature, but may be overruled by a two-thirds vote. The pardoning power is vested in the governor, justices of the supreme court, and attorney-general, or a major part of them, of whom the governor shall be one.

13. *Georgia*.—Ratified the Constitution of the United States Jan. 2, 1788. Its successive constitutions bear date Feb. 5, 1777; Jan. 4, 1789; May 30, 1798; Nov. 7, 1865; March 11, 1868; Dec. 5, 1877. Elections are held biennially on the first Wednesday of October in even years. A voter must be a male citizen of the United States, or one having declared his intention to become such; 21 years of age, a resident of the State for 6 months, and of the county or district for 30 days, and must have paid his taxes. The legislature meets on the first Wednesday in November in even years. The session is limited to 40 days. A representative must be 21 years of age, a citizen of the United States, and a citizen of the State for 2 years, and for 1 year a resident of the county for which he is chosen. A senator must be 25 years of age, a citizen of the United States, 4 years citizen of State, and 1 year resident of his district. The term of a

representative is 2 years, and that of a senator 4 years. The judges are elected by the legislature. Their term is in supreme court 6 years, in superior courts 4 years. They may be removed by the governor on the address of two-thirds of each branch of the general assembly, or by impeachment and conviction thereon. The governor must be 30 years of age, 15 years a citizen of the United States, and 6 years a citizen of the State. His salary is \$4000 and his term is 4 years. His veto may be overruled by two-thirds vote. He has pardoning power.

21. *Illinois*.—Organized as a Territory Feb. 3, 1809. Admitted as a State Dec. 3, 1818. Its successive constitutions bear date Aug. 26, 1818; Aug. 31, 1847; July 2, 1870. Elections are held on the Tuesday next after the first Monday in November. A voter must be a male citizen of the United States, 21 years of age, a resident of the State for 1 year, and of the election district for 90 days. The legislature meets biennially on Wednesday next after the first Monday in January of odd years. A representative must be 21 years of age, a citizen of the United States, 5 years a resident of the State, and 2 years of his district. A senator must be 25 years of age, and have the other qualifications of a representative. The term of a representative is 2 years, of a senator 4 years. Judges are elected by the people. Their term of office is in supreme court 9 years; in appellate and in circuit courts 6 years; in county courts 4 years. They may be removed by the general assembly on concurrence of three-fourths of all the members. The governor and lieutenant-governor must each be 30 years of age, and for 5 years a citizen of the United States and of the State. The governor's term is 4 years and his salary is \$6000. His veto may be overruled by a two-thirds vote. He has pardoning power.

19. *Indiana*.—Organized as a Territory May 7, 1800. Admitted as a State Dec. 11, 1816. Its successive constitutions bear date June 29, 1816; Feb. 10, 1851. Elections are held on the first Tuesday in November. A voter must be a male citizen of the United States, 21 years of age, a resident of the State 6 months, and, if a foreigner, 1 year in the United States. The legislature meets biennially on the Thursday next after the first Monday of January in even years. The session is limited to 60 days. A representative must be 21 years of age, a citizen of the United States, 2 years inhabitant of the State, and 1 year of his county or district. A senator must be 25 years of age, and have all other qualifications of representative. The term of a representative is 2 years, and of a senator 4 years. Judges are elected by the people. Their term is in supreme court 7 years, in circuit courts 6 years, and in courts of common pleas 4 years. They may be removed by the supreme court. The governor and lieutenant-governor must each be 30 years of age, 5 years a citizen of the United States and of the State, and not holding any other office. The governor's term is 4 years and his salary \$3000. His veto may be overruled by a majority vote. He has pardoning power.

28. *Iowa*.—Organized as a Territory June 12, 1838. Admitted as a State Dec. 28, 1846. Its successive constitutions bear date Aug. 3, 1846; Aug. 3, 1857. Its elections are held on the first Tuesday of November. A voter must be a male citizen of the United States, 21 years of age, 6 months a resident of the State, and 60 days of the county. The legislature meets biennially on the second Monday of January in even years. A representative must be 21 years of age, a male citizen of the United States, 1 year an inhabitant of the State, and of his county or district. A senator must be 25 years of age and have the other qualifications of a representative. The term of a representative is 2 years, and of a senator 4 years. Judges are elected by the people. Their term is in supreme court 6 years, in district courts 4 years. Their salary is in supreme court \$2000; in district courts \$1600. They may be removed by the senate. The governor and lieutenant-governor must each be 30 years of age, a citizen of the United States, and a resident of the State 2 years previous to election. The governor's term is 2 years and his salary \$2500. His veto may be overruled by a two-thirds vote. He has pardoning power.

34. *Kansas*.—Organized as a Territory May 30, 1854. Admitted as a State Jan. 29, 1861. Its successive constitutions bear date Dec. 15, 1855; May, 1858; Oct. 4, 1859. Elections are held on the Tuesday next after the first Monday in November. A voter must be a white male citizen of the United States, or one having declared his intention to become such, 21 years of age, 6 months resident of the State. The legislature meets biennially on the second Tuesday of January in odd years. The sessions are limited to 50 days. Senators and representatives must be duly qualified voters in their county or district. The term of a representative is 2 years, of a senator 4 years. Judges are elected by the people. Their term is in supreme court 6 years, in district court 4 years. They may be removed by

resolution of both houses of the legislature, two-thirds of the members concurring. The governor and lieutenant-governor must each possess the qualifications of an elector at the time of his election. The governor's term is 2 years and his salary \$3000. His veto may be overruled by a two-thirds vote. He has pardoning power.

14. *Kentucky*.—Formed out of Virginia. Admitted as a State by act of Congress, Feb. 4, 1791, which took effect June 1, 1792. Its successive constitutions bear date April 19, 1792; Aug. 7, 1799; June 11, 1850. Elections are held on the first Tuesday in November. A voter must be a male citizen of the United States, 21 years of age, 2 years resident of the State, and 1 year of the county. The legislature meets biennially on the first Monday in December of the odd years. Its session is limited to 60 days. A representative must be 24 years of age, a citizen of the United States, 2 years resident of the State, and 1 year of the county. A senator must be a citizen of the United States, 30 years of age, 6 years resident of the State, and 1 year of the district. The term of a representative is 2 years, of a senator 4 years. Judges are elected by the people. Their term is in the court of appeals 8 years; in the circuit courts 6 years; in the county courts 4 years. They may be removed by the governor on the address of two-thirds of each house of the general assembly. The governor and lieutenant-governor must each be a citizen of the United States, 35 years of age, and 6 years a resident of the State. The governor's term is 4 years and his salary \$5000. His veto may be overruled by a majority vote. He has pardoning power.

18. *Louisiana*.—Formerly belonging to France, but ceded to Spain in 1763, restored to France in 1801, and sold by Napoleon to the United States in 1803. Organized as a Territory March 3, 1805. Admitted as a State by act of Congress, April 8, 1812, which took effect April 30, 1812. Its successive constitutions bear date Jan. 22, 1812; Nov. 5, 1845; Nov. 1, 1852; September, 1864; Aug. 18, 1868; July 23, 1879. Elections are held every four years on Tuesday next after the third Monday of April. A voter must be a male citizen of the United States, by birth or naturalization, or one who has declared his intention to become such, 21 years of age, 1 year resident of the State, 6 months of the parish, and 30 days of the ward or precinct. The legislature meets biennially on the second Monday of May in even years. Its session is limited to 60 days. A representative must be an elector, 5 years a resident of the State, and 2 years of the parish or district. A senator must be 25 years of age, and have the same qualifications as a representative. The term of each is 4 years. Judges of the supreme court are appointed by the governor, by and with the advice and consent of the senate. Their term is 8 years. Judges of the courts of appeal are elected by the assembly in joint session. In each court one judge has a term of 8 years, and the other of 4 years. Judges of the district courts are elected by the people for terms of 4 years. Judges may be removed by impeachment, or by the governor on the address of two-thirds of the members of each house of the assembly. The governor and lieutenant-governor must each be 30 years of age, 10 years a citizen of the United States and resident of the State, and must not hold office under the United States within 6 months preceding the election. The governor's term is 4 years and his salary \$4000. His veto may be overruled by two-thirds vote. He has pardoning power, on the recommendation of the lieutenant-governor, attorney-general, and presiding judge of the court in which conviction was had, but not in cases of impeachment and treason. The latter crime may be pardoned by the general assembly.

23. *Maine*.—Formerly a part of Massachusetts, was admitted as a State March 15, 1820. Its constitution bears date Jan. 5, 1821. Elections are held on the second Monday of September. A voter must be a male citizen of the United States, 21 years of age, a resident of the State 3 months before the election. The legislature meets biennially on the first Wednesday of January in odd years. A representative must be 21 years of age, 5 years a citizen of the United States, 1 year resident of State, and 3 months of county or district. A senator must be 25 years of age, and have the other qualifications of a representative. The term of representatives and senators is 2 years. Judges of the supreme judicial court are appointed by the governor, with the consent of council, and serve for 7 years. They may be removed by impeachment, or by address of both branches of the legislature to the executive. The governor must be 30 years of age, a natural-born citizen of the United States, and 5 years a resident of the State. His term is 2 years and his salary \$2500. His veto may be overruled by a two-thirds vote. He has pardoning power, and is aided by an executive council.

9. *Maryland*.—Ratified the Constitution of the United States April 28, 1788. Its successive constitutions bear date

Nov. 11, 1776; Jan. 4, 1851; Oct. 13, 1864; Sept. 18, 1867. Elections are held on the Tuesday next after the first Monday in November. A voter must be a white male citizen of the United States, 21 years of age, 1 year resident of State, and 6 months of county or district. The legislature meets biennially on the first Wednesday in January in even years. Its session is limited to 90 days. A representative must be 21 years of age, a citizen of the State, and 3 years resident of the same, and 1 year a resident of the county or district. A senator must be 25 years of age, and have the other qualifications of a representative. The term of a representative is 2 years, of a senator 4 years. Judges are elected by the people, and hold their office in supreme court 15 years. They may be removed by the governor on conviction, or on the address of two-thirds of the general assembly. The governor must be 30 years of age, 10 years a citizen of the United States, 5 years a resident of the State, and a qualified voter. His term is 4 years and his salary is \$4500. His veto may be overruled by a two-thirds vote. He has pardoning power.

2. *Massachusetts*.—Ratified the Constitution of the United States Feb. 6, 1788. Its constitution is dated March 2, 1780. Elections are held on Tuesday next after the first Monday of November. A voter must be a male citizen, 21 years of age, 1 year a resident of the State, and 6 months of the county or district; he must have paid taxes within 2 years, and be able to read the constitution and to write his name. The legislature meets annually on the last Wednesday of May. A representative must be for 1 year a resident of his district. A senator must be an inhabitant of the State for 5 years and inhabitant of his district. The term of senators and representatives is 1 year. Judges are appointed by the governor, by and with the advice of the council, and hold their office during good behavior. They may be removed by the governor with the consent of the council. The executive department consists of a governor and lieutenant-governor, and the governor is aided by an executive council. The governor must be an inhabitant of the State for 7 years, possessing a freehold of £1000, and must be of the Christian religion. His term is 1 year and his salary \$5000. His veto may be overruled by a two-thirds vote. He has pardoning power.

26. *Michigan*.—Organized as a Territory Jan. 11, 1805. Admitted as a State Jan. 26, 1837. Its successive constitutions bear date Nov. 2, 1835; Aug. 15, 1850. Elections are held on Tuesday next after the first Monday of November. A voter must be 21 years of age, 3 months resident of the State, and 10 days of township or ward. The legislature meets biennially on first Wednesday of January in odd years. Senators and representatives must be qualified electors in their respective districts. Their term is 2 years. Judges are elected by the people. Their term is in the supreme court 8 years, in the circuit courts 6 years. They may be removed by the governor on a concurrent resolution of two-thirds of the members of the legislature. The governor and lieutenant-governor must each be 30 years of age, 5 years a citizen of the United States, and 2 years a resident of the State. The governor's term is 2 years and his salary \$1000. He has the veto power, but may be overruled by a two-thirds vote. He has also pardoning power.

32. *Minnesota*.—Organized as a Territory March 3, 1849. Admitted as a State by act May 4, 1858, taking effect May 11, 1858. Its constitution bears date Aug. 29, 1857. Elections are held on the first Tuesday of November. A voter must be a male citizen of the United States, or one having declared his intention to become such, 21 years of age, 1 year a resident of the United States, 4 months of the State, and 10 days of election district. The legislature meets annually on the first Wednesday of December. The session is limited to 60 days. Senators and representatives must be qualified voters, 1 year residents of the State, and 6 months of the district. Their term is 2 years. Judges are elected by the people. Their term is in supreme court and in district courts 7 years. They may be removed by impeachment. The governor and lieutenant-governor must each be 25 years of age, citizen of the United States, and 1 year *bona fide* resident of the State. The governor's term is 2 years and his salary \$3000. His veto may be overruled by two thirds vote. He has pardoning power.

20. *Mississippi*.—Organized as a Territory April 7, 1798. Admitted as a State Dec. 10, 1817. Its successive constitutions bear date Aug. 15, 1817; Oct. 26, 1832; Dec. 1, 1868. Elections are held on the first Tuesday after the first Monday in November. A voter must be 21 years of age, a citizen of the United States, 6 months resident of the State, and 1 month of the county. The legislature meets biennially on the first Tuesday after the first Monday of January in odd years. A representative must be 25 years of age and an actual resident of the county he represents. A senator

must be 25 years of age, 1 year inhabitant of the State and an actual resident of the district he represents. The term of a representative is 2 years, of a senator 4 years. Judges are appointed by the governor, by and with the advice and consent of the Senate. Their term is in the supreme court 9 years, in circuit courts 6 years. They may be removed by impeachment. The governor and lieutenant-governor must each be 30 years of age, 20 years a citizen of the United States, and 2 years a resident of the State. The governor's term is 4 years and his salary \$3000. He has veto power, but may be overruled by two-thirds vote. He has also the pardoning power.

24. *Missouri*.—Organized as a Territory June 4, 1812. Admitted as a State by act March 2, 1821, which took effect Aug. 10, 1821. Its successive constitutions bear date July 19, 1820; June 6, 1865; Oct. 30, 1875. Elections are held biennially on the Tuesday next after the first Monday of November. A voter must be a male citizen of the United States, or one having declared his intention to become such, not less than 1 year and not more than 5 years before he offers to vote, 21 years of age, 1 year a resident of the State, and 60 days resident of the county. The legislature meets biennially on the first Wednesday after the first day of January in odd years. Its session is limited to 70 days. A representative must be a male citizen of the United States, 24 years of age, for 2 years a qualified voter of the State, 1 year inhabitant of the county or district, and must have paid a State or county tax within 1 year before election. A senator must be 30 years of age, for 3 years a voter of the State, and must have the other qualifications of a representative. Judges are elected by the people. Their term of office is in supreme court 10 years; in court of appeals 12 years; in circuit courts 6 years. They may be removed by impeachment. The governor and lieutenant-governor must each be 35 years of age, 10 years a citizen of the United States, and 7 years a resident of the State. The governor's term is 4 years and his salary \$5000. He has the veto power, but may be overruled by two-thirds vote. He has also pardoning power.

37. *Nebraska*.—Organized as a Territory May 30, 1854. Admitted as a State by act Feb. 9, 1867, taking effect March 1, 1867. Its successive constitutions bear date June 21, 1866; Oct. 12, 1875. Elections are held on Tuesday succeeding first Monday in November. A voter must be 21 years of age, a male citizen of the United States, or one who has declared his intention of becoming such 30 days prior to the election, 6 months a resident of the county. The legislature meets biennially on the first Tuesday of January in odd years. Its session is limited to 40 days. Senators and representatives must be electors, and must have resided within their district 1 year before election. Their term is 2 years. Judges are elected by the people. Their term is in the supreme court 6 years; in district courts 4 years; in county courts 2 years. They may be removed by the governor. The governor and lieutenant-governor must each be 30 years of age, 2 years a citizen of the United States and of the State. The governor's term is 2 years and his salary \$1000. He has the veto power, but may be overruled by two-thirds vote. He has also pardoning power.

36. *Nevada*.—Organized as a Territory March 2, 1861. Admitted as a State by act March 21, 1864, taking effect Oct. 31, 1864. Its constitution bears date September, 1864. Elections are held biennially on Tuesday next after first Monday in November. A voter must be 21 years of age, a white male citizen of the United States, 6 months resident of the State, and 30 days of the county or district. The legislature meets biennially on the first Monday of January in odd years. Its session is limited to 60 days. Senators and representatives must be duly qualified electors in their respective districts and counties. Their term is 2 years. Judges are elected by the people. Their term is in supreme court 6 years, in district courts 4 years. They may be removed by impeachment. The governor and lieutenant-governor must each be 25 years of age, 2 years resident of the State, and a qualified elector. The governor's term is 4 years and his salary \$6000. His veto may be overruled by a two-thirds vote. He has pardoning power.

4. *New Hampshire*.—Ratified the Constitution of the United States June 21, 1788. Its successive constitutions bear date Jan. 5, 1776; June 2, 1784; Sept. 5, 1792. Elections are held biennially on the first Tuesday in November in even years. A voter must be 21 years of age, a male inhabitant of the State, town, and place. The legislature meets biennially on the first Wednesday in June in odd years. A representative must be 21 years of age, 2 years inhabitant of the State, resident of the district, and of the Protestant religion. A senator must be 30 years of age, 7 years inhabitant of the State, and must have the other qualifications of a representative. Judges are appointed

by the governor with consent of the council, and hold office during good behavior, but must not be over 70 years of age. They may be removed by the governor with consent of the council. The governor must be 30 years of age, 7 years a resident of the State and of the Protestant religion. His term is 1 year and his salary \$1000. He has the veto power, but may be overruled by two-thirds vote. He also exercises the pardoning power with the aid of the executive council.

3. *New Jersey*.—Ratified the Constitution of the United States Dec. 18, 1787. Its successive constitutions bear date July 3, 1776; Aug. 13, 1844. Elections are held on the first Tuesday after the first Monday in November. A voter must be a male citizen of the United States, 21 years of age, 1 year a resident of the State and county. The legislature meets annually on the second Tuesday of January. A representative must be a qualified voter, 21 years of age, 2 years a resident of the State, and 1 year of the county. A senator must be a qualified voter, 30 years of age, 4 years a resident of the State, and 1 year of the county. The term of a representative is 1 year, of a senator 3 years. Judges of the court of errors and appeals and of the supreme court are appointed by the governor with the consent of the senate; judges of the courts of common pleas are appointed by the senate and general assembly. Judges of the court of errors and appeals hold office 6 years; of the supreme court 7 years; of the courts of common pleas 5 years. They may be removed by impeachment. The governor must be 30 years of age, 20 years a citizen of the United States, 7 years a resident of the State. His term is 3 years and his salary \$5000. His veto may be overruled by a majority of the house in which the bill originated. Pardons are granted by the governor, the chancellor and the six judges of the court of errors and appeals.

5. *New York*.—Ratified the Constitution of the United States July 26, 1788. Its successive constitutions bear date April 20, 1777; February, 1822; November, 1846. Elections are held on Tuesday after the first Monday in November. A voter must be a male citizen, 21 years of age, 1 year resident of the State, 4 months of county, 30 days of district, and 10 days a citizen. The legislature meets annually on the first Tuesday in January. "No person shall be eligible to the legislature who at the time of his election, or within 100 days previous thereto, has been a member of Congress, a civil or military officer under the United States, or an officer under any city government." The term of a representative is 1 year, of a senator 2 years. Judges are elected by the people. Their term is in the court of appeals and supreme court 14 years (but not after the age of 70 years), in county courts 6 years. They may be removed by resolution of both houses of the legislature, two-thirds of the members concurring. The governor and lieutenant-governor must each be 30 years of age, a citizen of the United States, and 5 years a resident of the State. The governor's term is 3 years and his salary \$10,000. His veto may be overruled by two-thirds vote. He has pardoning power.

7. *North Carolina*.—Ratified the Constitution of the United States Nov. 21, 1789. Its successive constitutions bear date Dec. 18, 1776; March 16, 1868; Oct. 12, 1875. Elections are held on the first Tuesday of November. A voter must be a male person born in the United States or naturalized, 21 years of age, 12 months a resident of the State, and 90 days of the county. The legislature meets biennially on the first Wednesday after the first Monday in January in odd years. Its session is limited to 60 days. A representative must be a qualified elector and 1 year a resident of the county. A senator must be 25 years of age, 2 years a resident and citizen of the State, and 1 year of his district. The term of senators and representatives is 2 years. Judges are elected by joint ballot in the two houses of assembly. Their term is 8 years, but they may be removed upon a concurrent resolution of two-thirds of both houses of the general assembly. The governor and lieutenant-governor must each be 30 years of age, 5 years a citizen of the United States, 2 years a resident of the State. The governor's term is 4 years and his salary \$5000. He has veto and pardoning power, and is assisted by a council.

17. *Ohio*.—Erected into a Territory by the ordinance of 1787. Admitted as a State by act of April 30, 1802, which took effect Nov. 29, 1802. Its successive constitutions bear date Nov. 29, 1803; March 10, 1851. Elections are held on the second Tuesday of October. A voter must be a white male citizen of the United States, 21 years of age, and 1 year resident of State and county. The legislature meets biennially on the first Monday of January in odd years. Senators and representatives must have been residents of their respective districts or counties 1 year preceding their election. Their term is 2 years. Judges are elected by the people. Their term is 5 years. They may be removed by a concurrent resolution of both houses of the general assembly, two-thirds of the members concurring. The gov-

ernor and lieutenant-governor must possess the qualifications of an elector. The governor's term is 2 years and his salary is \$4000. He has veto and pardoning power.

33. *Oregon*.—Organized as a Territory Aug. 14, 1848. Admitted as a State Feb. 14, 1859. Its constitution bears date Nov. 9, 1857. Elections are held biennially on the first Monday of June in even years. A voter must be a white male citizen of the United States, 21 years of age, 6 months resident of the State. The legislature meets biennially on the second Monday of September in even years. Its session is limited to 40 days. Senators and representatives must be citizens of the United States, 21 years of age, 1 year inhabitants of district or county. The term of a representative is 2 years, of a senator 4 years. Judges are elected by the people. Their term is in supreme court and in circuit courts 6 years, in county courts 4 years. They may be removed by the governor on the joint resolution of the legislative assembly, in which two-thirds of its members concur. The governor must be 30 years of age, a citizen of the United States, 3 years a resident of the State. His term is 4 years and his salary \$1500. His veto may be overruled by two-thirds vote. He has pardoning power.

10. *Pennsylvania*.—Ratified the Constitution of the United States Dec. 13, 1787. Its successive constitutions bear date Sept. 28, 1776; Aug. 9, 1790; Feb. 22, 1838; Dec. 16, 1873. Elections are held on Tuesday next following the first Monday of November. A voter must be 21 years of age, 1 month a citizen of the United States, 1 year a resident of the State, 2 months a resident of the district, and must have paid within 2 years a State or county tax 1 month before the election. The legislature meets biennially on the first Tuesday of January in odd years. Its session is limited to 150 days. A representative must be 21 years of age, 4 years a citizen and inhabitant of the State, 1 year an inhabitant of the district, and resident of it during term of service. A senator must be 25 years of age, and must have all the other qualifications of a representative. The term of a representative is 2 years, of a senator 4 years. Judges are elected by the people. Their term is in the supreme court 21 years, in the court of common pleas 10 years. They may be removed by the governor on the address of two-thirds of the senate. The governor and lieutenant-governor must each be a citizen of the United States, 30 years of age, and 7 years inhabitant of the State. The governor's term is 4 years and his salary \$10,000. His veto may be overruled by two-thirds vote. He grants pardons on recommendation of board of pardons.

11. *Rhode Island*.—Ratified the Constitution of the United States May 29, 1790. As a State it remained under the colonial charter of 1663 until its present constitution was adopted, bearing date Nov. 23, 1842, and taking effect May 2, 1843. Elections are held on the first Tuesday in November. A voter must be a male citizen of the United States, 21 years of age, 1 year resident of the State, and 6 months of the district; he must possess real estate to the value of \$134, and must have paid his taxes. The legislature meets annually on the last Tuesday in May. Senators and representatives must be qualified electors. Their term is 1 year. Judges are elected by the legislature and hold their office until it be declared vacant by the legislature, or they may be removed by impeachment. The governor must be a qualified elector. His term is 1 year and his salary is \$1000. His veto may be overruled by two-thirds vote. He has pardoning power.

12. *South Carolina*.—Ratified the Constitution of the United States May 23, 1788. Its successive constitutions bear date March 26, 1776; March 19, 1778; June 3, 1790; Sept. 27, 1865; April 16, 1868. Elections are held biennially on the first Tuesday following the first Monday of November in even years. A voter must be a male citizen of the United States, 21 years of age, 1 year resident of the State, and 60 days of the county. The legislature meets annually on the fourth Tuesday of November. A representative must be 21 years of age, a citizen of the United States, 1 year resident of the State, and 3 months of county. A senator must be 25 years of age, and have the other qualifications of a representative. The term of a representative is 2 years, of a senator 4 years. Judges are appointed by the general assembly. Their term is in the supreme court 6 years, in circuit courts 2 years. They may be removed by the governor on the address of two-thirds of each house of the general assembly. The governor and lieutenant-governor must each be 30 years of age, 2 years a citizen of the United States, and a citizen and resident of the State, and must believe in the existence of a Supreme Being. The governor's term is 2 years and his salary \$4000. His veto may be overruled by a two-thirds vote. He has pardoning power.

16. *Tennessee*.—Formed out of North Carolina and admitted as a State June 1, 1796. Its successive constitutions bear date Feb. 6, 1796; March 6, 1835; March 26, 1870. Elections are held biennially on the first Tuesday after the first Monday in November of even years. A voter must be

a male citizen of the United States, 21 years of age, 12 months resident of the State and 6 months of county or district, and must have paid poll-tax. The legislature meets biennially on the first Monday in January in odd years. Its session is limited to 75 days. A representative must be a citizen of the United States, 21 years of age, 3 years resident of the State and 1 year of the county. A senator must be 30 years of age and have the other qualifications of a representative. The term of senators and representatives is 2 years. Judges are elected by the people. Their term is 8 years. They may be removed by a concurrent vote of both houses of the general assembly, two-thirds of the members concurring in such vote. The governor must be 30 years of age, citizen of the United States and 7 years citizen of the State. His term is 2 years and his salary \$3000. His veto may be overruled by a majority vote of all the members of both houses. He has pardoning power.

29. *Texas*.—Formerly belonging to Mexico, declared its independence March 2, 1836, was annexed to the United States by act of March 1, 1845, and admitted as a State Dec. 29, 1845. Its successive constitutions bear date Oct. 13, 1845; June 25, 1866; Dec. 3, 1869; Feb. 17, 1876. Elections are held biennially on the first Tuesday of November of even years. A voter must be a male person, 21 years of age, a citizen of the United States, 1 year a resident of the State and 6 months of the district or county. The legislature meets biennially on the second Tuesday of January in odd years. A representative must be a qualified elector of the State, 2 years resident of the State, and 1 year of his district. A senator must be 26 years of age, 5 years resident of the State, and 1 year of his district. The term of a representative is 2 years, of a senator 4 years. Judges are elected by the people. Their term is in supreme court and in court of appeals 6 years, in district courts 4 years. They may be removed by impeachment. The governor and lieutenant-governor must be 30 years of age, a citizen of the United States, and 5 years resident of the State. The governor's term is 2 years and his salary \$5000. His veto may be overruled by two-thirds vote. He has pardoning power.

15. *Vermont*.—Formed out of New Hampshire and New York. Admitted as a State by act of Feb. 18, 1791, taking effect March 4, 1791. Its successive constitutions bear date July 8, 1777; March, 1787; Nov. 2, 1796. Elections are held biennially on the first Tuesday of September in even years. A voter must be a male, 21 years of age, 1 year resident of the State. The legislature meets biennially on the first Wednesday of October in even years. A representative must be a freeman, 2 years resident of the State and 1 year of the county. A senator must be 30 years of age and a freeman of the county for which he is elected. The term of senators and representatives is 2 years. Judges are elected by the legislature. Their term is 2 years. They may be removed by impeachment. The governor and lieutenant-governor must each be 4 years resident of the State. The governor's term is 2 years and his salary \$1000. His veto may be overruled by a majority vote. He grants pardons with consent of the executive council.

1. *Virginia*.—Ratified the constitution of the United States June 26, 1788. Its successive constitutions bear date June 29, 1776; Jan. 14, 1830; Aug. 1, 1851; April 11, 1864; July 6, 1869. Elections are held biennially on the first Tuesday after the first Monday of November in odd years. A voter must be a citizen of the United States, 21 years of age, 12 months a resident of the State and 3 months of the county, having paid capitation tax. The legislature meets biennially on the first Monday of December in odd years. Its session is limited to 90 days. Senators and representatives must be qualified voters of the district. The term of a representative is 2 years and of a senator 4 years. Judges are chosen by the joint vote of the general assembly. Their term is in supreme court 12 years, in circuit courts 8 years, in county courts 6 years. They may be removed by impeachment. The governor and lieutenant-governor must each be a citizen of the United States, 30 years of age, 3 years a citizen of the State; if of foreign birth he must have been a citizen of the United States for 10 years next preceding his election. The governor's term is 4 years and his salary \$5000. His veto may be overruled by two-thirds vote. He has pardoning power.

35. *West Virginia*.—Formed out of Virginia; admitted as a State by act of Dec. 31, 1862, taking effect June 19, 1863. Its successive constitutions bear date April 3, 1862; Aug. 22, 1872. Elections are held biennially on the second Tuesday of October in even years. A voter must be a male citizen of the State, 1 year resident of the State, and 60 days of the county. The legislature meets biennially on the second Wednesday of January. Senators and representatives must have been residents of their district 1 year. The term of a representative is 2 years, of a senator 4 years. Judges are

elected by the people. Their term is in supreme court 12 years, in circuit court 8 years. They may be removed by a concurrent two-thirds vote of both houses of the legislature. The governor's term is 4 years and his salary \$2700. His veto may be overruled by a majority vote. He has pardoning power.

30. *Wisconsin*.—Organized as a Territory April 20, 1836. Admitted as a State by act of March 3, 1847, which took effect May 29, 1848. Its constitution bears date March, 1848. Elections are held on the first Tuesday after the first Monday of November. A voter must be a white male citizen of the United States, or one who has declared his intention to become such, 21 years of age, and 1 year a resident of the State. The legislature meets on the second Wednesday of January. Senators and representatives must be qualified electors in the district which they are chosen to represent. The term of a representative is 1 year, of a senator 2 years. Judges are elected by the people. Their term is in supreme court 10 years, in circuit court 6 years. The governor and lieutenant-governor must each be a citizen of the United States, and a qualified elector. The governor's term is 2 years and his salary \$5000. His veto may be overruled by a two-thirds vote. He has pardoning power.

CONSULS.

CONSULS. Consuls are divided, according to the See Vol. VI. *United States Consular Regulations*, into p. 280 Am. the following classes: Consuls-general, vice- ed. (p. 315 consuls-general, consuls, vice-consuls, deputy Edin. ed.). consuls, consular agents, commercial agents, vice commercial agents, consular clerks, and office clerks. Deputy consuls, etc. exercise the same powers as their superiors within a limited territory, while vice-consuls, etc. are appointed to fill temporary vacancies. A class of consular pupils is recognized by a treaty between France and the United States, which provides that they shall have the same privileges and immunities of the person as consuls. "Commercial agents" are peculiar to the United States service, probably from considerations of convenience in their appointment or recognition. A consul must receive, in addition to his commission from the appointing government, a permission to act from the nation of his residence. This permission is commonly in the form of an *exequatur*, which consists of letters patent signed by the chief executive of the nation and countersigned by the minister for foreign affairs. In Russia and Denmark the *exequatur* is not used, and the consul simply receives notice of his recognition. In Austria *exequatur* is written in the commission, accompanied by the imperial seal. By treaties between the United States and Italy, Denmark, Belgium, France, and New Granada, the *exequatur* is required to be issued free of charge; but England, Spain, and some other countries require the payment of charges ranging from about \$8 to \$90.

A nation may appoint consuls in such ports and cities of another nation as are desirable, although consular conventions usually specify the places where these officers may be maintained. A consul's powers extend to a great variety of matters, including marriages, desertions, wrecks, administration of estates, adjustment of average, shipping interests, judicial proceedings affecting members of the nation he represents, and protection (when appealed to) of the persons and property of foreigners generally. A consul may take affidavits and depositions affecting members of his nation; authenticate contracts, wills, protests, declarations, etc.; and execute commissions issued from the courts of his nation. For the protection of the rights and redress of the wrongs of the members of his nation a consul may appeal to the judicial or other authorities in his district.

The immunities of consular officers, as a rule, are only such as are necessary to the proper administration of their functions. A consul is entitled to immunity from military occupation of his dwelling, from military and naval service, and from jury and other civil service. If he is not engaged in commerce, he is exempt from arrest on civil process. A consul is subject to arrest in criminal cases, but a distinction is made sometimes between offences which are "crimes" and those that are "misdemeanors" according to the local law. Treaties between the United States and France and Italy permit arrest only in case of "crimes." (A. P. S.)

CONTEMPT.—Every defiance or disobedience of constituted authority, every insult to it, every act in derogation of it, involves a contempt of that authority. Under the system of law prevailing in England, and in this country, such acts, with respect to legislative bodies and courts, have come to be known as "contempts." Anything intended to obstruct justice, or which will have that effect, may be punished as a contempt by the court before which the proceedings are had. "Contempt is a wilful disregard or disobedience of a public authority;" it is also defined as "a disobedience to the rules and orders of a court which hath power to punish such offence." "And this word is used for a kind of misdemeanor, by doing what one is forbidden, or not doing what he is commanded."

Sir William Blackstone (4 *Com.* 285) enumerates various contempts, which may arise in presence of a court, by rude and contumelious behavior, obstinacy, prevarication, and any wilful disturbance; others out of the presence of the court, by disrespect to, or disobedience of, its process or orders, by speaking contemptuously of the judges acting in their judicial capacity, by printing false accounts, or even true ones, without proper permission, of causes depending in judgment. Contempts are distinguished as direct and constructive contempts, the first being those committed in the actual presence of the court, or by disobedience of its orders or process, "which openly resist or insult the powers of the court or the persons of the judges;" the second being those elsewhere committed, and which do not involve such direct defiance and disobedience. Contempts accompanied by violence, insulting language, etc., are sometimes termed criminal contempts.

As special instances of contempt the following have been noted:

Insulting language to a judge relative to his conduct in a suit before him, even though uttered out of court, or any insult to him in the discharge of the duties of his office, is a contempt: so is a publication tending to degrade a court, to overawe it, and extort a decision from it. To threaten a prosecutor with danger of his life, to procure the arrest of a party to a suit to prevent him from being heard, are contempts. Formerly it was held a contempt to publish an advertisement as to proceedings in court, or to print a brief before a cause was heard, and generally to publish matter tending to prejudice the minds of the public or the jury, or reports of a trial after an order of court prohibiting this to be done; but now much greater license is allowed in these respects. Endeavoring to prevent witnesses from attending court, unfair practices towards, or oppression under color of process, of witnesses, or threatening them, striking a defendant in the lobby of the court, calling a person a liar in the presence of a court, and in hearing of its officers, arresting a party to a suit, or a witness, while attending court, though not in its actual presence, or serving process on him in its presence, all these acts have been held contempts. Mustering a body of militia so near a court as to disturb its deliberations is a contempt. As grand- and petit-juries while sitting are part of the court, any improper conduct with regard to them may come within this category. Such are communicating with a grand-jury by a witness or a bystander, without their request, touching a complaint before them; speaking disrespectfully of a grand-jury, or publishing defamatory notices of them in a newspaper, sending letters to improperly influence them in a matter before them, or about to come before them. To sign a counsel's name to a bill in equity, or an attorney's to process without his consent, to appear as an attorney not having been admitted as such, to procure worthless bail, or bail in feigned names, these are contempts. As regards those in official position, which includes all judges of inferior courts, magistrates, officers of the court, comprising attorneys, gaolers, sheriffs, and many others performing similar functions, it may be said that all corrupt conduct, oppression, or injustice in execution of an office, gross or wilful neglect of duty, and generally all misbehavior in office, constitute contempt of court.

Persons connected with proceedings in court as parties are guilty of contempt if they disobey any rule or order of

court, endeavor to make improper use of the powers of the court, so if they refuse to pay fees of a court officer, or, when books are submitted to a party by order of court, break open parts sealed up not relating to the subject of litigation. Witnesses are guilty of contempt if when summoned they fail to appear, when called on to testify they refuse to be sworn, or to give evidence, or prevaricate in their evidence, or remain in a court-room whence an order of court has excluded them.

Very many of the contempts to legislative bodies are constituted by the refusal to testify, or produce books and papers before committees of such bodies. Interference with the officers of a court or a legislative body in discharge of their duty is a contempt.

Contempts are punishable by fine and imprisonment, and anciently in England by a corporal or infamous punishment, but no instance of this latter sort has occurred in this country. There is a difference in the kind and degree of punishment which may be imposed by different courts: the punishment in the power of legislative bodies is imprisonment only, which must terminate at the end of the session, since then such bodies are dissolved. If a fine be not paid the party may be committed to prison; he is then in the position of one convicted of a criminal offence, and this is true of any commitment for contempt. It has been held that a court of the United States which has committed a prisoner for contempt cannot discharge him on the ground of his inability to pay, his offence being one against the United States and subject to the pardoning power of the President alone. In many States there are statutory provisions for the discharge of criminals unable to pay their fines.

Contempts in the presence of the court it will of its own motion notice and punish summarily; those elsewhere committed must be brought to its knowledge by information, generally on affidavits, when a summons is issued to the offender to appear and answer, or to show cause why an attachment, that is, a warrant of arrest, should not issue against him. In flagrant cases an attachment issues in the first instance. Some cases of constructive contempts, as those by publication, for instance, the court will of its own motion notice and punish. To award an attachment is entirely in the discretion of the judge, and he may do so on his own knowledge or on a bare suggestion. The object of an attachment is only to bring up the offender for a hearing that he may answer on oath in regard to his alleged contempt; it is indispensable that he be arrested or summoned, except in cases of contempt in the presence of the court, on which, as said, the court will take action at once.

Persons guilty of contempt may be arrested whenever found within the jurisdiction of the court, even though the contempt were committed outside of such jurisdiction. The accused may clear himself on oath of the alleged contempt; that is, in technical language, he may purge the contempt; but if he commit perjury in so doing he may be prosecuted therefor. The contempt may also be purged by the submission of the offender; but although he may excuse himself on the ground of innocence of intention, where the words or the act were at all doubtful, or admitted of more than one interpretation, the nature of the words or the act will be chiefly regarded, and if plainly insulting or defiant, an avowal of innocence will not justify, although to some extent it may mitigate, the offence.

It has been questioned whether the summary punishment for contempt is an infringement of the provision in the various State constitutions guaranteeing to the citizen a trial by jury, but wherever this point has been passed on by the courts they have, without exception, decided that it is not. Nor will the privilege of a member of Parliament in England protect him in the commission of a criminal contempt, as, for instance, carrying off a ward of chancery, and refusing to inform the court of her whereabouts. A barrister and member of Parliament wrote an insulting and threatening letter to a master in chancery: the lord chancellor

ordered him to be committed to prison. He evaded arrest until Parliament met, and the House of Commons then decided that his privilege did not protect him. In the celebrated Tichborne case a member of Parliament was committed to prison for making public speeches abusing the lord chief-justice; it was held a gross contempt.

The power of punishing contempts is necessary to self-preservation of a court or a legislative body. How could any assemblage make laws which could not, when convened, establish and maintain, as its own first law, order, and protect itself from insult? How could any court sustain its dignity and enforce its decrees if it could not instantly repress insolence and violence offered it or its ministers, and punish disobedience? Before the English and Roman kings, and the Roman emperors, the embodiments of power and justice, or the chosen citizens on whom were bestowed judicial functions, the representatives of the power of the whole community, any irreverence, any disobedience, was nothing less than a crime, and the devolution on others of this exercise of these functions has carried with it this attribute. To the English Houses of Parliament and to superior courts pertains a power commensurate with their rank; descending in the scale it diminishes, the inferior courts and legislative assemblies having only such as enables them to preserve their existence and perform their functions. The category of contempts which may be committed against these supreme depositaries of power and justice embraces everything which can be defined as such. Of course there cannot arise, in regard to legislative assemblies, so many contingencies in which contempts are possible as occur in the course of the administration of justice by courts. These supreme depositaries are also empowered to inflict the maximum penalty known for offences of this description, and they are, moreover, in all cases where their jurisdiction exists, the sole judges as respects their exercise of this power, free of any interference or control whatever, nor are their decisions subject to review by any other authority. A very celebrated and leading case on this subject is that of *Brass Crosby*, Lord Mayor of London (3 *Wilson Rep.*, 188, A.D. 1771). *Brass Crosby* had been committed by the House of Commons to the Tower for contempt in signing a warrant for the arrest of the messenger of the House and holding him to bail. A writ of habeas corpus had been issued on his behalf from the Common Pleas, and he was brought up into court; but, on hearing the cause of his imprisonment, he was remanded, the court refusing to release him, on the ground that no court would interfere with a commitment for contempt by a superior court.

This case has its parallel in that of *Ex parte Nugent* (1 *Am. L. J. (N. S.)*, 107). This was a petition for a habeas corpus for one committed for contempt before the Senate of the United States in secret session. The writ was issued by the United States District Court in the District of Columbia, and Cranch, C. J., cited Judge Story as declaring that the Lord Mayor's Case had settled the law, which had so continued down to the present day, and, accordingly, the prisoner was remanded. Although the Lord Mayor's Case was a contempt to the House of Commons, the decision fully sustains the general principles as given above: in the opinion of Blackstone, J., the Courts of Westminster Hall are mentioned with the Houses of Parliament, and the same rule laid down for all. To this rule, which is much earlier than the Lord Mayor's Case, there is scarcely any exception. A very noted case, which may be considered to establish the exception to the rule, is *Bushel's Case* (*Vaughan's Rep.*, 135, A.D. 1682). The Court of Oyer and Terminer, a superior court, had committed for contempt a jury which, on a trial in that court, had acquitted the accused, against the direction of the court, and against the law and the evidence (so stated in the order of the court committing them), for which they

were fined, and on non-payment of the fine imprisoned. This action of the court was grossly unconstitutional, and when the jurymen were brought up on habeas corpus in the Common Pleas they were discharged; Chief-Justice Vaughan setting forth most clearly and forcibly that the action of the jury in acquitting was no cause of fine and imprisonment.

This case stands alone, but should its like ever arise again, either in England or the United States, it is hardly possible that any court before which such commitment should be brought for examination could do otherwise than follow the course indicated by Lord Ellenborough in his opinion in *Burdett vs. Abbott* (14 *East. Rep.*, 150), in which *Bushel's Case* had been cited, where he said: "If a commitment appeared to be for a contempt of the House of Commons generally, I would neither in the case of that court, or of any other of the superior courts, inquire further; but if it did not profess to commit for contempt, but for some matter appearing on the return, which could by no reasonable intendment be considered as a contempt of the court committing, but a ground of commitment palpably and evidently arbitrary, unjust, and contrary to every principle of positive law or national justice, I say, in the case of such commitment if it should ever occur, but which I cannot possibly anticipate as ever likely to occur, we must look at it and act upon it as justice may require from whatever court it may profess to have proceeded."

The doctrine we are discussing is well established in England. In the United States it has been adopted in the main by the Federal courts, and those of New York, Vermont, Kentucky, Iowa, Texas, Mississippi, Alabama, Arkansas, and Connecticut. In some of the other States of the Union a different view is entertained; this we will now proceed to examine. Although not universally held in this country, we have denominated the newer views entertained in opposition to those of the English courts, by the courts of some of the States, as the American doctrine, because it originated here, and has in some States supplanted the older doctrine. Why this divergence of opinion first arose, though the causes may not all be apparent, will be somewhat better understood if we advert for a moment to the difference between the English system of courts and that of this country.

The Court of King's Bench in England, being held by fiction of law before the King in person, had precedence of all other courts (strictly so called) in the kingdom, but the other Courts of Westminster Hall were of nearly equal dignity. These courts were the Court of Common Pleas, Exchequer, and the Court of Chancery. In *Bacon's Abridgement* (Courts D.), we are told that Parliament, consisting of King, Lords, and Commons, is the supreme court of the kingdom. Each of the two houses is also a court of judicature. The power of the Houses of Parliament and all these courts over contempt was necessarily independent of all revision or control of any other authority; and this independence of control resulted from the high dignity of the Houses of Parliament and the courts specified, and was established with reference to them. This very clearly appears on examination of Sir William Blackstone's opinion in the Lord Mayor's case. No such order of courts ever existed in the United States. In each State was organized one, or, where a separate equity system was established, two courts of appeal and last resort, which took the place of the King's Bench and Court of Chancery in England, and exercised superintendence over all other courts. Thus the highest courts being much fewer in number in each State, one very strong reason was wanting for the establishment of the English rule. It seemed better that the highest court of a State should exercise a general superintending jurisdiction over all others, the more so that a contempt was a criminal offence. While it was recognized that many of the courts thus controlled were superior courts, they were

still subordinate courts. In some States a distinction has been recognized between the control which a court should have over its officers, allowing a greater latitude in punishing their contempts than those committed by others. Accordingly, on appeal or writ of error, or a certiorari, or a writ of habeas corpus, the highest courts in various States will examine a commitment for contempt by another court of an inferior degree to see—1st, that the committing court did not transcend its jurisdiction; 2d, that its proceedings were formal and regular; 3d, in some cases the inquiry has even been carried farther and the nature of the act considered, whether or not it constituted a contempt. Substantially these views prevail in Pennsylvania, Indiana, Illinois, Tennessee, North and South Carolina, Georgia, Kansas, Michigan, and Wisconsin. Of these States some originally adhered to the stricter doctrine of the English courts. In some States the change has been gradually brought about by decisions of the courts; in others a sudden and radical alteration has been made by statute.

Hitherto we have spoken only of the examination of a commitment for contempt by another court of the same State. Manifestly it is impossible that such examination should be made by a court of another State—that is, by a court of a different sovereignty; the question can only arise within one and the same jurisdiction. But within the boundaries of every State the United States have also jurisdiction, and the inquiry naturally arises, what is the attitude of the Federal and State courts towards each other in this matter. But one case where the question arose is recorded, that of *Passmore Williamson* in 1855, 26 *Penn. State Rep.*, 9. Williamson had been committed by the United States District Court for the Eastern District of Pennsylvania for contempt in disobeying its order to produce certain slaves whom he had aided in carrying away from their owner. Application was made to the Supreme Court of Pennsylvania for a writ of *habeas corpus* in his behalf. The court refused the application on the ground that the commitment was by an independent co-ordinate court, belonging to a different judicial system, and that the doctrine of the Lord Mayor's Case applied to the fullest extent. Had the commitment been by a court of the State the decision would have been different. Thus a conflict of jurisdiction was perhaps avoided.

Notwithstanding the divergence of views above stated, the difference between the English doctrine and that which is gaining ground in the United States is more apparent than real, greater in *practice* than in *principle*; in truth the American doctrine is founded on a logical development of principles underlying all law and justice, and which have been unmistakably declared in a number of cases, old and recent, very notably in *Bushel's Case* and *Burdett vs. Abbott* above adverted to.

Even with regard to commitments of the House of Commons the Court of Queen's Bench declared in *Stockdale vs. Hansard* (9 *Ad. & Ell.*, 1, 1839) that it had power to examine into the alleged privilege of the House (which was set out in the plea), to ascertain if it were truly such; that is, to pass on the question of the jurisdiction of the House of Commons in punishing for the alleged contempt. A similar decision as to the power of the Massachusetts House of Representatives was made in *Burnham vs. Morrissey* (14 *Gray*, 226, 1859). The principle must be borne in mind that where the warrant of commitment of a superior court states no ground of commitment, but alleges generally contempt, this cannot be inquired into. In view of recent decisions, both in England and this country, it may be doubted if this holds good as regards legislative contempts other than those to a House of Parliament.

The law in New York adheres to the stricter view as regards the power of review of sentences for contempt, but in *People ex rel. vs. Kelly* in 1861 (24

N. Y. Rep., 74; 1 *Am. Law Reg.* (N. S.), 534) it was declared that the act charged as a contempt must be such that some degree of delinquency can be fixed on it, if indifferent or proper it cannot constitute a criminal contempt; and if the alleged contempt was only the assertion of a constitutional right, the imprisonment for contempt would be held illegal. In a note to the report of this case Prof. Theodore Dwight argues that the principle of the Lord Mayor's Case does not apply to such cases as this, in which the propriety of a conviction for contempt should be examinable in some way to prevent a failure of justice. This principle should govern only where the commitment is for contempt generally. If the ground of the adjudication appeared on the face of the return, and was plainly bad, the prisoner should be discharged. He cites the opinion of Lord Ellenborough in *Burdett vs. Abbott*, and the very similar case of *Burnham vs. Morrissey*, which fully sustain his views.

This discussion and comparison of the English and American doctrines will now enable us to state briefly the distinction between them. According to the first the jurisdiction of superior courts and the formality and regularity of their proceedings in matters of contempt are presumed, and will not be elsewhere examined, where a commitment by such courts is brought in question; but if want of jurisdiction, lack of proper formality, or gross illegality, be apparent on the face of the proceedings, as they come before the judicial body which scrutinizes them, then such commitment must be declared invalid, and the person under sentence for contempt relieved from such penalty. Where the contrary doctrine governs the same causes would bring about the like result, but if such causes did not appear on the face of the proceedings, the court called on to take cognizance of such commitment would examine and decide whether there were found these requisites of jurisdiction and regularity of proceedings, and where this view is most strongly held, even what was the act complained of, and if it constituted a contempt.

Where the English doctrine prevails there is no other remedy than the very limited power of revision recognized by it for any error, injustice, abuse of discretion, oppressive or corrupt conduct on the part of a judge of a superior court, except by an impeachment before the legislature, or in England an address to the crown, asking the removal of the judge. A number of such cases are found in our annals. That of the judges of the Supreme Court of Pennsylvania in 1807 (which at that date adhered strongly to the English doctrine), though resulting in their acquittal, led to the passage of the act of 1809, limiting the power of the courts over contempts. The victim of legislative tyranny exercised in this manner, except in so far as he can hold accountable its officers and agents, has no redress. The act is that of the whole body, and it is practically irresponsible.

In England inferior courts are usually, in the United States always, courts not of record. To this class in England belonged various private and local courts, many of which have long been obsolete, such as the market court, the court leet. Here must be classed many statutory courts created with limited powers. All these are courts of partial jurisdiction. In the United States courts of justices of the peace, and other similar magistrates, are usually of this class; also such as the surrogate's court in New York, and the court of probate in Massachusetts.

The jurisdiction of this class of courts is never presumed, but must be shown; the same is true as to the regularity and formality of their proceedings. The warrant or order of commitment must set forth the facts and circumstances of the contempt. The power of all such courts is limited to direct contempt committed in their actual presence, and is subject to examination and control by the higher courts to see if they had jurisdiction, and their proceedings were reg-

ular and lawful. In England, and in various American cases, it has been determined that the reviewing court will not go further and examine into the facts of the case to see if a contempt had been committed, if by any fair intendment the facts or words used could constitute contempt. In others of the United States, however, reviewing courts have examined into the act complained of and passed judgment on it, even in respect to commitments for contempt by superior courts, and so likewise in case of contempts to inferior courts. But it is a principle of universal recognition that no court will punish or take notice of a contempt to another court.

The English Houses of Parliament were originally courts, the highest in the kingdom, and, indeed, theoretically, remain such to this day. All the decisions relative to the powers of Superior Courts respecting contempts are of force with regard to them. But no similar state of facts exists with respect to any other legislative assembly, either in the English colonies or dependencies, or this country. Hence springs a distinction between all such assemblies and the Houses of Parliament as regards the foundations on which rests their power over contempts. The early cases in the Federal Courts in which commitments for contempt by either House of Congress were brought under examination seem not to have recognized this distinction, nor to have noticed the historical facts which gave rise to it. In *Kilbourn vs. Thompson* (A. D. 1880, 13 *Otto*, 168) it is very clearly set forth, and the similarity declared in former decisions of the Supreme Court of the United States to exist between the powers of Parliament and Congress entirely repudiated. The exercise of this power by either House of Congress is said not to be supported by the possession of any judicial attributes, nor is any warrant for it found in the history of Congress; it rests solely on the provisions of the instrument by which Congress was created, viz., the Constitution of the United States. The Supreme Court, however, expressly disclaimed deciding how far the power might be implied as necessary to the proper performance of the legislative function.

The principle laid down in this case may be safely assumed to be of force in regard to all legislative bodies in this country, though but one other case is found where the question arose, viz., *Burnham vs. Morrissey*, before mentioned. In this case the power of the Massachusetts Assembly to punish for contempt came under examination by the Supreme Court of the State. The views of the court were in accord with those subsequently pronounced in *Kilbourn vs. Thompson*. Further, it was said that under a written constitution it belongs to the judicial department to determine whether the powers of the legislature have been exercised in conformity with the constitution, and, if not, to treat their acts as null and void. Their power over contempt is limited to cases specially provided for by the State constitution, or necessarily implied from those constitutional functions and duties to whose performance it is absolutely necessary. It is worthy of note that the Constitution of Massachusetts provides that contempt to a house of the legislature may be punished by a definite term of imprisonment extending beyond its session. This is an exception to the parliamentary law of contempt.

As all legislative bodies in the United States are created by positive law, that is, by the constitutions of the several States, in which their powers are laid down and defined, we must look to their organic law to ascertain the nature and extent of their power to punish contempts. It must be derived from this source alone, except in so far as it may be necessary to enable such bodies to carry out the objects for which they were instituted.

In England these principles are now fully recognized, although a contrary view, the same which until recently prevailed in this country, was advanced. This

doctrine, which was formerly that of the Supreme Court of the United States, attributes to every supreme legislative body, such as Congress and the State Legislatures, the inherent power of punishing contempts, as implied in their very nature.

But the English courts latterly repudiated this opinion, and drew a distinction between the powers of either House of Parliament, which depend on the *lex et consuetudo parliamenti* and those of a colonial House of Assembly, such as those of Dominica and Newfoundland. These have no judicial functions like the House of Lords, nor any privileges by ancient usage and prescription like the House of Commons. They are regulated by their charters and have only the authority necessary to their existence and the proper exercise of their functions.

To remove obstructions to the transaction of their business, to expel disorderly members, would seem to be included among these powers, but not to imprison for contempts, which is a judicial power, nor *à fortiori* without an express grant to punish for contempts committed out of their presence. They have no inherent power to commit for contempt.

At the present day the spirit of the law tends entirely toward restriction of the power of punishing contempt. In England the alteration has been made by direct enactment, but recent decisions of the courts manifest a disapproval of the system of punishment for contempt before unknown there. As early as the case of *Stockdale vs. Hansard* (9 *Ad. & Ellis*, 1, 1839) the Court of King's Bench asserted their right to inquire into the alleged privileges of the House of Commons, whose violation was the ground of commitment for contempt by the house; and in a recent case it was observed that the jurisdiction of committing for contempt being practically arbitrary and unlimited, should be jealously watched and not exercised except where there is no other remedy not liable to the same objection. Elsewhere it is said to be of a high and peculiar character, in derogation of the liberty of the subject, and displaying the anomaly of constituting those who exercise it judges in their own cause, and judges from whom there is no appeal.

In the United States a far wider innovation has been effected, and in very many States constitutional and statutory changes and limitations have been made in this branch of the law. The effect of such changes has been to narrow the definition of the offence, diminish the number of persons to whom it can be imputed, and restrict the punishment of it by the courts. This is very noticeably the case as to constructive contempts, which in the United States may be said to be in the main abrogated. An inquiry into the nature and extent of alterations thus effected requires a more detailed examination of the laws of the United States and the constitutions and laws of the various States.

Judicial decisions manifest the same disposition. The power has been declared to be arbitrary in its nature, to be an exception to the provisions of the Constitution of the United States, and one which should not be extended beyond statutory limits. A commitment until further order of the court has been characterized as not consorting with our free institutions. We cannot better sum up our discussion of this branch of the subject than in the language of the Supreme Court of the United States in the case of *Kilbourn vs. Thompson*: "The tendency of modern decisions everywhere is to the doctrine that the jurisdiction of a court or other tribunal to render a judgment affecting individual rights is always open to inquiry, when the judgment is relied on in any other proceeding." (For further details See *American Law Register*, Feb. to July, 1881.) (c. c.)

CONTINGENT REMAINDER, in law, a remainder limited so as to depend on an event or condition which may never happen or be performed, or which may not happen or be performed till after the determination of the preceding estate.

There are four sorts of contingent remainders: *First*. Where the remainder depends entirely on a contingent determination of the preceding estate itself, as where an estate is settled to the use of B till C return from Rome, and after such return of C then remainder over. *Second*. Where the contingency on which the remainder is to take effect is independent of the determination of the preceding estate, as where an estate is settled to A for life, remainder to B for life, and if B die before A remainder to C for life. *Third*. Where the remainder is limited to take effect upon an event which, though it certainly must happen some time or other, yet may not happen until after the determination of the particular estate, as where a settlement is made to A for life, and after the death of B remainder to another in fee. *Fourth*. Where a remainder is limited to a person not ascertained or not in being at the time when such limitation is made.

A striking feature of the law with relation to contingent remainders is the capacity to bar them. This may be effected by collusion of the life-tenant and ultimate remainder-man, if any such there be. If, for example, an estate be settled to A for life, remainder to his eldest unborn son in fee, and in default of such son to B in fee, here A and B can by collusion defeat the contingent remainder to A's unborn son. If A surrenders his life-estate to B prior to the birth of such son, he thereby incurs a forfeiture of which the next succeeding remainder-man can avail himself. There being no estate vested in the unborn son, B is of course the next remainder-man. The whole fee vests therefore in him, and will not thereafter open to allow the intervention of the estate of A's son should he be born. To prevent this result, most modern settlements provide for trustees to preserve contingent remainders, by whose intervention B is prohibited from taking advantage of the forfeiture. See REMAINDER.

(L. L., JR.)

CONTRABAND OF WAR. Contraband of war embraces both persons and property. Persons of a military character on board neutral vessels are liable to capture when on their way for the purposes of the belligerent. In the case of the Trent, Mr. Seward contended that civil officers sent out in the service and at the expense of the enemy, and bearers of contraband despatches, were also contraband of war; but by treaties of the United States with various countries the principle is recognized that persons in neutral ships are not to be seized unless they are officers or soldiers and in the actual service of the enemy; and this appears to be the better rule.

What constitutes contraband goods has been a perplexing question for a long period. In the absence of international convention it was said by Chief-Justice Chase that merchandise is divided into three classes, the first consisting of "articles manufactured and primarily and ordinarily used for military purposes in time of war; the second, of articles which may be and are used for purposes of war or peace according to circumstances; and the third, of articles exclusively used for peaceful purposes." "The first class, destined to a belligerent country or places occupied by the army or navy of a belligerent, is always contraband; the second class is contraband only when actually destined to the military or naval use of a belligerent; while the third is not contraband at all, though liable to seizure and condemnation for violation of blockade or siege." From the various authorities it may be deduced that the following articles are among those absolutely contraband: Arms, and machinery for their manufacture; ammunition, and materials for it, such as lead, potash, and nitrate of soda, gunpowder, saltpetre, brimstone, and gun-cotton; military and naval stores; military clothing and equipments. The following are conditionally contraband: Money, provisions and liquors, materials for the construction of railroads, telegraphic materials, coal, nav, horses, timber, tallow, rosin, etc., etc. It has

been held that paper and printing-presses, and postage-stamps belonging to the enemy and intended for immediate use, are contraband (*The Bermuda*). By treaty between the United States and Bolivia the following articles are specified as contraband of war: (1) Cannons, mortars, howitzers, swivels, blunderbusses, muskets, fuses, rifles, carbines, pistols, pikes, swords, sabres, lances, spears, halberds, grenades, bombs, powder, matches, balls, and everything belonging to the use of arms; (2) bucklers, helmets, breastplates, coats-of-mail, accoutrements, and clothes made up in military form and for military use; (3) cavalry belts and horses, with their harness; (4) generally, all offensive or defensive arms made of iron, steel, brass, copper, or of any other material, prepared and formed to make war by land or at sea. The United States Government has also entered into treaties with Venezuela, the Dominican Republic, and the Two Sicilies containing similar provisions.

A ship is contraband when used or intended to be used by the enemy; and such a ship is liable to confiscation, together with any goods on board belonging to her owner. The prevailing rule among nations is that a ship not itself contraband, but carrying contraband goods, is subject to confiscation; but the United States Government has by recent treaties recognized the milder doctrine that only the contraband goods shall be subject to confiscation.

(A. P. S.)

CONTRACT (from the Latin *contrahere*, to draw together) is the term used to express an undertaking or agreement enforceable by law. It has been defined by Blackstone as "an agreement, upon sufficient consideration, to do or not to do a particular thing;" by Chief-Justice Marshall, "an agreement in which a party undertakes to do or not to do a particular thing;" and by Prof. Theophilus Parsons, "an agreement between two or more parties for the doing or not doing of some particular thing." The law of contracts, in its fullest sense, embraces nearly all the law regulating human affairs both in business and social life; for, in the language of Prof. Parsons, "out of contracts, express or implied, declared or understood, grow all rights, all duties, all obligations, and all law." The subject is treated fully in the work to which this is a Supplement, and the general principles there laid down are applicable to this country and to many other countries also; for there is a singular harmony in the jurisprudence of all the modern nations of the world on this subject. Contracts are generally divided and classified according to—1, their form; 2, the mode of their creation; and 3, the time of their performance. In form, contracts are either of *record*, such as judgments, recognizances, etc., or *specialties*—i. e., in writing and under seal; or else *simple*, which term includes all other contracts, whether written or merely oral. As to the mode of their creation, contracts are either *express*, when stated by the parties in direct and formal terms, or *implied*, when the contract rests upon construction of law arising from the circumstances and the acts of the parties. As to the time of their performance, contracts are either *executed*, where the obligations have been carried out by both parties, or *executory*, where there yet remains to be done what is necessary to fulfil the contract. The essential elements of a legal contract are—1, appropriate parties; 2, mutual assent of the parties; 3, a valid consideration; and 4, a definite subject-matter. Any one not under a legal disability, such as infancy, marriage, or lunacy, may be a party to a legal contract. The assent of the parties must be mutual, and it must be either expressly given or clearly implied from the circumstances and the acts of the parties. The consideration of a contract, the *quid pro quo*, to be valid, must come within the rule that it shall either be some benefit to the party promising or some disadvantage or injury to the party to whom the promise is made. The remedy upon contracts is usually by an action at law, in which may be recovered the sum due by the party who has made default, or such damages arising from his

breach of the contract as the plaintiff may have suffered. But, inasmuch as the mere payment of damages cannot, in some cases, be a complete satisfaction to the injured party, whose injury has resulted from a failure on the part of the other to do what it was in his power to do, courts of equity will, in such cases, as an adequate remedy cannot be had at law, decree a *specific performance* of the contract. The best treatment of the subject of contracts by American writers may be found in the works of Story, Kent, and Parsons. (S. W.)

CONTRERAS. See MEXICAN WAR.

CONTRIBUTION, in law, the doctrine whereby one of several parties who has discharged a common debt or obligation for the benefit of all is enabled to recover from each of his fellows a proportional part of the money laid out by him for them. The doctrine of contribution is said not to depend upon contract, but to be based on the abstract principles of justice.

Contribution could not originally be enforced in courts of common law, and hence came to be a subject of distinctively equitable cognizance. In process of time the common-law courts began to administer justice in such cases through the medium of an implied assumpsit. The peculiar facilities which are afforded in courts of equity, however, to adjust the rights of the various parties, have caused almost all cases on the law of contribution to be litigated before those tribunals, as in this way more satisfactory results are found to be attained.

The doctrine of contribution is most frequently applied in the case of sureties. Where there are two or more sureties, and one pays the debt for which all are bound, the surety who pays has a right to recover from each of his co-sureties his proportionate share of the common burden. In order to entitle the surety to relief in such case it must distinctly appear that the persons against whom he is seeking contribution really occupy towards him the position of co-sureties. He must further show that he has actually paid the debt, and not merely that he is pressed to do so. He must then prove that he has resorted in the first instance to the principal, but has failed to collect the amount paid out from him. In no case can a surety recover from his co-sureties more than the amount actually paid by him. If, therefore, he has compromised the debt, that compromise will inure to the benefit of all the sureties.

Where some of the co-sureties are insolvent, the burden of the debt is divided among the solvent sureties, and the party paying is entitled, therefore, to recover from each of the others an amount dependent upon the number of those actually able to pay. As the right of contribution is an equitable right, it will not be enforced as against superior equities of a third party or of the co-surety, nor will it be enforced to the prejudice or injury of the creditor. (L. L., JR.)

CONVERSION, a change of property from real to personal or from personal into real, not actually taking place, but presumed to exist only by construction or intendment of law.

Conversion is a doctrine of exclusively equitable origin, and is applied for the purpose of preventing manifest injustice, which would otherwise in many cases ensue. It is applied (1) in the case of contracts, (2) in the case of settlements and wills.

(1) As to contracts. Whenever a binding contract is made for the sale of land, *eo instante*, from an equitable point of view, conversion ensues. The purchaser is thenceforth regarded for many purposes as the owner of the land, and the rights of all parties claiming under him are determined by the rules applicable to the devolution of realty. The right of the vendor, on the contrary, is deemed to be exclusively to the purchase-money, and if he die the right to recover that amount vests in his executor.

(2) As to settlements and wills. Whenever a settler or testator by deed or will peremptorily directs land to be converted into money or money into land, the trans-

mutation will, in equity, be deemed to be effected from the moment when the deed or will goes into operation, and the rights of all parties claiming under or through the beneficiaries will be determined by the rules of law which govern the property in its converted shape. Thus, if A devise real estate to his executors, and direct them to sell the same and pay the proceeds to B, and afterwards B dies prior to the disposition of the property, it will be held that B's personal representatives are entitled to the proceeds of the land, and not his heirs. On the other hand, had the testator bequeathed money to his executors, directing them to buy land and convey the same to B, and subsequently B had died prior to the purchase, his heirs would have been held to be entitled, and not his personal representatives.

In order to bring this doctrine into play it is essential that the testator's direction to convert be imperative, leaving no discretion in any one whether the conversion shall or shall not take place. Such an imperative direction may be implied (1) from direct words of command, or (2) by such disposition of the property as necessarily to require a conversion.

It makes no difference how long the actual conversion is to be postponed. In contemplation of equity if it is ever certain to take place it is effected from the moment the deed or will goes into operation.

The doctrine of conversion, being a mere fiction for the purpose of effecting certain ends of abstract justice, will never be applied where there are no distinctive reasons demanding its application. Its effect will also be invariably limited to the purpose of the testator or donor, and therefore in the event of a failure of that purpose the property will devolve according to its original character.

Reconversion is that imaginary process by which a prior constructive conversion is annulled and taken away, the converted property being restored, in contemplation of equity, to its original and actual condition. The beneficiaries under any deed or will whereby a conversion of property is commanded are at liberty at any time before the actual conversion takes place to elect to have the property in its unconverted shape. From the moment that such an election is made the property is said to be reconverted. Reconversion may also in some cases take place by operation of law. (L. L., JR.)

CONVEYANCING. The system of conveyancing in vogue in the United States is much less complex than that employed in England. This circumstance may be accounted for by a variety of considerations. The elaborate family and marriage settlements common in England are seldom or never made use of here. The land is more equally divided among the people, and there is a comparatively small number of great landed proprietors. Even if a single individual does acquire great quantities of real estate, the absence of the law of primogeniture tends speedily to divide his acquisitions. Real estate passes from hand to hand more frequently in this country than in England. Hence there has been a necessity of more convenient methods for its transfer than those adopted in the mother country.

Deeds and conveyances of all kinds in the United States are usually extremely concise in their terms. In some of the States short and apt forms have been provided, which are by statute declared as efficacious as the lengthy and cumbrous instruments drawn up by English conveyancers. In almost all of the States deeds are usually engrossed upon printed forms, thus saving infinite trouble and expense. All unnecessary forms have been dispensed with. The former elaborate covenants for title have been reduced to three—the covenant of seisin, the covenant against incumbrances, and the covenant of general or special warranty. The insertion of any other covenants in a deed is the exception rather than the rule.

A seal of wax is no longer essential to a valid deed.

In Alabama, Iowa, Kansas, Kentucky, and Texas seals have been altogether abolished by law. In Arkansas, Delaware, Florida, Georgia, Illinois, Maryland, Michigan, Minnesota, Missouri, Mississippi, North Carolina, Ohio, Oregon, South Carolina, and Wisconsin, a mere scroll of the pen has been pronounced a sufficient seal. In almost all the other States a rude drawing in pen and ink, a piece of paper gummed to the instrument, or a bit of ribbon drawn through it, is pronounced equally effective.

In the United States deeds are almost invariably acknowledged before a judge, magistrate, notary public or some other appropriate person designated by law, whose certificate and seal are then appended thereto. This has the effect of rendering the deed admissible in evidence without further proof of its execution, and also entitles it to be recorded. The system of recording deeds prevails universally throughout the United States. In every county a register's or recorder's office is provided where the deeds are transcribed into large books kept for that purpose. Indices of the various conveyances recorded are open to the public, and thus sure and satisfactory information may be acquired by any one dealing as to land, with respect to the true state of the title thereof. Speaking generally, it may be said that, as between two conflicting claimants to land, he who first puts his deed on record has the prior right, unless indeed at the time of his acceptance of the deed he had notice, express or implied, of a valid title in the other party.

The value of the recording system in insuring safety to titles, and in promoting ease of transfer from one person to another, cannot be overestimated. It has in addition other and equally valuable features. The preservation in public offices of exact copies of all muniments of title renders it far less necessary to have such muniments drawn up in the first instance in expensive and permanent shape. Paper may be substituted for parchment, and elaborate recitals omitted which the fear of losing the instruments thereby referred to would otherwise cause to be inserted. The loss of title-deeds is also made of far less moment. It is indeed the custom in some of the Southern States to destroy a deed immediately after it has been recorded, the fair record being deemed more desirable than the instrument itself with possible erasures or interlineations.

The system of mortgages is equally simple. The instruments employed are very brief and concise, and are also universally acknowledged or recorded. Equitable mortgages by the deposit of title-deeds are entirely disused, and in some States have been pronounced inefficacious. The comparatively recent origin of most of our titles renders it an easy task in most instances to trace the title to the fountain-head. It is, therefore, the common practice of conveyancers, in examining into a title, to pursue their investigations as far as the original grant from the commonwealth or the United States. In the older States the length of time which has elapsed since the primitive settlements renders this task, in some instances, a difficult one. Proposals have been already made to abridge the length of time covered in such cases, and these will no doubt ultimately be adopted. The statutes of limitation universally existing to quiet the possession of title will contribute much to this end.

In the Western States the division of the land by the government into surveyed blocks much facilitates conveyancing operations. These are, of course, still in their infancy in that region.

The business of conveyancing is carried on in the larger cities and towns of the United States by persons termed conveyancers. These are sometimes, but by no means always, learned in the law. They unite the functions of a scrivener with those of an English attorney and conveyancing counsel. They prepare all necessary papers and pass upon the title. Of late, companies have been formed in some of our large

cities which carry on the business of conveyancing, and also insure the title to real estate. Where a conveyance of land is made, the purchaser usually employs the conveyancer, who acts as his agent. Where a mortgage is executed, the mortgagee names the conveyancer, but the charges of drawing the mortgage and passing the title are paid by the mortgagor.

(L. L., JR.)

CONWAY, MONCURE DANIEL, an American author and public teacher, is the son of W. P. Conway of Fredericksburg, Va., his mother, Margaret Daniel, having been a granddaughter of Thomas Stone, signer of the Declaration of Independence. He was born in Stafford co., Va., March 17, 1832. Having passed through the neighboring academy at Fredericksburg, he went to Dickinson College, Carlisle, Pa., where he graduated in 1849. In the year following he studied law, and wrote occasionally for the *Richmond Examiner*, then edited by his cousin, John M. Daniel. He also wrote, in his nineteenth year, a pamphlet advocating the introduction of free schools into Virginia. Having abandoned the legal profession, he became a minister of the Baltimore Methodist conference, and was appointed to Rockville circuit. In 1852 he was appointed to Frederick circuit in the same State, but his theological views having undergone a change towards Unitarianism, he resigned his charge, and early in 1853 entered the Divinity College, Harvard University, where he graduated the following year. He was at once settled with the Unitarian church at Washington, where he remained two years. His anti-slavery discourses having led to dissatisfaction in the society, he was compelled to leave, and accepted a call to the First Congregational Church in Cincinnati. Here he also published *The Dial*, a monthly periodical. On the breaking out of the Civil War, Mr. Conway devoted himself to delivering free lectures throughout Ohio advocating immediate emancipation as the only means of terminating it. His works on the same subject, *The Rejected Stone* (1861) and *The Golden Hour* (1862), having attracted a good deal of attention, he was invited to speak in New England, and changed his residence to Concord, Mass. In 1863 he visited England, and gave lectures in various parts of that country and Scotland on the struggle in America. He wrote various articles in the English magazines intended to stem the tide of sympathy with the Confederacy, and also published there a work entitled *Testimonies concerning Slavery* (1864). The war having ceased, Mr. Conway, whose theological views had become extremely radical, accepted an invitation to settle with the South Place Free Religious Society in London. In August, 1884, he resigned this pulpit, with the purpose of returning to America and confining himself to literature. His chief publications are—*The Earthward Pilgrimage* (1870), *Republican Superstitions* (1872), *The Sacred Anthology, a Book of Ethnical Scriptures* (1874), *Idols and Ideals* (1877), *Demonology and Devillore* (2 vols., 1879), *A Necklace of Stories* (1880), *The Wandering Jew* (1881), *Thomas Carlyle* (1881), *Emerson at Home and Abroad* (1882), *Travels in South Kensington* (1882.)

CONWAY, THOMAS (1733–1800), a major-general in the American Revolution, was born in Ireland, Feb. 27, 1733. He was educated in France, and entered the French service, rising to the rank of colonel. In 1777 he was induced by Silas Deane to come to America, was made a brigadier-general, and fought in the battles of Brandywine and Germantown. Having urged upon Congress the need of an inspector-general, he was appointed to that position in December with the rank of major-general, being thus promoted over his seniors in commission against the protest of Washington. In Nov., 1777, Major Wilkinson, while on his way from Saratoga to York, Pa., where Congress was in session, with despatches relating to the surrender of Gen. Burgoyne, stopped at the quarters of Lord Stirling at Reading, Pa., and in conversation reported some ex-

pressions used by Conway in letters to Gen. Gates disparaging Washington and censuring his management of the war. These were soon reported to the commander-in-chief, but Gates, on being questioned, pronounced the statements false. In the same month, however, a new Board of War was formed, with Gen. Gates as president, and soon Conway was busy in an intrigue with some members of the board and other influential persons to have Washington superseded by Gates. An important preliminary step to the execution of their plan was to separate, and if possible alienate, La Fayette from Washington; to accomplish this an invasion of Canada was projected under the command of the French marquis, with Conway as second. La Fayette, following the advice of Washington, accepted the position offered him, and went to Albany, where he waited in vain for the men and supplies promised. As the real design of the "Conway Cabal" became known, it was universally condemned, and its authors were deprived of the power to do further mischief. Conway, professing to feel hurt at the distrust shown towards him, offered his resignation, which, contrary to his expectations, was promptly accepted. On July 4 he fought a duel at Philadelphia with Gen. Cadwallader, who charged him with cowardice at the battle of Brandywine. Conway, supposing the wound he had received to be mortal, sent a penitent letter to Washington, and on his recovery returned to France. He again entered the French service, and in 1779 was a general in the army of Flanders. In 1781 he went to India, where he was made colonel of a regiment. In 1784 he was appointed governor of Pondicherry and the French possessions in India, with the rank of field-marshal. When the French Revolution broke out he was obliged to fly, and was saved only by the intervention of the British authorities. He died about 1800.

COOK, JOSEPH, an American lecturer, was born at Ticonderoga, N. Y., Jan. 26, 1838. His name was originally Flavius Josephus, but while at college he shortened it to its present form. After a preparatory training at Phillips Academy, Andover, Mass., he entered Yale College in 1858. Two years later he was obliged to leave on account of impaired health, and in 1863 he went to Harvard College, whence he graduated in 1865. He then spent three years in the study of theology at Andover, and being licensed to preach, supplied some churches in Massachusetts, but has never been ordained. In 1871 he went to Germany and devoted two years chiefly to theological study, though he also travelled as far as Egypt and Syria. On returning to the United States he settled in Boston, and preached in various churches. In 1875 he was invited to deliver a series of lectures on the relations of religion and modern civilization. The course, called the "Boston Monday Lectures," has been chiefly delivered in the Park Street Church and Tremont Temple, and widely published in newspapers. Each year one or more courses were delivered until 1881, when Mr. Cook went abroad and spent two years in travelling around the world. He delivered many lectures in Great Britain, India, Japan, and other countries, and returning to Boston towards the end of 1883 resumed his Monday Lectures. Several volumes of his lectures have been published, among which are those on *Biology*, *Transcendentalism*, and on *Orthodoxy* (all in 1877); on *Conscience*, *Heredity*, *Marriage* (1878); on *Labor* and *Socialism* (1880). He has been in the main a popular champion and expounder of the conservative New England orthodoxy, and has expressed freely his opinions on all questions of the time.

COOKE, JAY, an American financier, was born at Sandusky, Ohio, Aug. 10, 1821. He is the son of Eleutheros and Martha Cooke, and is in direct descent from Francis Cooke, who came to Plymouth in the Mayflower. Eleutheros Cooke, a lawyer of extensive practice, was frequently a member of the Ohio legislature,

and in 1831 was elected to Congress, where he was one of the founders of the Congressional Temperance Society. He died Dec. 28, 1864. Jay Cooke came to Philadelphia, and entered the banking-house of E. W. Clark & Co., in which he became a partner at the age of twenty-one. This firm was prominent in the negotiation of Government loans during the Mexican War. Mr. Cooke retired from business in 1858, but on the breaking out of the Rebellion established the firm of Jay Cooke & Co., and undertook the agency of the Government for the negotiation of its loans. This work he successfully accomplished, supplying the Treasury with more than \$2,000,000,000, all of which passed through his hands. During the darkest hours of the war he was faithful at his post, and by his energy and financial skill contributed materially to the success of the Union cause. His wealth was spent generously, and his summer residence on an island in Put-in Bay, in Lake Erie, near Sandusky, afforded a hospitable retreat to many poor clergymen needing a few weeks' respite from their labors. After the war his firm became the agents of the Northern Pacific Railroad, but misfortunes overtook them in 1873, and their suspension caused the panic of that year and the business depression which followed. Mr. Cooke still retained his faith in the resources of that railroad, and was employed by the receivers to whom his affairs had been assigned for the benefit of his creditors. He devoted himself with unabated energy to the labor of regaining his former position, and in eight years accomplished this herculean task.

COOKE, JOHN ESTEN, a prominent Virginia author, was born at Winchester, Nov. 3, 1830. His father was a distinguished lawyer; his mother, Maria Pendleton, was descended from the Revolutionary judge of that name. Young Cooke's infancy was passed in the Valley of Virginia, but at an early age his father removed to Richmond to practise his profession in the court of appeals, and the boy was placed at school in that city. At nineteen he left school, studied law, was admitted to the bar, and practised four years, when he quitted the profession in order to devote himself exclusively to literature. His first work, *Leather Stocking and Silk*, was published in 1853, and was well received; this was followed the next year by *The Virginia Comedians*, in two volumes. This novel and its sequel, *Henry St. John, Gentleman*, with *Canolles* and *Cary of Hunsden*, described the picturesque old Virginia society of the last century, covering the whole of the interesting period from 1765 to 1781. Between 1856 and 1861 he was a frequent contributor to the *Southern Literary Messenger*, for which he had written from the beginning of his literary career.

When the Civil War broke out he reluctantly threw aside his pen for the sword, and served under Stuart and Jackson. At the close of the war he resumed his literary labors, his first work being the *Life of Stonewall Jackson*, which was published in 1865. The same year he wrote *Surry of Eagle's Nest*, in which, under the form of a novel, he narrated some of the most stirring events of the war from his own experience. The book was very popular, and rapidly went through seven editions. The war was a fresh literary field at that time and Mr. Cooke was so successful in it that he followed *Surry* with *Wearing of the Gray*, *Hilt to Hilt*, *Mohun*, *Hammer and Rapier*, the *Life of Gen. Lee*, etc.

Among Mr. Cooke's later novels are *Pretty Mrs. Gaston*, *The Virginia Bohemians*, and *Mr. Grantley's Idea*. These introduce characters of the present day, but still amid the Virginia scenery, which the author loves to depict. They are marked by the same easy flow of language and incident as his earlier publications. Besides contributing frequently to *Harper's Magazine* and other periodicals, Mr. Cooke has prepared for the young a *History of Virginia*, and has edited *The Life of Capt. John Smith*. Since 1867 he has resided in Clarke co., Va., where, in a beautiful country-seat, he spends his time in literary work. (E. L. D.)

COOKE, HENRY, D. D., LL. D. (1788-1868), an Irish Presbyterian minister, was born at Grillagh, near Maghera, county Derry, May 11, 1788. He graduated at Glasgow University in 1806, and in 1808 was ordained pastor of the Presbyterian church of Duncane. Two years later he became pastor of the church at Donegare, county Antrim, and while holding this charge entered on the contest with Arianism which first rendered him famous. That he might be better fitted for the struggle he returned to his college studies, spending three years (1815-1818) at Glasgow University and Trinity College, Dublin. He then became pastor of the church at Killyleagh, county Down, and in the meetings of the Presbytery and Synod he was the champion of the orthodox party, while the Arians were led by Rev. Henry Montgomery, a man of great tact, eloquence, and learning. The Presbyterian people of the North of Ireland had long held the Westminster Confession of Faith and Catechisms in high esteem and even veneration. Cooke showed them that their prominent ministers were quietly but steadily departing from these standards; he infused courage into the ministers who were weakly deploring the movement instead of resisting it. Repeatedly he forced a contest upon his opponents, and finally secured the passage of an act requiring all the ministers to subscribe anew to the Confession of Faith. The act was carried into effect in 1829, but the opposing party withdrew and formed the Remonstrant Synod of Ulster. His victory was hailed with approval by Presbyterians throughout the world. Jefferson College, in Pennsylvania, conferred on him the degree of D. D., and Trinity College, Dublin, that of LL. D. He was called in 1829 to the pastorate of May Street Presbyterian Church, the largest in Belfast, and remained in that position till his death. In 1847 he was made professor of sacred rhetoric and president of the faculty in the Assembly's College, Belfast. He was also three times elected moderator of the General Assembly, and his position as leader of the Presbyterian Church of Ireland caused his influence to be sought by the government. Besides assisting in other measures for the general welfare of the people, he took part in the establishment of the plan for national education which was adopted in 1830. He was noted for eloquence as a preacher as well as his tact in managing large assemblies. While a strenuous champion of orthodoxy, he was free from sectarian bitterness, and established friendly relations between the Presbyterian and the Established Church of Ireland. The Presbyterian Church in Ireland owes its present healthy and prosperous condition in great measure to the labors of Dr. Cooke. He died at Belfast, Dec. 13, 1868. His biography has been written by his son-in-law, Rev. J. L. Porter, D. D., under the title *Life and Times of Henry Cooke* (London, 1871; new ed., Belfast, 1875).

COOKERY, AMERICAN. While French *cuisine* is generally regarded as the best in the world, it has not been generally adopted in the United States, which have in time acquired a peculiar and marked system of their own. This has come from the necessities of a new and developing country as well as from the special character of many of the native productions. The French method may rather be distinguished as the perfection of *réchauffée*, the science of warming over and economizing, while American cookery deals with the natural viand and is somewhat limited as to the means of treatment. We have open wood-fires or close coal-stoves or ranges; we use the frying-pan and gridiron, and the numberless copper utensils of the European kitchen would be out of place and actually dangerous if neglected. The French system grafted on the American affords an advantage in saving or reducing waste, rather than in actual preparation of food. While the matter of taste is not open to argument or capable of final adjudication, there can be hardly a doubt that the more the natural taste and individuality of food is retained the better it is. From

this it follows that a simple roast or a plain broil cannot be surpassed, whereas the famous *pot au feu* is the means of utilizing many different materials at the sacrifice of the distinctive peculiarities of all. The French excel the world in soups, for example; but what is soup but the essence of meat, fish, or vegetable, flavored in a hundred different ways? In America the same meat, fish, or vegetable would be cooked in a more wasteful way, but so as to retain its natural character. In Europe plain vegetables and plain roasts are rarely served unless at very wealthy tables; in America soups are rarely used except at large dinners and at fashionable hotels, and then are either turned out of can or made of meats and vegetables, with the result left to accident. Our waters produce the finest fish in the world—the salmon, the shad, which is much superior to the European species; the Spanish mackerel, regarded by some judges as the most delicious of all; the pompano, the pride of the Gulf of Mexico; the beautiful red-snapper; the white-fish of the Great Lakes, and a number of smaller but equally excellent kinds. A fish is never better than when boiled simply and plainly with suitable sauce. Cold fish warmed over, except in the shape of that American dish, the fish-ball, is not good, and all foreign attempts to make it so have failed. The flavor is so delicate that simplicity in preparation is a necessity to a satisfactory result.

In shell-fish America has many advantages; crabs are abundant and delicious, soft-shell crabs being accepted as a national dish, though to refined palates they are not as epicurean as the healthy hard crab. The raw oysters of France and England are preferred by those who are used to eating them; but the stewed, fried, and roast oyster are found in perfection only in the United States. The salt water, diamond-backed terrapin is found only along the American Atlantic coast, and it and the canvas-back ducks have attained a reputation the world over unequalled and well merited. A perfect dinner could only be procured in America. A boiled Spanish mackerel, or a broiled or, what is better, "planked" shad, and potatoes for the first course; stewed terrapin or fried oysters, or both, with a mayonnaise of lobster with the oysters, and peas or lima beans, or sweet corn, or all of these, for the second course; and a canvas-back duck (roasted just fifteen minutes) to each guest for the third course, with a salad or currant jelly, as individual taste may dictate. Then sweets, cheese and coffee, and no *cuisine* nor *cordon bleu* can produce a dinner to surpass it. Perfection is attained combined with perfect simplicity, and only in America is such a dinner a possibility. Compare this with a regulation entertainment under ordinary auspices. First come a few cold, clammy raw oysters, which are only suitable for lunch or a stomach stay; then a soup which, if thin, is beef-tea with a few vegetables floating in it, but if thick, is heavy and substantial enough to destroy appetite. Next, fish swimming in gravy between truffles or mushrooms, with no flavor of its own. Then a mess sometimes well flavored, often tasteless, in a little form of pastry. Next, sundry meats cooked up with carrots, turnips, truffles, or mushrooms, so that the natural flavor is utterly extinguished. Finally, chicken or game, the former greasy, the latter cooked out of recognition. Let any intelligent man of healthy stomach compare these dinners, and decide whether French cookery has the superiority over American. Nature has given to each meat, fish, and vegetable its own peculiar taste, and the purpose of cookery should be to retain and develop this taste, not to confound, destroy, and obliterate it.

There are certain dishes which are favorites in our country, and which have come to be looked upon as national, although they may not have originated with us. Griddle-cakes, which are eaten all over the civilized world, have been immensely developed and perfected with us, and few breakfast dishes are better than well-cooked wheat- or rice-cakes. Strawberry short-cake may also be regarded as especially Amer-

ican. Boston baked beans are as famous as they are satisfying to a hearty hunger. Clams raw or as chowder, are peculiar to America, and pumpkin pie is more frequently eaten here, if it is equally appreciated abroad. In fact, the two points that distinguish American cookery are the extent and variety of material, and the simplicity of its preparation. It is not to be judged by that abomination which has almost established itself as a national article of food, the fried beef-steak, than which, as it is generally prepared, nothing can be worse for the palate or the stomach. Nor by that twin essence of evil, the saleratus biscuit, which has committed incalculable wrong against the rural digestion and happiness. But as it is practised in intelligent households, the *cuisine* of the United States will compare favorably with that of any nation in the world. (R. B. R.)

COOLEY, THOMAS MCINTYRE, LL.D., an American lawyer, was born at Attica, N. Y., Jan. 6, 1824. He removed in 1843 to Michigan, was admitted to the bar at Adrian in 1845, and for a time was an editor. The State legislature in 1857 appointed him to the work of compiling and publishing the laws of Michigan. He was (1858-65) reporter of the decisions of the State Supreme Court, and published (vols. v.-xii.) Michigan Supreme Court Reports. He also published an addition of Harrington's *Chancery Reports*, with notes (1872.) In 1859 he became a law professor in the State University at Ann Arbor. He was made one of the judges of the State Supreme Court in 1864, and still remains in that position, though in 1868-69 he acted as chief-justice. Among his works are *Constitutional Limitations upon the Legislative Powers of the States* (1868, 3d ed. 1874); *Blackstone's Commentaries*, with notes (1870); *Story's Commentaries on the Constitution*, with additions (1873); *The Law of Taxation* (1876).

COOPER, PETER (1791-1883), an American philanthropist and manufacturer, was born in New York city, Feb. 12, 1791. His grandfather, John Campbell, had been a deputy quartermaster-general of the American army in the Revolutionary war, and his father was a lieutenant in that army. The latter afterwards engaged in hat-making, but not being very successful removed to Peekskill, where he kept a country store. Peter Cooper had only one year of meagre schooling, and until he was seventeen years of age was kept busy by his father, learning hat-making, ale-brewing, and brick-making. He was then apprenticed to Mr. Woodward, a coach-maker, and while in his employ not only distinguished himself by industry and integrity, but also constructed a machine for mortising the hubs of carriage wheels, which proved very profitable to the owner. When Cooper reached manhood Mr. Woodward offered him capital to start in business, but declining this, he went to Hempstead, L. I., where he was employed in making machines for shearing cloth. He bought the right to manufacture these machines for the State of New York, and for a time was very successful; but the business ceased to be profitable after the conclusion of peace with Great Britain in 1815. Cooper then successively attempted the trade of cabinet-making, the grocery business, and finally the manufacture of glue. For the latter he purchased on a lease of 21 years a factory and other buildings with three acres of ground on Old Middle Road (about Thirty-second street) in New York city. Here he manufactured glue, oil, whiting, prepared chalk, and isinglass. By careful attention to the business he soon got the reputation of making the best glue in the market, which found a ready sale and brought him large returns. When his lease expired the business was removed to Williamsburgh, where he purchased ten acres of ground for the purpose. His enterprise, however, was not confined to this business. In 1828 he purchased for \$105,000 three thousand acres of land at Canton, a suburb of Baltimore, where he erected large iron-works, and afterwards added a

rolling-mill. Locomotives had recently been introduced on railroads, but it was believed that the Baltimore and Ohio Railroad, then building, was unfitted for their use on account of its numerous short curves. The proprietors of the road were greatly disheartened at the prospect of its failure, but Mr. Cooper's inventive genius was stimulated. In 1830 he constructed from his own designs the first American-built railway locomotive. It was called "Tom Thumb," and was used successfully on the road in August of that year. On its trial trip it carried its own wood and water, had six men on an open platform, and drew a car with thirty-six men. On a grade rising 18 feet in a mile it ran 13 miles in 72 minutes, and returned in 57 minutes. Though too small to be of permanent service this engine had proved the practicability of using locomotives on the road, and probably saved the company from bankruptcy. Soon after this Mr. Cooper sold his iron-works in Baltimore, but two years later built other works in New York, which he leased for a time, but was eventually compelled to take into his own management. In these he manufactured wire, and applied successfully for the first time anthracite coal in iron-puddling. In 1845 he removed his works to Trenton, N. J., where they steadily grew into an extensive establishment with subsidiary iron-furnaces in other places. Among these were three large blast-furnaces at Phillipsburg, Pa., and the Durham furnaces 25 miles from Trenton. For many years he employed over 2500 workmen, whom he paid punctually and faithfully. He afterwards sold one-half of the works in order to form a company called the Trenton Iron Works for the management of the vast and increasing business. Finally a division was made by which the company took the blast-furnaces, and Mr. Cooper the rolling-mills and ore-lands. During his active business career he had invented a number of useful devices, among which were one for propelling canal boats by water-power, a machine for grinding plate glass to a perfect plane, an automatic cradle, a cylindrical machine for making wrought-iron rapidly, and many others which might have proved profitable to him had he cared to seek such advantage from them. He was an early advocate and promoter of the electric telegraph. He invested largely in this enterprise, and about 1855 became the President of the North American Telegraph Company, which then controlled one-half of all the telegraph lines in the country. He was thus led to engage in the first attempts to lay a cable across the Atlantic, and continued to assist the enterprise liberally until it resulted in complete success.

Though Mr. Cooper's education had been neglected he highly appreciated the advantages of proper training, and when fortune smiled upon him resolved to assist youth of later generations in procuring what had been denied to himself. As his plans became definitely formed in his mind he purchased the lots and buildings between Third and Fourth avenues and Seventh and Eighth streets in New York city. Here in 1853 he began to build the brown stone structure known as the Cooper Union, and six years later he gave a deed of the property to trustees incorporated by the State legislature. In the act of incorporation the building is declared to be forever devoted to the union of science and art in their application to the useful purposes of life. The building had cost \$634,000, but to this Mr. Cooper added other donations that his benevolent plans might be fully carried out. Free schools giving instruction in various arts and sciences, free reading-rooms, free courses of scientific lectures have been successfully maintained for many years. The chief support of the various departments is derived from the rents of the stores and offices which occupy three stories of the buildings, and from an endowment of \$150,000. The lecture-halls are also rented for public meetings. The classes are open to young women as well as young men, and those who pursue

their studies for five years are entitled to a diploma certifying their attainments. Other certificates are also given to those who pass a satisfactory examination. Mr. Cooper took a warm personal interest in the execution of his benevolent ideas, and frequently visited the classes and other departments of the Union to examine their practical effects. His long life enabled him to witness and enjoy the gratifying result of his practical philanthropy.

Mr. Cooper's interest in the welfare of the laboring classes also led him to a consideration of various problems of social science. His experience as a manufacturer had impressed him with the advantages of the protective system in developing varied industries in each country, and especially in the United States. In the latter part of his life he was equally convinced that it is the duty of each government to provide for its people such amount and kind of currency as their social needs should demand. During the financial agitation in the United States, which followed the period of contraction and the crisis of 1873, this view of the duty of the government was adopted by many persons in the United States, and led to the formation of the Greenback party. In 1876 the representatives of this party nominated Mr. Cooper for President, and over 81,000 votes were cast for that ticket, but he did not secure any electoral vote. His candidacy had no effect in changing his mode of life. Modest, affable, and public-spirited, he still continued his daily round of business and charity. With abundant wealth he lived in unassuming style, and was generous in helping all whose needs were made known to him. He was respected for the purity of his private character, and was beloved by all classes of his fellow-citizens. After a brief illness he died at New York, April 4, 1883.

COOPER, SUSAN FENIMORE, an American author, eldest daughter of the famous novelist, James Fenimore Cooper, was born in 1815. She has written numerous sketches describing country life. Her best-known works are *Rural Hours* (1850, 3d ed. 1876) and *Rhyme and Reason of Country Life* (1854). She has frequently contributed to periodical literature, and edited *The Journal of a Naturalist* (1852).

COOPER, THOMAS, M. D., LL.D. (1759-1840), a politician, natural philosopher, and jurist, was born in London, Oct. 22, 1759. He was educated at Oxford, studied medicine and law, and went to France as a representative of the democratic clubs of England. In his old age he said that the four months he spent in Paris were the happiest in his life, and that in them he lived four years. Mr. Burke having denounced his conduct in a speech in Parliament, Cooper published a violent reply, a cheap edition of which was prohibited by the Government. Having learned in France a process for making chlorine from common salt, he became a bleacher at Manchester. In 1792 he accompanied Rev. Dr. Priestley to the United States, and practised as a lawyer in Sunbury, Pa. Entering into politics, he opposed the Federal party, and published an article in a newspaper, in October, 1799, imprudently attacking President Adams, for which he was tried under the Sedition Act, and sentenced to six months' imprisonment. When he came out of prison, his sufferings as well as his talents placed him high in the esteem of the Republican party, which had now come into power. He was appointed a land commissioner for Pennsylvania, and when he had happily succeeded in settling difficult disputes in Luzerne county, Gov. McKean, in 1806, appointed him judge, but he was removed in 1811 by Gov. Snyder at the request of the legislature on a charge of arbitrary conduct. He then became professor of chemistry in Dickinson College, and in 1816 professor of mineralogy and chemistry in the University of Pennsylvania. In 1819 he became professor in the University of South Carolina, and in 1820 was made president, being also professor of chemistry and political economy. In the nullification contest he supported the ultra States' Rights doctrine. In 1834,

on account of the infirmities of age, he retired from the presidency, and was appointed by the legislature to revise the statutes of South Carolina. Before completing the fourth volume, he died, at Columbia, May 11, 1840. Dr. Cooper was famous for the wide extent of his knowledge and his vigor of expression with voice and pen. Few men have had such an active career and excelled in such diverse departments. President Adams in his old age referred to Cooper as "a learned, ingenious, scientific, and talented madcap." Besides a number of pamphlets, he published *Information concerning America*, London, 1794; *The Bankrupt Law of America contrasted with that of England*, Phila., 1801; *An English Version of the Institutes of Justinian*, Phila., 1812; 3d ed., Phila., 1852; *Tracts on Medical Jurisprudence*, Phila., 1819; *Elements of Political Economy*, Charleston, 1826. He also edited three volumes of the *Emporium of Arts and Sciences*, Phila., 1814. A full account of his trial for libel on President Adams is given in Wharton's *State Trials of the United States*.

COOPER, THOMAS, an English Chartist, lecturer, and poet, who afterwards became a Baptist preacher, was born at Leicester, March 20, 1805. In early life, in spite of extreme poverty, he was diligent in the pursuit of knowledge. He was for a time a Methodist local preacher, but was afterwards dismissed from the Society and became a journalist. While editing a newspaper at Leicester in 1841, he showed some favor to the Chartists, and thereby lost his place. He then took charge of the Chartist journal, and labored in behalf of the oppressed working classes. In August, 1842, he was arrested and imprisoned on a charge of participating in a riot, but, on trial, was acquitted. At a second trial in March following he was found guilty of sedition, and sentenced to two years' imprisonment. During this time he composed his principal poem, *The Purgatory of Suicides; a Prison Rhyme*. It was published in 1845, and procured for him the friendship of some prominent men. He gradually withdrew from active connection with the Chartists, and devoted himself to lecturing on literary and moral subjects. About 1855 his religious convictions returned, and he lectured chiefly on the evidences of Christianity. In 1859, having embraced the views of the Baptists, he was immersed and ordained as a preacher. In 1866, his health having failed, his friends purchased an annuity of £100 for him. He has published *The Bridge of History over the Gulf of Time* (1872), which is a popular view of the historical evidences of Christianity. His other works are *Plain Pulpit Talk* (1873); *The Life of Thomas Cooper* (1873); *The Paradise of Martyrs* (1874). The last is an incomplete poem, similar in form, but different in spirit from his earlier poem,—a revised edition of which was issued in 1877.

CO-OPERATION appears to have been introduced into the United States through the New England fisheries. As far back as 1730, the cod and mackerel fishers and the whalers worked upon the share system. In 1752 mutual assurance began in the organization of The Philadelphia Contributionship for the Insurance of Houses from Loss by Fire; popularly known, from its seal, as The Hand-in-Hand. In 1767 The Corporation for the Relief of Widows and Children of Clergymen in the Communion of the Church of England in America was organized among the colonial clergy of that church. These early essays were very successful. The share system has continued in use, more or less, in the fisheries of New England down to our own times. The Philadelphia Contributionship, and the Pennsylvania Branch of the Corporation for the Relief of Widows and Children, etc., are still in prosperous business. In 1819 the Independent Order of Odd Fellows was instituted in this country; the chief aim of which was, and has continued to be, the mutual assurance of its members in accidents and sicknesses, and of their families in the event

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Edin. ed.).

of death. From this point co-operation has had a continuous history, which will be surveyed in decades.

I. 1820-30. Robert Owen's famous experiment at New Harmony, Ind., occurred early in this period (1824-27.) A number of kindred societies were organized under the impulse of this agitation, eleven in all. Their history was brief, and as they were nearly all communistic in the theory and actual ownership of property, it is treated under COMMUNISM.

II. 1830-40. In this decade co-operative loan and building associations arose in Philadelphia, though apparently to no considerable extent. The records of these pioneers in one of the most successful phases of co-operation in our country are but little known. (See BUILDING ASSOCIATIONS.)

Early in this decade The New England Association of Farmers and Mechanics mooted the subject of co-operative distribution, but no action appears to have resulted. Later on some labor organizations in New England revived the discussion, and stores were started, but appear to have disappeared speedily and silently.

III. 1840-50. This decade opened amid the remarkable wave of interest in co-operation which was roused by the social stir of the Transcendental movement in New England, and by the Fourierite propaganda of the New York *Tribune*. Brook Farm (1841-47), Hopedale (1841-57), and the thirty or more Fourierite Phalanxes (1843-47), were all primarily agricultural co-operative societies, and were in some instances, secondarily, industrial and manufacturing associations. All these experiments were failures, though a few were brilliant failures. (See COMMUNISM.) In the middle of this decade an effort was made to establish co-operative distribution, which for a while promised well. The Working Men's Protective Union, whose first council was held in 1845, attempted to organize the wage-classes for more economical purchasing. Local divisions formed branches of a central supply agency, through which goods were bought at reduced rates. In 1849 its name was changed to The New England Protective Union. The trade of the central store was given as follows:

1848.....	\$112,507.79
1849.....	220,801.60
1850.....	535,338.56

By this time there were 106 divisions in existence, 83 of which reported a membership of 5109, while 84 returned a capital of \$71,890.36. The highest amount held by any one division was \$2765.51; the lowest, \$150; the average, \$855.63. The largest trade made at this time by one division was by No. 55, New Bedford, which, in 1849, made total sales of \$31,278.64.

IV. 1850-60. The early part of this decade witnessed the further growth, and the later period the decline, of The New England Protective Union. The culmination of the organization was reached by the middle of the decade, by which time internal dissensions had brought about a division that was the beginning of dissolution. The old organization in 1855 reported 72 divisions, with 4527 members and an aggregate business of \$1,130,719.29. The new organization reported for the same year a trade of \$1,400,000. By the end of the decade both branches of The Union were practically defunct, and the local stores nearly all either closed, turned into ordinary joint-stock concerns, or were bought out by private parties. A few live on still under new names—e.g., the stores in Worcester, Natick, New Bedford, etc.

This decade brought forth another ephemeral development of co-operation in New England in a series of loan societies. In 1852 The Suffolk Mutual Loan and Accumulating Fund Association of Boston was organized. It was followed by 9 similar societies in 1853, and by 16 in 1854. An act of the legislature was procured in this year to facilitate the incorporation of these associations. This movement assumed such promise that in 1857 the insurance commissioners

of the State began to make special reports of its progress. The report for 1859 showed 36 associations in existence, which had made an aggregate of loans since their organization of \$3,113,808.16.

The early years of this decade saw the very modest beginnings of a form of co-operative industry, quite novel, and destined later on to grow to large proportions. Following the example of a farmer in the western section of New York, a number of experiments were made after 1851 in the combination of dairy-work. Farmers living near each other brought their milk daily to a common dairy-house, where butter and cheese were made by skilled hands. The advantages of this system were at once apparent to those who tried it in the economy it secured and the excellent quality of the products it turned out. It was evident that there was needed only a general knowledge of this system to lead to the wide spread of cheese-factories and creameries which came in later years.

Late in this decade a local experiment was made in co-operative colonization, whose complete success ought to have had more influence than it seems to have exerted. In 1857 fifty poor workingmen of San Francisco combined to purchase a tract of land of upwards of a thousand acres in Los Angeles co., Cal. They placed the charge of it in the hands of the originator of the scheme. He laid out the settlement and worked it by hired hands, while the members of the colony went on in their trades. In three years he had the estate ready for occupancy, and the company located on it, each man in his allotted section. Anaheim continues still a successful village.

V. 1860-70. Fincher's *Trade Review*, a weekly paper, heartily interested in co-operation, records the evidence of the extensive agitation of the subject in this decade. Accounts of meetings for the discussion of the question, calls for lectures and for printed information, appear from time to time in its columns, amid notices of the formation of associations both for productive and distributive co-operation. Between 1863 and 1866 the *Review* notes the opening of 36 stores in different States. That the movement towards co-operative stores had gathered considerable force is evidenced from a call for a conference of New England store-associations in Boston to consider the creation of a wholesale agency, and from the suggestion of a similar conference of the representatives of the stores in New York State. A few of these stores appear to have had substantial strength. The Providence store within its first six months made sales of \$600 a day. The Roxbury and Charlestown stores started with sales of \$6000 each in the first week. Cheering reports came in from time to time of continued prosperity in some of these stores. The Chelsea store claimed total sales in its first year of \$90,000. Along with these encouraging signs appear, however, brief notices of stores closing in various quarters. The *Trade Review* suspended in 1866, and the only general chronicle of the decade ceases.

Massachusetts reported officially in 1868 the existence of 12 distributive associations, having an aggregate capital of \$47,000 and an aggregate membership of 1859. Other stores followed in this State before the close of the decade. An illustration of the soundness of some of these stores is found in the First Worcester Co-operative Grocery and Provision Store (1867), which has continued to the present date, doing a business of \$75,000 in 1875, and reporting in 1881 a paid-up capital of \$5000, with reserves of \$1113.

A curious phase of co-operative distribution is found in this period in the "dividing stores" of Fall River, Mass. A little shop under this name was opened in a wooden shed belonging to a mill corporation in 1865, and so well patronized by the operatives that others followed quickly. They sold as near cost as possible, and of course therefore attempted to create no educational or other funds, such as in the Rochdale store made so essential a part of the scheme. The purely

mercantile character of the system prepared the rapid collapse which the next decade showed.

Productive co-operation received various tentative essays in this decade, none of which seems to have attained much importance or to have secured long continuance. We find notices of foundries in Somerset, Mass., Albany, Cleveland, Cincinnati, Troy, and St. Louis; of ship-yards in Boston and Baltimore; of a cigar manufactory in Westfield, Mass.; of stove manufactories in Lynn and North Adams, Mass.; of a printing establishment in New York city, etc.

The associated dairies grew steadily and rapidly through this period. In 1866 there were 500 in New York State alone, where they originated, averaging 400 cows to a factory, aggregating 200,000 cows, worth \$8,000,000, and bringing into use 1,000,000 acres of land, valued at \$40,000,000. By the close of the decade there were 1313 cheese-factories in the country.

This decade witnessed a decline of the Loan Societies of Massachusetts, which had promised so well in the previous period. The report of the Insurance Commissioner of the State for 1864 gives 22 societies in working order; that of 1865 records 8; and that of 1866 can only show 3 in existence. Their plans seem to have been radically defective. Other States took up this line of effort. Ohio had a series of experiments in loan societies in the years immediately succeeding the war. These all followed the plan already becoming known for its successfulness in Pennsylvania.

In 1866 in Pennsylvania began the remarkable development of co-operative Building and Loan Associations, which has continued to the present time in steady progress, and which has created so large a factor in the wealth of the State. (See BUILDING ASSOCIATIONS.)

In this decade the application of the principle of mutuality to insurance, which had theretofore, with a few isolated exceptions, been confined to charitable and religious organizations, took on the business form in which it has continued to receive an ever-increasing development until it now enters as an important element into the business of the country.

V. 1870-80. The associated dairies grew during this decade into the immense proportions of the present time, as indicated in the next section.

In this period a great impetus was given to co-operation by the institution of national organizations having this as a chief aim. In 1871 the Order of the Patrons of Husbandry ("Grangers") was founded. A prominent object in its institution was the combination of the farming population for purchase and shipment in wholesale. Each local branch or grange was a purchasing club. The granges in a State united to support a general agent, who combined the orders of the scattered clubs, bought in large quantities directly of the manufacturer or wholesale dealer, shipped by the car-load, and thus dispensed with middlemen and reduced the rates of transportation. The business of these State agents was often very large. The agent of the Ohio granges reported in 1876 purchases for the preceding year of \$965,906.70 for goods which at retail would have cost \$1,206,632.11; a saving to the granges in the State of \$240,725.40. The granges in large numbers opened local stores, which were generally conducted on the Rochdale plan. Educational influences were not overlooked. The granges met statedly to discuss economic and kindred social and political topics, and established circulating libraries, schools of agriculture, etc. No official records are published of the national organization, and private inquiry has failed to draw out accurate statistics of the growth and business of the order. Its growth for a few years was certainly very rapid, coinciding as the institution of the order did with the opening of the long-continued and severe depression in business experienced in this period. The grange papers in the height of the movement, about the middle of the

decade, made imposing claims; *e. g.*, that the membership of the order in 1875 was 1,500,000; that the patrons saved \$5,000,000 in 1873, \$12,000,000 in 1874, and \$20,000,000 in 1875. The order experienced a rapid shrinkage in the latter part of the decade, owing chiefly to the return of general prosperity, but accelerated by mistakes of semi-political action.

Another national organization, patterned upon the Patrons of Husbandry, but designed for others than farmers, arose in 1874—the Sovereigns of Industry. This organization made use of the method of club-purchasing which had effected such large savings for the grangers. The members of the local branches purchased at a certain store where a liberal discount would be allowed to such a combination. Flour they bought by the car-load. A system of purchasing agencies was early planned and partially set in operation, and a general distributing agency was opened in Chicago. Stores upon the Rochdale plan were started by the local branches. In 1875 Massachusetts had 15 stores with an aggregate capital of \$27,974. By 1877 there were 29 stores reporting to the State council, 15 of which were joint-stock companies, and 14 of which were carried on upon the Rochdale plan, with total sales per month of \$49,806, or per annum of \$597,672. There were in addition 8 stores not reporting to the council, making a total of 37 stores in the third year of the order in one State. Accurate statistics of the national organization or the various State organizations are not accessible, if they exist. The growth of the order was plainly rapid. At the first annual meeting of the Massachusetts Council (December, 1874) 100 local councils were reported, having 10,000 members. The second annual council (December, 1875) reported 166 local councils, with 20,000 members. Other States probably did not equal this growth, as the order originated in Massachusetts. The address of the president to the national council in 1877 referred to 94 local councils, selected from the whole, which reported a membership of 7273, and which, with an average capital of only \$884, did a business in the preceding year of \$1,089,372.55. This was estimated to make a saving of \$17 to every member of these councils after deducting initiation-fees and annual dues. This address conjectured that the unreported sales would swell the aggregate for the year to \$3,000,000, which, at the same ratio of profit, would represent a saving to the order of \$420,000. That the trade of the order was really large at this period may be inferred from the proposition made about this time to found a Co-operative Exchange under the title of the "New England Sovereigns of Industry Board of Trade." Some of the stores of this organization have been carried on to the present time. The Old Colony Co-operative Association Store, Kingston village, Mass., started in 1875, and in 1877 doing a business of \$30,000, reported for 1881 a paid-up capital of \$4,680. The usual reaction overtook this order in the latter part of the decade, helped on again by the returning prosperity of the country, and no revival appears to have taken place.

A third national organization came into existence in this decade, seeking the development of co-operation in another line. The order of the Knights of Honor was founded in 1873 as a mutual insurance league. By the end of the decade it had attained very respectable proportions, having spread through about a dozen States and enrolled a membership of perhaps 75,000.

The growth of co-operation in this decade was not confined to these great national organizations. Towards the end of the decade a number of attempts at co-operative colonization were made, with few if any successes. Rugby, in Tennessee, was the most interesting of these experiments. The colony started with éclat, having a fine class of young Englishmen and noble ideals, but the ground was badly chosen and the young men mostly unused to pioneer life. Its organization has since been changed. The Co-operative Coloni-

zation Society, of New York, was an effort made to transfer workingmen from the overcrowded centres of the East to the West and South, and to plant them in well-ordered settlements by the same simple combinations which had made so signal a success of Anaheim. But the unusual drouth of 1880 sealed the fate of the first colony, which had been planted in Kansas, and the return of good times rendered it needless to renew the effort for the present.

Local productive associations arose in various parts of the country. In the mid year of the decade Massachusetts had 16 productive societies reporting to the State, and 9 not reporting. The 16 reporting societies gave an aggregate capital paid in of \$114,210. Besides these 25 associations, others were known to be in existence, though not regularly incorporated. The industries represented were the manufactures of boots and shoes, furniture, chairs, cigars, gas, cotton goods, and printing, dairy-work, and foundry-work. Several of these societies are still in more or less successful operation.

Stores were started in different States—in Massachusetts, New York, New Jersey, Pennsylvania, Maryland, Ohio, Illinois, etc. Massachusetts reported in 1875 the organization of 15 stores since 1870, having an aggregate capital of \$29,260. Other stores were known to exist, but did not report to the State. Eight societies reported total sales per annum of \$500,000. Some of the stores of this period have achieved positive success, and live on thrivingly; *e. g.*, the Silver Lake Co-operative Association, and the Old Colony Co-operative Association in Kingston, Mass.; the Farmers' and Mechanics' Trading Company, Seneca Falls, and the Port Jervis Co-operative Association, Port Jervis, N. Y.; the Raritan Woollen Mills Co-operative Association, Raritan, N. J.; and the Neshannock Co-operative Society, Neshannock Falls, Pa. The most signal success has been that of the Philadelphia Industrial Co-operative Society, Limited. It started in 1875 with one store, and has now six stores—a main store, a store for boots and shoes, one for meats and provisions, one for dry-goods, and two branch stores. In 1882 its sales for the first quarter were \$51,413.63, being an increase over the preceding quarter of \$11,056.72. The gross profits for the quarter amounted to \$4,516.52. It has now 1061 members. Most of the stores of this period, however, as of earlier periods, were short-lived. The dividing stores in Fall River, which started into existence in the latter half of the previous decade, attained considerable success for a few years in the early portion of this decade, and then declined rapidly, and for the most part disappeared. In 1874 there were 34 of these stores in Fall River, representing a constituency of 1200 families. The absence of anything in their organization contemplating higher than economic aims, as already hinted, proved their ruin. A firm of grocers from Boston opened a branch in Fall River in 1874, and by very low prices cut under the dividing stores completely. Having no other bond of union but cheapness, they mostly succumbed at once. By the end of the decade there were not over 10 stores left; there are now 7 remaining.

The loan and building associations of Pennsylvania grew in this decade astonishingly. The bulk of the societies now existent appear to have been organized in this period. Out of 163 associations reporting to the State in 1881, there were 120 whose date of organization lay within this decade. Massachusetts made a new essay in loan associations in this period, patterned upon the plan of the Pennsylvania societies. Four associations reported to the State in 1875, and by the close of the decade about a dozen were in successful operation. Ohio, California, and other States followed the example of Pennsylvania, in some instances to a considerable extent, New Jersey in particular rolling up a considerable array of such societies (106).

VII. *The Present State of Co-operation.*—The decade 1880–90 opened with increased interest and renewed activity in every line of co-operation.

The United States Census Report for 1880 gives the following statistics of the cheese and butter factories, which show results largely due to the system of associated dairies:

Number of establishments.....	3,932
Capital invested in the business.....	\$9,604,803
Average number of hands employed	{ Males above 16..... 6,419
	{ Females and children..... 1,484
Yearly wages paid.....	\$1,546,495
Quantity of milk used, pounds.....	2,747,427,449
Value of all materials used.....	\$18,363,579
Value of all products.....	\$25,742,510

Concerning co-operative manufacturing we are left without any accurate knowledge. Few of the States have any official information upon the subject. Massachusetts reported in 1881 fifteen incorporated productive societies, representing an aggregate capital of \$140,773. There are believed to be a number of productive associations scattered through the country, but of their extent or of the actual condition of most of them no reliable information is forthcoming.

In co-operative credit we have reached a very gratifying development. Pennsylvania has registered (report of 1880–81) 1017 building and loan associations. The total number in the State is variously estimated at from 1500 to 1800. There are said to be 600 in Philadelphia alone, with a membership of 75,000, and an aggregate capital of \$80,000,000. It is estimated that from their inception up to the present time 60,000 comfortable houses have been built in Philadelphia by their aid; that they have enabled 25,000 householders to pay off mortgages that would otherwise have probably been foreclosed; and that through the economical habits they have fostered \$110,000,000 have been invested within the city limits. Massachusetts has now 22 building and loan associations, with a total membership of over 6000, representing 40,000 shares, having assets valued above \$650,000. New Jersey reported 106 associations in 1880; of these, only 51 returned statistics. They show an aggregate of 46,869 shares, held among 6310 share-holders. Their net assets were over \$4,002,647.70. California reports 16 societies, of which 11 reporting show 29,947 shares, a paid-in capital of \$1,808,304.98, earnings of \$787,183.62, and assets of \$2,595,488.48. Of the number and condition of these societies in other States official information has not been obtained, and in most of them probably does not exist. The bureau of statistics of labor and industry of New Jersey estimates that there are 3000 such societies in the United States.

Co-operative insurance is very largely developed. Churches engraft this principle, in the form of burial clubs, upon their work. The various labor organizations apply it among their members. Several well-established secret brotherhoods embody it; *e. g.*, the Free-masons, Odd-fellows, etc. New orders are arising with this aim in view. The Knights of Honor report 2400 lodges in 34 States, with a membership of 114,000. By January, 1882, this order had paid to heirs of deceased members upwards of \$5,000,000. The Patrons of Husbandry have applied the co-operative principle to fire insurance very largely. In many States there are fire insurance societies connected with the granges in nearly every county. Some single societies are said to insure \$1,000,000 of farm property. Several States are said to have successful life insurance societies in connection with their granges. Massachusetts reports, through her insurance commissioner, 140 mutual benefit associations of various kinds. As a pure business mutual assurance has assumed immense proportions.

Co-operative distribution is carried on to a considerable extent, which is steadily increasing. The Patrons

of Husbandry seem to have revived somewhat within a couple of years. Old granges that had dropped out of life have been resuscitated, and new ones are being formed through the country. A high authority among the grangers illustrates their present strength by such facts as that there are 700 granges in Pennsylvania, 500 grange halls in Ohio, 7 grange high schools in one county of Michigan. He writes that hundreds of co-operative stores upon the Rochdale plan are in successful operation through the land, while a number of large wholesale or supply houses are running at various commercial centres; e. g., Cincinnati, St. Louis, Chicago, Galveston, New Orleans, San Francisco, and elsewhere. That this is not an idle vaunt is indicated, among other facts, by the official reports of the Patrons of Husbandry in Texas, which gave 75 co-operative societies as connected with the State association of grangers in 1882. This report claims a gross profit on the business of the State of \$9401.55. The Sovereigns of Industry have a number of stores still in operation. Stores disconnected with any general organization are in existence, in varying numbers, in many States. Twenty-eight such stores are claimed in Texas. Tidings of new stores are coming in frequently from different States. The Co-operative Dress Supply Association of New York, which was in operation about a year in a fine store on Twenty-third street near Fifth avenue, was patterned upon the successful association of the same kind in London, and promised prosperity, but failed in December, 1882. A new labor organization has arisen since 1880, called The Knights of Labor, among whose aims are "the establishment of co-operative institutions, productive and distributive."

This necessarily sketchy outline of the history of co-operation in the United States shows that its beginnings are much older, and its developments far greater than is usually supposed. It dates back to colonial times. It has attained a considerable volume in distribution, imposing proportions in banking and insurance, and a unique development in dairy farming. In the *Massachusetts Labor Bureau Report for 1877* it is claimed that there had been through the past twenty-five years an annual investment in co-operative enterprises within that State of from \$100,000 to \$250,000.

Failures in abundance have marked the pathway of co-operation, particularly along the line of production. Some of the earlier periods have known little else than failure in every line. Nevertheless the movement has regathered its forces after every ebbing wave, has pressed on to its present gratifying reach, and seems now swelling towards far higher developments.

Authorities: *Reports of the Bureau of Statistics of Labor of Massachusetts; Reports of the Bureau of Statistics of Labor and Industry of New Jersey; Reports of Labor Bureau of Ohio; Reports of the Insurance Commissioners of Massachusetts; Report of the Secretary of Internal Affairs of Pennsylvania for 1879-80; Reports of the Bureau of Agriculture of the United States; Noyes' History of American Socialisms; Fincher's Trade Review; Reports of Texas Co-operative Association, Patrons of Husbandry, for 1881; Reports of various local co-operative associations; documents and newspapers of the Patrons of Husbandry, Sovereigns of Industry, etc.; letters from officials in local co-operative associations and national organizations, and from private persons engaged in our earlier enterprises.*

(R. H. N.)

COOPERSTOWN, the county-seat of Otsego co., N. Y., is at the south end of Lake Otsego, on the Susquehanna River, 60 miles directly west of Albany. It is a terminus of the Cooperstown and Susquehanna Valley branch (16 miles long) of the Albany and Susquehanna Railroad. It has 2 national banks, 3 weekly newspapers, several hotels, 6 churches, 2 academies, and other schools. Two small steamers ply on the lake. J. Fenimore Cooper, the distinguished novelist, was a resident of this place, and died here in 1851. Population, 2182.

COOT, a kind of water-fowl. In New England the name is very inappropriately applied to those species of ducks (*Anatida*) which compose the genus *Edemia*, three in number—*E. Americana*, the black scoter; *E. perspicillata*, the surf duck, and *E. fusca velvetina*, the white-winged scoter; all of which are known as "sea-coots."

The coots proper are lobe-footed-water fowl of the genus *Fulica*, sub-family *Fulicinae*, and family *Rallidae*, nearest related to the gallinules (*Gallinulinae*), and through these connected with the rails proper. As in the gallinules, the bill extends upon the forehead as a horny plate or frontal shield, of varying size and shape in different species; the bill otherwise resembles that of the gallinules. But the coots are remarkably distinguished by their lobate feet, like those of Phalaropes, and less nearly like those of Grebes, whereby they are fitted to swim with the ease of ducks. To the same end the body is not compressed, but depressed and flattened beneath, with dense water-proof plumage of the under parts. The tail is extremely short, and generally carried cocked up. There are some ten or a dozen species of most parts of the world, the horned coot of South America, *F. cornuta*, being the most remarkable. The N. American species (closely resembling the European *F. atra*) is *F. americana*; about 14 in. long; the wing 7 or 8; the tail 2; the tarsus 2; the middle toe and claw 3; the bill $1\frac{1}{4}$ – $1\frac{1}{2}$ along the gape. The bill is white, a very small pointed frontal plate, this and a mark near the end dark reddish or dusky; the plumage is dark slate color, paler and grayer below, tinged with olive on the back, varied with white on the under tail coverts, edge of the wing, and tips of the secondaries; the feet dull olivaceous. It is one of the most abundant water-fowls of North America, migrating with great regularity in spring and fall, and breeding chiefly in northern regions. Coots are very generally distributed over the lakes and water-courses of the continent, but their favorite resorts, especially during the breeding season, are reedy pools and other stagnant waters where the vegetation is dense, as well as river-banks which offer the same conditions for the concealment of the shy birds. The nest is a large heap of decaying reeds and other vegetation matted together, placed close by the water's edge or even in the water among the rushes, the foundations at least being usually water-soaked through. The eggs are eight to a dozen or fourteen in number, of rather elliptical than oval figure, clay-colored or dull creamy, profusely spotted and blotched with dark brown and neutral tints. The young take directly to the water: when first hatched they are curious objects, pitch-black striped in the most fantastic manner with orange-red. Coots are generally found in flocks in the fall and winter; the flesh is fit for the table, though not very highly esteemed. They are commonly known as "mud-hens;" in some sections as "flusterers," from the difficulty they seem to experience of rising on wing from the water; they are also called "white-bills." The habits of other species are substantially as here described. (E. C.)

COPE, CHARLES WEST, an English painter, was born at Leeds in 1811. His father was a landscape painter of some merit, and gave him his earliest instruction in art. After his father's death Cope studied at the Royal Academy, and then spent two years in Italy. On his return he exhibited an Italian landscape at the Royal Academy in 1831, and his picture of The Holy Family attracted much attention. In 1843 his cartoon, Trial by Jury, gained a prize of £300, and in the same year he was elected an associate of the Academy, becoming an academician in 1848. In the fresco competition of 1844 his Meeting of Jacob and Rachel was successful, and, being commissioned to prepare a fresco in the House of Lords, he took as his subject Edward, the Black Prince, receiving the Order of the Garter. For several years he was en-

gaged on frescoes in the Peers' Corridor in the Houses of Parliament. This series of eight paintings illustrates the reign of Charles I., four showing memorable events on the royalist side, and four on the parliamentary side. In these Mr. Cope has been eminently successful both in composition and execution, and some of his oil-paintings, as *The Departure of the Pilgrim Fathers*, treat of the same subjects. Besides historical paintings he has executed a large number of domestic pieces, as *The Young Mother and Maiden Meditation*, painted in 1847; *Fireside Musings* and *The First-born* (1849); *Creeping to School* (1852); *Baby's Turn* (1854); *Evening Prayer* (1860); *Two Mothers* (1862); *Scholar's Mate* (1862); *Home Attraction* (1875); *Hope Deferred* (1877). Among his historical pieces may be noted *Last Days of Wolsey* (1848); *The Children of Charles I.* (1855); *Parting of Lord and Lady Russell* (1861). Some of his works are illustrations of scenes from Shakespeare, as *King Lear and Cordelia* (1850); *Shylock and Jessica* (1867); *Othello Relating His Adventures* (1868); *Anne Page and Slender* (1875); *Bianca's Lovers* (1878). His etchings have also been highly esteemed.

COPE, EDWARD DRINKER, an American biologist and geologist, was born in Philadelphia, July 28, 1840. He belongs to a Quaker family which has long been eminent in that city for enterprise and public spirit. His grandfather, Thomas Pym Cope, an eminent merchant, was frequently called by his fellow-citizens to fill public positions of responsibility. He was also noted for his philanthropic labors, and was for many years president of the Mercantile Library. Alfred Cope (1806-1877), son of Thomas, inherited the business talent and charitable disposition of his father. He assisted in establishing an institute or high school for colored youth in Philadelphia and the Free Library in Germantown. He also presented to the city of Philadelphia a tract of land now included in Fairmount Park. Edward, son of Alfred, was taught in private schools and studied medicine in the University of Pennsylvania. He was for some years professor of natural history in Haverford College, Pa., and secretary of the Academy of Natural Sciences, Philadelphia. He was the geologist and palæontologist of the survey of the region west of the 100th meridian under Capt. G. M. Wheeler, and palæontologist of the geological survey of the Territories under Dr. F. V. Hayden. In connection with these surveys he explored, in 1871, Western Kansas, then occupied by hostile Cheyenne Indians; in 1872, the Bad Lands of South-western Wyoming; in 1873, the Cheyenne country in North-eastern Colorado; in 1874, North-western New Mexico; in 1877, Western Texas; in 1879, the Bad Lands of Central Oregon; in 1881, Eastern New Mexico. He has sent exploring-parties to other regions of Western North America, to Honduras, Peru, and Brazil. The result of these explorations is one of the finest collections of vertebrate fossils in America. In the reports of Wheeler's survey he published *The Vertebrate Palæontology of New Mexico* (1877). In the report of Dr. Hayden's survey he has published three volumes on the *Vertebrata of the Cretaceous Formation, of the Palæozoic and Mesozoic Formations, and of the Tertiary Formation* (1882). In these volumes he has described for the first time 1000 species of Vertebrata, many of which represent families and orders previously unknown. He has also published a *Synopsis of the Extinct Batrachia and Reptilia of North America* (1869-71). Besides these works he has published nearly three hundred papers, and has reconstructed the arrangement of the Fishes, the Batrachia, and in part that of the Reptiles and Mammalia. He has also contributed to the philosophy and theory of evolution, and, while following Lamarck and Herbert Spencer, has suggested views that have been generally adopted: these are the laws of acceleration and retardation, of homologous groups, of the location of growth-force under use and effort, and

of archæothetism. He is a member of the National Academy of Sciences and of various other scientific societies in America and Europe, and one of the editors of the *American Naturalist*.

COPPÉE, FRANÇOIS EDOUARD JOACHIM, a French poet and dramatist, born in Paris, Jan. 12, 1842. He produced poetical pieces of merit at a very early age, and was employed upon the compilation of the *Parnasse Contemporain*, which appeared in 1866. In the same year he published a small collection of poems entitled *Le Reliquaire*, which was followed in 1868 by another called *L'Intimité*. In a later volume (*Poèmes modernes*) were two pieces, "La Bénédiction" and "La Grève des Forgerons," which were read publicly and received with great favor. The first is of a pathetic incident at the capture of Saragossa in 1809, and the second describes the strike of the iron-workers. He began early to write dramas which were adapted to the stage: *Le Passant*, which was acted in 1869, became at once very popular and largely increased his reputation. In 1870 he produced *Deux Douleurs* and *L'Abandonné*, which did not add to his fame, but his next effort, *Fais ce que dois*, was received with enthusiasm, as was also his *Les Bijoux de la Délivrance*, founded upon an incident in the Franco-Prussian war. With the collaboration of M. D'Artois he wrote *Le Petit Marquis*, a prose drama, which, without being published, was produced at the Odéon. *Le Luthier de Crémone* ("The Lute-maker of Cremona"), presented at the Théâtre Français in 1877, was also eminently successful. Many of his pieces and collections were crowned by the French Academy. Among his later poetical productions are *Les Humbles* (1872), *Le Cahier rouge* (1874), *Olivier* (1875), *L'Exilée* (1876), and a romance called *Une Idylle pendant le Siècle*. The poet was a favorite of Napoleon III., who gave him a position in the library of the Senate at the Luxembourg. In 1878, upon the death of M. Guillard, he was appointed archiviste (keeper of the records) of the Comédie Française. He is also a member of the Legion of Honor. A complete edition of his poems and plays in five volumes appeared in the *Petite Bibliothèque Littéraire* in 1870-79. This includes three volumes of *Poésies* written between 1864 and 1878, and two volumes of his dramas, produced between 1869 and 1872. His prolific pen is constantly adding to these. He is the poet of French humanity and patriotism; his themes are of general interest to all classes; his thoughts are high and pure, and his style strikingly simple and unaffected. He avails himself of touching incidents which appeal to our common humanity, and his little stories carry their moral with them, to be clearly discerned by the most casual reader. Among these are *Le Liseron* ("The Climbing Vine"), *La Tête de la Sultane* ("The Head of the Sultana"), *Le Naufragé* ("The Shipwrecked Mariner"), *L'Araignée de Mahomet* ("The Spider of Mohammed"). The greatest living poet of France, except perhaps Victor Hugo, he unites the fervor of that great writer with the *bonhomie* of Béranger and the simplicity of La Fontaine. His career has been one of development, and the world may confidently expect greater works from his pen. (H. C.)

COPPÉE, HENRY, an American soldier and historian, born at Savannah, Ga., Oct. 13, 1821. After a course at Yale College he entered the Military Academy at West Point July 1, 1841, and in 1845 he was graduated and promoted as brevet second lieutenant in the Second Artillery. He served in the war with Mexico, 1846-48, being engaged at the siege of Vera Cruz, in the battle of Cerro Gordo, in the skirmishes of La Hoya and Oka Laka, in the battles of Contreras and Churubusco, the storming of Chapultepec, and the assault and capture of the City of Mexico. Promoted to a first lieutenancy in the First Artillery on Aug. 20, 1847, he received the brevet of captain on the same day for "gallant and meritorious conduct in the battles of Contreras and Churubusco." After the war he was ordered to West Point in the department of instruction, where he

remained for seven years, the greater part of the time as principal assistant professor in the department of Ethics and English studies. In 1855 he resigned from the army to take the chair of English literature in the University of Pennsylvania in Philadelphia. This post he held until 1866, when he was elected president of the Lehigh University at Bethlehem. After ten years he retired from the presidency to take the chair of English literature and history, which he now holds. He is the author of the following works: *Elements of Logic* (1857), *Elements of Rhetoric* (1858), *Grant and his Campaigns* (1866), *English Literature considered as an Interpreter of English History* (1873). He was, during the Civil War, editor of the *United States Service Magazine*. In 1861 he issued two collections of poetry, entitled *A Gallery of Famous Poets* and a *Gallery of Famous Poetesses*, and also in 1866 one of sacred poetry, called *Songs of Praise in the Christian Centuries*. In 1875 he edited an English version of the *Guerre civile en Amérique* of the Comte de Paris. In 1880 he published a *History of the Conquest of Spain by the Arab-Moors*, in two volumes.

COPPER has been found in the United States in workable quantities not only in nearly the entire belt penetrated by the Appalachian chain of mountains, but also far to the West thereof. Among the States and Territories most favored in the geological distribution of copper deposits are Arizona, California, Montana, Michigan, Colorado, Idaho, Maine, Maryland, Missouri, New Mexico, North Carolina, Pennsylvania, Vermont and Wisconsin. The world's annual yield of ingot copper is nearly 200,000 tons, of which the United States contribute more than one-quarter. The domestic product in recent years will be found in the subjoined statement:

State.	1882. Pounds.	1883. Pounds.
Michigan.....	57,955,980	60,000,000
Montana.....	9,058,284	24,500,000
Arizona.....	17,984,415	24,500,000
Colorado.....	1,494,000	1,550,000
Wyoming.....	100,000	950,000
California.....	826,695	750,000
New Mexico.....	869,498	1,115,000
Utah.....	605,880	557,875
Vermont.....	1,265,000	800,000
Nevada.....	350,000	300,000
Missouri.....	294,695	260,306
Eastern and Southern States...	690,000	500,000
Other States.....	125,000	125,000
Total.....	90,819,447	115,658,181

Michigan, which only a few years since possessed an uncontested supremacy as a copper-producing State, has found rivals—first in Arizona, and more recently in Montana, which at present rapid rate of increase may soon reach a product of 50,000,000 pounds of copper in the form of ores and furnace-products. In Arizona the principal districts are the Warren, in which the Copper Queen is the leading producer; the Clifton, in which the Arizona Copper Company and the Detroit Copper Company together represent the total product; and the Globe district, in which the Old Dominion Copper Company is the leading mine. All of them work comparatively high-grade oxidized ores easily smelted in blast-furnaces, the product being a black copper containing from 95 to 97 per cent. of metal. In Montana the centre of the great new district is Butte City. The ores, chiefly complex sulphides, are rich in copper. The fact that they are contaminated with arsenic is more than compensated for by the presence of notable, though varying, quantities of silver. They are better paid for in England than at home, and the bulk of the rich ore, and the matt. obtained by concentrating and smelting the lower-grade ores, is exported to that country. In Michigan, in the Lake Superior district, the metal is found as native copper. The heavy masses of copper

in these places are imbedded in azoic rock, and small veins ramify in all directions. It occurs in bodies of almost every size from small grains to masses weighing ten tons and upwards. This native copper is frequently found to be mixed with silver in distinct fibres, the latter not being alloyed with the copper. Native copper has also been found in the ore veins of New Jersey, Pennsylvania, Arizona, and New Mexico. The following table shows the product (refined copper) of the Lake Superior region for several years past:

Year.	Tons.	Lbs.	Value.
1871 and previous.....	139,756,	118	\$70,198,774
1872	12,276,	1523	7,979,400
1873.....	15,045,	1505	8,726,100
1874.....	17,166,	1389	8,009,356
1875.....	18,019,	1497	8,180,626
1876.....	19,135,	997	7,998,430
1877.....	19,513,	671	7,327,888
1878.....	20,845,	1266	6,920,540
1879.....	21,425,	1529	7,327,350
1880.....	24,869,	367	9,947,673
1881.....	27,270,	909	9,971,702
1882.....	28,577,	1980	10,522,416
1883.....	30,000,	...	10,000,000
Total.....	386,916,	450	\$173,110,255

That the Lake Superior copper region was known to a prehistoric race is evident from the remains which still exist of gangways, tools, and other proofs of skill which the races occupying the country at the time of its discovery nowhere evinced. The Indians found by the white explorers are believed to have been utterly ignorant of the methods of working that had been in use by the former race; they had no traditions to explain the existence of the numerous excavations, and what native copper they possessed was only such as they gathered among the surface stones. The first record of the deposit is found in the missionary report of the Society of Jesus for 1660. The occurrence of copper was one of the objects that early attracted the attention of the Jesuits, and its presence among the Indians naturally excited their curiosity and wonder. The savages had rude utensils made from the metal, and huge blocks of it were worshipped among their gods. But long prior to this period the metal that attracted the attention of the missionaries and the early *voyageurs* had been sought and mined by a people who have left no record but the implements which they used and the excavations which they made. Yet their work remained concealed from the white race until the country was thrown open to settlement and actual mining had begun. That this earlier mining work is of great antiquity is evident from many facts; the pits and tunnels which had been made had become filled up with rubbish and with decayed vegetation, and overgrown with forest trees. If the depressions were ever observed they were naturally regarded as those made by overturned trees, or as hollows in the rocks, until the discovery was actually made so late as 1847 that here, too, men had formerly delved in search of metals. These ancient excavations are found in all portions of the Mineral Range and in Isle Royale. There is scarcely a vein or outcrop of mineral in the whole copper district of Michigan where evidences are not found of their ancient workings, sometimes extending sixty feet into the solid rock. In these pits have been found large masses of copper which these primitive miners had unsuccessfully endeavored to remove. Masses of copper of many tons in weight have thus been discovered surrounded with stone hammers in great numbers, pieces of burnt wood and other evidences of former labor. The method of mining which these people apparently pursued was to heat the rock by fire, and then by pouring on water and pounding the rock with their stone hammers to disintegrate and separate it. The stone hammers found in these ancient pits consist of small boulders of hard-trap rock of from three to thirty pounds in weight, around which a groove was sometimes made for the purpose of hold-

ing a withe which fastened on the handle. In the copper district these pits of the ancient miners, extending along the surface outcrop, have undoubtedly been of great service both as guiding to the discovery of lodes and giving indication of their value. The first systematic attempt at modern mining in this region was made by Alexander Henry, an educated Englishman, who explored the country in 1763, and in 1770 established, as the agent of an English company, some works on the Ontonagon River, about 20 miles above its mouth. The attempt, however, did not prove successful, and the works were soon after abandoned. The true mining era of the region begins only with the year 1844. The possession of this country known as the region of Lake Superior as a portion of the territory of the United States is said to be due to Dr. Franklin, who, while in Paris, during the American Revolution, became acquainted with the reports that had been made concerning the existence of copper along the margin of the Great Lake. Subsequently in arranging the treaty with England, in which American independence was acknowledged, Franklin drew the boundary line so as to include the south shore of Lake Superior within the limits of the new nation.

Prior to the admission of Michigan as one of the States of the Federal Union, that Territory claimed, as a portion of its domain, a strip of land bordering on Lake Erie, in which was included the present city of Toledo, Ohio. The right of possessing this parcel of land was insisted upon by the State of Ohio. The matter coming before Congress on the application of Michigan to become a State, that body passed an act admitting her into the Union upon condition that she should relinquish her claim upon the disputed territory, receiving in lieu of the disputed land the isolated region now known as the Upper Peninsula. A convention, acting upon the matter in December of the same year, reluctantly accepted the proviso, and in January, 1837, Michigan was admitted into the Union. This northern peninsula has since proved to be one of the most valuable regions within the limits of the national domain. Its mineral wealth was long unparalleled and almost incredible. Its iron ores are of unsurpassed richness, and it possesses native copper in an abundance found in no other country.

No efforts were made toward the systematic exploration of Michigan prior to 1818. In the latter part of 1819 Gen. Lewis Cass, then Governor of the Territory, made a tour of inspection, which included the south shore of Lake Superior. The especial purpose of the expedition was to determine, as far as possible, the truth of the reports regarding the mineral value of the country. The party entered the mouth of the Ontonagon River, with a view of finding the famed "copper rock," where Alexander Henry had attempted to start his works. With great difficulty the party finally reached their destination, and found the object of their search. The rock had evidently been visited frequently, as the marks of pounding, many cuts, and the broken tools strewn about, plainly showed. This mass of native copper, which, up to the time of its removal, was the largest known in the world, was in the spring of 1842 taken to the mouth of the river, and soon afterward sold to the U. S. Government. It was then transferred to the grounds of the War Department, at Washington, where it still remains. In 1841 Dr. Houghton, having been appointed geologist of Michigan, submitted to the State legislature his report, in which the geological features of the country were ably outlined, and which gave to the world the first definite information regarding the copper veins and the character of the deposits. His announcements drew public attention to the country, and in a short time thereafter the influx of explorers, prospectors, and speculators began. The first operations were undertaken under grants from the War Department, which issued about 1000 permits, and

960 locations were actually made. Very many of these locations were made along the Keweenaw peninsula, and this portion of the country became the seat of the earliest mining work. The mineral range begins at Keweenaw Point, trends westerly a distance of about twenty miles, and thence southwesterly, and is characterized by the occurrence of a broad belt of greenstone or semi-crystalline trap, which forms the southern escarpment in this portion of the range. This greenstone formation terminates near the south line of the county, and does not again appear throughout the further prolongation of the mineral range. Both north and south of the greenstone are numerous amygdaloid beds, which are crossed by the fissure veins, and which usually carry a greater or smaller percentage of copper. In the earlier period of copper-mining on Lake Superior the fissure veins yielding copper in masses gave to the country its celebrity, and the ones which proved the most productive lie south of the greenstone—an important geological feature of this region being the fact that what is known as the great copper-bearing belt of Keweenaw co. lies immediately south of the greenstone and pitches beneath it.

The first mining shaft was sunk on the lake at Copper Harbor in 1844. In the following year the celebrated vein on which is located the famous Cliff mine was discovered on the Eagle River. This mine, with a total paid-in capital stock of \$110,905, from 1848 to 1870 not only sustained the expenses of the company, but also paid to the stockholders the net sum of \$2,627,660. In the year 1881 there were thirty-three mines of Lake Superior copper, whose yield amounted to 74,549,708 lbs.

Nearly all the veins which are worked, and which cut across the trap ridge, contain mass copper, and large masses are continually being raised from them. The largest continuous mass which has been taken out was probably that from the Minnesota in 1857, which is variously stated as weighing 420 tons and 470 tons. Its length was about 45 ft., its height 22 ft., and its greatest thickness 8 ft. Some of the masses taken from the Phoenix mine, one of the oldest on the lake, were from 4 to 5 ft. thick and composed of solid copper. The Cliff mine has yielded masses weighing from 100 to 150 tons in one piece. One of forty tons was taken out in 1879, beside numerous blocks weighing from one to eight tons.

As it is not possible to break out such huge masses of metal when they are found by drifting upon the course of the vein, the following method of extraction is employed: A narrow passage or chamber is excavated upon one side of the mass, laying bare as much of the surface as possible. If it cannot be dislodged now by levers, the excavation of a second chamber behind the mass is resorted to. This last excavation is made large enough to contain from five to twenty or more kegs of powder. In the Cliff mine one charge of twenty-one kegs of powder threw down 200 tons of copper. Bags of sand are used for tamping, and the drift is closed up by a barricade of refuse and loose earth. After such a blast the drift is, of course, charged with foul air, and cannot be safely entered for hours afterwards. The huge masses of copper dislodged in this way are too heavy to be brought to the surface entire; the mass is therefore marked off in squares or blocks of suitable size, and so cut up. This is done by the copper-cutters. Copper-cutting is a distinct art, and requires considerable skill and experience and long training. The tools used for this purpose are simply narrow chisels and driving hammers. The chisels are shaped like the parting tools of turners. They are made of flat bars of half-inch steel, about 2 in. wide and 18 in. long. They are chamfered each way like a cold chisel, to form the cutting edge.

The mass mines have entirely lost their early importance, only a small part of the product of the lake being obtained in this form. Probably 90 per cent. of the copper made is from low-grade ore crushed in stamps.

The native copper ores of Lake Superior, which at some mines are worked profitably even when they contain less than 1 per cent. of copper, are crushed almost exclusively first in rockbreakers, any masses found being sorted out, and are then delivered to stamps. The type of the latter, developed in the region and peculiar to it, is similar to a direct-acting steam-hammer. The majority in operation are those modelled on the general design introduced by Ball, though recently important modifications of it by Mr. E. D. Leavitt, Jr., has increased its capacity while lowering its fuel consumption. On conglomerate rock the Ball stamps crush 160 tons per day, while the Leavitt heads have made monthly averages of 235 tons per day. In these stamps the particles of copper are released from their matrix of rock, and after their discharge from the mortar are separated from it by the usual methods of concentration, by utilization of their greater density, in jugs and luddles. The resulting product, called "mineral," contains from 60 to 80 per cent. of pure copper, and is smelted and refined in reverberating furnaces.

COPPER-SMELTING.

The *smelting of copper ores* is a metallurgic operation of great complexity, owing to the great variety of ores presented for treatment. Thus, a smelting process adapted for copper pyrites must contain provisions for the removal of arsenic and sulphur, which are not present in the carbonates and the oxides of copper, so that the processes of smelting are arranged in such a manner that these ores, as well as the slags obtained in some of the operations, can be introduced after the sulphur and the arsenic have been expelled.

The extraction of copper from its ores consists in: 1st. *Roasting processes* for the purpose of expelling arsenic and sulphur, and for converting the iron contained in the ore into oxide of iron. 2d. *Melting processes* for the purpose of effecting the solution of the oxide of iron with silica at a high temperature, so as to obtain the copper in the simple combination of sulphide of copper; and 3d. *Process of roasting and melting* in a single operation, for the purpose of expelling the sulphur and obtaining metallic copper.

Copper-smelting proceeds as follows: (1) Before being brought to the roasting furnace or *calciner* the ores are broken up in small-sized pieces and assorted so that the charge may contain about ten per cent. of metallic copper, proper attention being paid in the mixing also to the *gangue* or earthy matters associated with the ores so that they may serve as fluxes to each other. The *calciner* is a *reverberatory* furnace, with a large hearth (14 by 16 feet) to allow of the ore being spread out in a thin layer upon it. At one end of the hearth near the fire-place is a flue for the admission of the air necessary in the roasting process. The charge for each calciner is about 3 tons of the broken ore, which is spread out evenly over the hearth and roasted for 12 hours, being occasionally raked over, so as to expose fresh portions to the action of the air and to prevent any part of the ore from being melted. At this temperature the arsenic in the ore combines with the oxygen, and forms *arsenious acid*, which passes in the form of vapor into the flues. About half the sulphur in the ore also combines with the oxygen and passes up the chimney as *sulphurous acid* gas. A large portion of the iron is converted into oxide of iron, and the small quantity of sulphuric acid which is also formed remains in the ore as sulphate of copper.

(2) From the calciner the ore goes next into the *ore-furnace*, which is also a reverberatory furnace, but its hearth is much smaller than that of the calciner (about one-third) because the charge has to be made at a much higher temperature. In this the melting for coarse metal is effected, for which reason the hearth is slightly inclined on all sides towards a depression at one side, which serves as a crucible in which the melted coarse metal collects. The charge of this furnace is composed of

Calcined or roasted ore about.....	18 cwt.
Ores containing oxide of copper and silica...	3 "
Metal-slag containing oxide of iron and also some oxide of copper and silica.....	6 "

The slag is the first to fuse (about one-half hour after the charge is made), and by degrees the whole mass becomes liquid. The disengagement of sulphurous acid gas causes violent ebullition, which favors the intimate mixture of the melted matters on the hearth. After three or four hours the melted mass is mixed with a rake and the temperature considerably raised, so as to effect the separation of the coarse metal from the slag. Half an hour thereafter the tap-hole is opened and the *matt* of coarse metal is run out into an iron box, perforated at the bottom, and standing in a cistern through which water is constantly running; the coarse metal is thus *granulated* preparatory to undergoing the next operation. Sometimes the matt (also called *regulus*) from two or three operations is allowed to accumulate in the furnace before tapping, the slag alone being raked out before the introduction of a fresh charge. This *ore-furnace-slag* is run into sand moulds where it solidifies into blocks, which are used for rough building purposes in the vicinity of the works. The purpose of the second process is to remove the oxide of iron, into which the iron sulphide contained in the pyrites had been converted by the first process. This is effected by causing a combination of the silica with the oxide of iron, to form a compound capable of being melted and separated from the ore. The coarse metal obtained in the matt contains copper, iron, and sulphur in about the same proportion in which they are present in pure copper pyrites, so that the copper amounts to about 33 parts in 100, or nearly four times the proportion contained in the raw ore at the commencement of the first process.

(3) This coarse metal is next returned to the calciner, and 3 tons of the granulated matter is roasted for 24 hours, the temperature being moderated at the commencement to avoid fusion, and gradually raised in proportion as the removal of the sulphur diminishes the fusibility of the charge, which is raked over about every 2 hours. About one-half of the sulphur is again converted here into sulphurous and sulphuric acids which escape in vapor, so that roasted coarse metal consists essentially of sulphide of copper, oxide of iron, and some unchanged iron sulphide.

(4) This calcined coarse metal is now conveyed to a furnace which does not materially differ from that employed in the second process, except that there is no cavity in the hearth which is made to slope from all parts towards the tap-hole. The charge consists of 1 ton of calcined coarse metal with 12 cwt. of roaster slag, refinery slag, and ores containing oxide and carbonate of copper. These materials are fused together for about 6 hours, when they divide as before into regulus or matt, and a slag which remains above it. This slag is termed *metal-slag*, and its appearance is very different from the ore-furnace-slag. It is usually employed as part of the charge in the second process, as before stated. The matt resulting from this process is sometimes run out into water (as in the coarse metal process), when it is called *fine metal*, containing about 77 per cent. copper, and considerable sulphur; or it is run into pig-moulds of sand, when it constitutes *blue metal*, its surface being a bluish color, due to its containing sulphide of iron. When it is intended to manufacture *best selected copper*, the blue metal is run into a series of sand-moulds. The pigs which are cast first are the most impure, because the impurities in the melted mass tend to collect at the bottom. These first pigs yield *bottoms* or *tile-copper*, so called from the shape of the ingots, and the subsequent casts give the *best selected copper*.

(5) The pigs of blue metal are next charged into a reverberatory furnace (1½ tons to the charge), where they are roasted at a gradually increasing temperature so as to avoid fusion (for about 4 hours), for the pur-

pose of converting part of the sulphuret of copper into oxide of copper. Next the temperature is further raised, the doors of the furnace closed to exclude access of air, and the mass fused. During this fusion a violent effervescence takes place in the liquid mass, owing to the escape of sulphurous acid gas formed by the union of the sulphur in the sulphide with the oxygen from the oxide of copper, whilst metallic copper subsides in a fused state and is run out into sand-moulds. The duration of the process varies with the purity of the blue metal under treatment—consuming from 12 to 24 hours. A small quantity of slag—called *roaster-slag*—is formed during fusion; it contains about 16 per cent. of copper and is used as a portion of the charge in the fourth process. The ingots or pigs from this process have, when solidified, a blistered appearance, owing to the escape of sulphurous gas while cooling; hence the term *blistered copper*. Blister-copper contains from 95 to 98 per cent. of pure copper, the remaining impurities being sulphur, arsenic, iron, tin, lead, and other foreign substances.

(6) The removal of these impurities is the object of the next process, called refining. The furnace employed for this purpose is similar to the ore-furnace. The charge consists of from 6 to 8 tons of blister-copper, piled upon the hearth in such manner as to allow air to circulate freely among the ingots. A moderate heat is applied at first, to allow the oxygen to act upon the copper, which reaction is facilitated by the porous structure of the ingots. The chemical effects of this are the same as in the previous processes of calcination. After being roasted for about 6 hours, the metal is melted, when a thin layer of slag is formed upon its surface; this slag is raked off, which operation is termed *rabbling*, and, when finished, a small test-ingot is drawn and examined by the refiner, who decides entirely by the appearance of the fracture upon the readiness of the material for *poling*. This is done by covering the surface of the metal with charcoal, which is renewed from time to time, so as to shield the copper from further oxidation, and the melted metal is stirred with a pole of green wood, until a sample, when broken, shows a fine silky fracture and light red color, and, when hammered hot, is found to be soft and free from cracks at the edges. The copper is then said to be at *tough-pitch*, and it is ready to be ladled out and cast into the requisite shapes for its different commercial uses.

The effect of poling in toughening the metal depends upon the complete deoxidation of the copper. If, during the operation of casting, the surface of the metal on the hearth be not well covered with charcoal, the copper will *go back* or become brittle again from the absorption of oxygen from the air. The slag skimmed from the surface of the metal before poling is called *refinery-slag*, and consists almost entirely of an oxide of copper and silica. It is used in the charge for the fourth process in smelting. The refineries in the United States use throughout the reverberatory furnace for this process, except the Ansonia Brass and Copper Company of Connecticut, which has adopted a Siemens' regenerative furnace of twelve tons capacity for this purpose. As previously stated the metal is not tapped in the refining furnace, but is taken out in iron ladles lined with clay and poured into iron moulds. Refined copper is cast into three different forms, viz.: *ingots*, *bars*, and *plates*. The ingots vary in weight from 13 lbs. to 18 lbs., and are only used for remelting, and as quickly as the copper has *set* in the ingot-mould this latter is reversed and the copper dropped into a tank filled with water. This is done to preserve its bright appearance, as it would turn black if cooled in contact with the air. The ingots are cast with two indentations to facilitate their breaking up in smaller pieces for remelting. Bars are cast in sectional moulds set on a slight angle, and vary in weight from 60 lbs. to 100 lbs. and more, according to the purpose for which they are cast. Great care must be taken that the process of casting be continuous, as otherwise the bar would show seams. In casting plates, a *bottom-plate* or *tile* varying from $\frac{1}{2}$ in. to 1 in. in thickness is poured first, to separate any impurities which the copper may still contain; such impurities settle at the bottom. Then, on top of this, three more plates varying in thickness from $1\frac{1}{4}$ in. to $2\frac{1}{2}$ in. are cast successively in the same mould; the separation of these different layers being effected by simply interrupting the pouring long enough to allow the copper to take a slight set. The standard weight of plate ingots is about 150 lbs., though much larger ones are cast for specific purposes. During the process of ladling and pouring, frequent tests are made, so as to keep the molten mass up to tough pitch.

The following tabulated system shows the extent of the imports and exports of copper and manufactures of copper, into and from the United States, during the fiscal year ending June 30:

	1881.		1882.		1883.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
<i>Imports.</i>						
Copper ore.....	9,904,832	\$165,806	18,346,728	\$157,708	59,068,128	\$122,536
Copper (not manufactured).....	718,616	86,433	744,566	90,945	323,987	35,510
Manufactures of copper.....		387,076		315,475		236,719
<i>Domestic Exports.</i>						
Copper ore.....	1,115,296	51,499	2,904,832	89,515	12,647,376	913,771
Copper (not manufactured).....	4,865,407	786,860	3,340,531	565,295	8,221,363	1,293,947
Manufactures of copper.....		38,036		93,646		110,286
<i>Foreign Exports.</i>						
Copper ore.....	234,528	6,545	1,013,488	28,814	2,724,400	73,824
Copper (not manufactured).....	664,564	103,286	108,504	18,636	7,772	904
Manufactures of copper.....		13,304		13,575		15,926

The great consumption of copper in the United States is a remarkable economic feature; out of a total production of 70,100,000 lbs. in 1881 only 4,865,407 lbs. were exported. Since the decline of wooden ship-building its principal application has been to such articles as clocks, ornamental hardware, modern household appliances, etc. It is probably no exaggeration to state that in the United States the consumption of copper for metallic cartridges alone equals the total consumption of copper by any other nation. The new demand for copper-wire, created by the

development of electric appliances, is becoming an important factor in fixing the price and consumption of this metal. Under these circumstances, and considering the exceeding richness of the American ores, the enormous extent of our copper-working industries is not surprising, one firm alone, the Ansonia Brass and Copper Company, using in their different manufactures about 9,000,000 lbs. annually, or nearly 13 per cent. of the total production of the United States. Foremost among the manifold industrial applications of copper must be counted the manufactures

of copper plates, bolts, tubing wire, rivets, and burs, seamless tubing, electric wire, and phosphor bronze goods. The facility with which copper unites with almost all other metals has made possible the large extent of its use in the arts. The most important of copper alloys is the commercial brass consisting of copper and zinc.

BRASS.

Brass is made in plumbago crucible pots, holding from 75 to 100 lbs., and consists of copper and zinc, or spelter as it is called commercially, in the average proportion of two parts of copper to one part of zinc; this proportion being more or less varied in accordance with the purpose for which the brass is made. Each pot is set in a separate pot-hole, and the time required for melting varies with the mixture, the zinc being added shortly before the end of the process. When the fusion is complete, the pot is lifted out by a crane, and the metal quickly covered with charcoal, to prevent the volatilization of the zinc. The mass is then allowed to cool somewhat, is next raked off, and then poured into sectional iron moulds.

One of the principal causes of an increased demand for the copper in the United States is to be found in the sudden impulse given to the manufacture of ornamental brasswork, for the decoration of modern houses. The use of brass in decoration has so very much to recommend it that it is becoming more and more popular. The copper used for the purpose by most of the New York foundries comes principally from the shores of Lake Michigan, in the shape of ingots. The most ordinary piece of ornamental brasswork passes through seven processes before it is ready for sale. After the design has been furnished, a cast is modeled in plaster of Paris, and it then passes to the moulder, who casts it in metal. The filer then works upon it and rids it of all imperfections and unevennesses, when it is ready for the chaser. If the article consists of various parts, they are now brazed together with hard solder and forwarded to the filer once more, and then to the polisher and colorer. The production of what is called "shell-bark" is more elaborate. The copper is first cut in sheets and placed over the chuck, or block, on a lathe, and as the lathe revolves, a workman with a steel instrument molds the metal into the required shape until it is perfectly fitted on the chuck. The highest rate of speed is necessary in thus welding the brass on to the model, and lathe and chuck revolve with the greatest rapidity. In this way knobs and balls of brass are made; such, for example, as form the base of chandeliers or the top of pedestals. The ornamental open work with which we are familiar upon the chains of chandeliers, or that which has the appearance of half-relief, is made by a still more difficult process, known as half-scouring.

Embossed sheet brass is used for finger plates to doors, for panels, and for the decoration of flat surfaces in almost every position. Brass plaques shine resplendently upon the walls, hammered brass salvers replace those of silver or electroplate, and in domestic utensils of almost every kind brass is used to some extent. The revival of the art of sheet brass repoussé work is partly due to the encouragement given to pupils in a school established in Philadelphia by Mr. C. G. Leland. Some of the most beautiful decorative brass articles are the popular accompaniments of the grate—andirons or fire-dogs, for example. These are now made in every variety, expensive and inexpensive, merely upright posts ornamented by a ball or by a sunflower, or by elaborately carved images of animals. Another form of brass ornamentation is the fender with its twisted bars and radiating knobs, as costly in its way as the ordinary cut-brass fender is inexpensive.

Lamps are formed with spiral columns of burnished brass, surmounted by a globe. The brass used in chandeliers is lacquered, or polished with a fine composition, which gives it additional lustre, but would

not stand very frequent polishing. Every possible combination of porcelain and brass ornamentation is found in gas fixtures and fittings. Frames of wrought iron, or of ebonized or carved wood, are fitted with the finest brass wire, which is almost as fine as spun silk, and which is often very beautifully decorated with a centre of repoussé work. Embroidery is mounted in frames of hammered brass, and beautiful effects are produced by its introduction in the fitting of colored glass for medallions, circlets, screens, and even mosaic window margins.

Phosphor-Bronze is composed of copper, tin, and phosphorus. The proportion of these ingredients depends upon the purposes for which the bronze is intended, the amount of tin varying from 3 to 15 per cent., and that of the phosphorus from $\frac{1}{4}$ to $2\frac{1}{2}$ per cent. This alloy is principally used in mining- and marine-pumps, bolts for locomotive-boilers, etc., as it is found to resist oxidation or corrosion from water impregnated with sulphur, salt, and other mineral substances, which soon destroy brass rods.

As will be seen from the table of Imports and Exports, but a trifling amount of manufactured or refined copper is imported into the United States. The reason for this is found not only in the superior richness of American ores and improved methods of manufacture, but also in the duty imposed on foreign copper and copper manufactures. The revenue duties at present collected are—

On copper ores, 3 cts. per lb. of all fine copper they contain; and on copper regulus, on black or coarse copper, 4 cts. per lb. on all fine copper they contain. The same duty is levied on old copper fit only for remanufacture. Copper in plates, bars, ingots, new clippings, etc., pays 5 cts. per lb. duty. On copper sheets, rods, pipes, wire-rods, and all alloys to which copper gives the chief value, a duty of 45 per cent. ad valorem is collected.

Although the copper product of the United States is increasing yearly, yet the uses of the metal here have risen apace with the current output, and western matts, which were formerly consigned to eastern smelters, have of late been regularly exported at the rate of 1,400,000 pounds per month. There is no reason to fear any serious fluctuations in the market which could have an injurious effect upon the pre-eminence of the American copper industries.

(A. F. H.)

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COQUELIN, BENOIT-CONSTANT, a French actor and author, was born at Boulogne Jan. 23, 1841. His father was a baker, and he was destined for the same trade; but he felt called to the stage, and his parents entered him at the Paris Conservatory of Music and Declamation, where he was admitted on Dec. 29, 1859, into the class of M. Regnier, one of the foremost of French comedians and an admirable teacher. Having taken a second prize in comedy, he made his first appearance at the Théâtre Français as Gros-René in Molière's *Dépit Amoureux*, on Dec. 7, 1860, less than a year after he had entered the Conservatory. Aided by the kind counsel of his instructor, M. Regnier, who was one of the most influential members of the Comédie Française, M. Coquelin soon made his mark as a humorous actor from whom much might be expected. He acted all the chief comic characters in the classic comedies, and he had a few taking parts in new pieces. His success was such that in 1864, when he was not yet twenty-three years old, he was elected an associate. Since then his powers have been steadily expanding and his reputation has been rapidly growing, until now he is clearly the first comedian of France. Outside of the old comedies, in which, as we have seen, he has acted most of Molière's own parts in the theatre which Molière founded, he has "created," as the French call it, important characters in Théodore de Banville's *Gringoire* (1866), in Manuel's *Ouvriers* (1869), in Ferrier's *Tabarin* (1871), in Coppée's *Luthier de Crémone*

(1876), and in Lomon's *Jean Dacier* (1877)—all poetic plays, most of which owed much to his suggestions. Of late his four greatest successes have been as the Duke in the *Étrangère* of M. Alexandre Dumas fils (1876), as Léopold in M. Augier's *Fourchambault* (1878), as the Préfet in M. Pailleron's *Monde, où l'on s'ennuie* (1881), and as Florence in the *Rantzau* of MM. Erckmann-Chatrian. This list shows the extraordinary range of M. Coquelin's histrionic capacity. He has the double faculty of compelling at will smiles or tears; and he has in addition the gifts of dignity and of poetry. His Duke in the *Étrangère* is a high-bred rascal, corrupt and depraved to the backbone, but true to his inherited nobility in spite of his worthlessness. His Gringoire is a beautiful picture of a starving comic poet sacrificing his love with real heroism. His Jean Dacier is a brave and tender soldier of the Revolution. His Florence is a garrulous and kind-hearted old schoolmaster. All these characters are radically different, and demand an extraordinary versatility, yet it is in these that M. Coquelin has succeeded amply, although he is perhaps even better in the richer comic parts of Molière. His Mascarille, for example, in the *Etourdi*, is an ideal picture of a quick-witted, light-fingered, loud-mouthed, long-winded rascal. His Vadius in the *Femmes Savantes* is the model of a dull pedant, empty and emphatic, and with a lack-lustre eye. Equally admirable in humor and in pathos, in broad farce and in poetic drama, in dignified characters and in brainless pedants, M. Coquelin has attained a position on the Parisian stage while still a young man which has rarely if ever been held by an older comedian.

In 1870 he did his duty in the army; he has always been a sincere republican; and he was perhaps the closest personal friend of M. Gambetta. He has many intimates among the leading painters and poets of Paris. He has done much for the younger poets, delivering their stanzas with admirable appreciation and urging them to fresh effort. To him more than to any one else is due the present French fancy for reciting verse. Of late, M. Coquelin on the evenings he is not acting has appeared now and again as a lecturer. His first effort was a vindication of his profession; this was published under the title of *L'Art et le Comédien*, and an English translation by Miss Alger, called the *Actor and his Art*, has been issued in this country. Later are two lectures on the *Misanthrope* and the *École des Maris* of Molière; and he has now in hand a series of literary portraits of the younger poets, of which the lecture-essays on M. Eugène Manuel and M. Sully-Prudhomme have already appeared.

During the visit of the Comédie Française to London M. Coquelin was the greatest favorite among the actors of that incomparable company; and he has since utilized his vacations by acting again in London with abundant success. At other times he has made a trip through the chief countries of Europe. It is only a question of time how soon he shall pay a long-promised visit to the United States.

His younger brother, ERNEST COQUELIN, generally known as Coquelin cadet, was born in 1848; followed his brother to Paris, and was admitted to the Conservatory in 1864; took a first prize in comedy in 1867; acted for a while at the Odéon; and in 1868 made his first appearance at the Théâtre Français. During the war he was a soldier like his brother, and won the military medal at Buzenval. He acted for a while at the Variétés, but returned to the Théâtre Français in 1876, and in 1878 was elected an associate of the Comédie Française. He is a broadly comic actor of farce. Although he has played more elevated parts with effect, it is as a droll, as an exponent of pure fun, that he has been most successful. Following in his brother's footsteps, he has popularized monologues of much breadth of comic effect. He has published a little essay on the monologue and two collections of jests. (B. M.)

COQUIMBO OR LA SERENA, a city of Chili, capital of the province of Coquimbo, on a river of the

same name, 1 mile from the ocean and about 240 miles N. of Valparaiso. It is connected by a railway with the port of Coquimbo, 7 miles distant. It is regularly built, and is one of the most beautiful towns of Chili. It is a bishop's see, and has a fine cathedral, several churches and convents, a priests' seminary, 2 branch banks, a hospital, and copper-smelting works. Many of the residences are surrounded by gardens. Copper is the chief article of export. In 1875 the population was 12,293. The port of Coquimbo (Puerto Coquimbo, population 5077) has one of the best harbors in Chili.

CORACOID (Gr. *κόραξ*, a raven, *είδος*, form), one of the bones of the scapular-arch, or shoulder-girdle of vertebrates. In man and other mammals, excepting *monotremata*, the coracoid is reduced to a mere process of the scapula or bladebone, being consolidated therewith, and does not reach the sternum; the name is derived from its fancied resemblance to a crow's beak. In birds the coracoid is a large, stout bone, of constant character, always distinct from the scapula, articulating with the sternum, taking part in the formation of the socket for the head of the humerus, and serving to bear the shoulder-joint firmly away from the breast. In ratite birds the axis of the coracoid is coincident, or nearly so, with that of the scapula; in other birds the two bones meet at an angle, usually less than a right angle. (E. C.)

CORCELLES, CLAUDE FRANÇOIS PHILIBERT TIRCUIR DE, French diplomatist and deputy, born at Marcilly d'Azergue, department of Rhone, June 22, 1802. His father was a deputy who voted with the extreme Left, and fiercely opposed the restoration of the Bourbons and the monarchy of July. The son was elected to the Chamber of Deputies in 1837 by the arrondissement of Séez (Orne), where he took part with the independent liberals under the leadership of De Tocqueville. He was also an ardent Roman Catholic. He was much interested in questions of national economy and in Algerian affairs. After the revolution of February, 1848, and the abdication of Louis Philippe, he again had a seat in the Chamber, where he voted with the Right and in favor of the republican constitution. He supported the presidency of Louis Napoleon, and, approving the French expedition to Rome, he accompanied it, and was intimately concerned in Italian affairs. Sent a little later on a mission to the pope, he disavowed the treaty made by De Lesseps with the Roman triumvirs, and after the occupation of Rome lent his aid in restoring the *ancien régime*. He retained his seat in the Chamber, but was dissatisfied with the action of Louis Napoleon and with the *coup d'état* of Dec. 2, 1851, which made him emperor. He retired from politics until the downfall of the Empire in 1871, when he returned to the legislature. On the 11th of Jan., 1873, he was sent as an ambassador to Rome, to the great satisfaction of the pope. He remained in this station until 1876, when he retired on account of age and ill-health. (H. C.)

COREA, called Chō-sen or Tsio-sen ("morning calm") in the native language, consists mainly of a peninsula, having the Yellow Sea on its W. and the Sea of Japan on the E. But its N. portion, including over a third of the whole area, is clearly non-peninsular. A good part of the kingdom is insular, for the W. and S. coasts are lined by countless islands—the Korean archipelago, of which only one island, Quelpaert, is large or noteworthy. The N. E. horn of the Yellow Sea is known to geographers as the Gulf of Corea. The S. W. entrance of the Sea of Japan is called the Corea Straits. The name Corea was formerly official. It originally belonged to a now extinct minor state in the N. W. part of the peninsula, and from the eleventh till the fourteenth century, A. D., it designated the whole country. The name comes to us from the Japanese, through the Portuguese. The area of the kingdom is about that of the State of Minnesota. The Korean coast-line is said to measure

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1740 miles. In the main, the eight provinces (*dō*) of Corea correspond pretty closely to the principal river basins of the country.

The *climate* of Corea is not unlike that of the Atlantic coast of the United States in corresponding latitudes. Among wild animals, besides numerous tigers, boars, and bears, monkeys are found in large numbers, and alligators are not unknown. The height of the mountains modifies the climate, which appears to be more rainy and much less mild than that of the neighboring empire of Japan. As in Japan and China, southern forms, both in animal and vegetable life, prevail, reaching latitudes much colder than might be looked for from comparison with the flora and fauna of other parts of the world.

The *people* of Corea are of composite origin. There is probably a large Aino or Ghiliack element among the common people. The language, in its radical elements, is decidedly akin to the Japanese, but it is much less euphonious. Dravidian affinities, as well as likenesses with the monosyllabic languages of Indo-China (themselves presenting surprising likenesses to Dravidian speech), are easily traced. The Chinese elements in the Corean are also very copious, being probably in part the common inheritance of the two nations; but in a large degree the Chinese has been directly engrafted upon the Corean stock, since in Corea the Chinese has always been the principal literary language. There are two ways of writing Corean, one by means of a regular and excellent phonetic alphabet, and the other by a syllabary (also phonetic) of 129 characters. Chinese characters are used to some extent as logograms.

The *social condition* of the Corean people is by no means admirable. All kinds of industry are hampered and over-ridden by a complicated system of trades-unions. The village life of the poor is virtually communistic, and it is by its village communes that a great part of the taxes is paid. The bulk of the common people are serfs, with no political rights; and it is only by combination that they have been able to provide for themselves some degree of protection and safety. Society is ranked in many social grades. Above the serfs there is a certain number of free citizens, ranking below the nobles; and below the serfs are found real slaves. Corean serfdom is practically not very severe; but the lot of the slaves, whether they be private or government property, is a deplorable one. The common people have but few comforts. Morality, public or private, hardly exists; a *vendetta*, or system of private vengeance, everywhere prevails. The religions of the country are wretched and degrading superstitions. The system of government espionage is very complete. There are at least two political parties (nominally four), the conservative or feudalistic, and the progressive. Intemperance in the use of intoxicating drinks is very common. Spirits as well as beer are manufactured from grains, such as rice, millet, and barley. People who can afford it use beef, pork, poultry, fish, venison, game, dog's flesh, etc. Food is badly and even filthily cooked, but nothing is wasted, except in over-feeding, for as a race the Coreans are grossly gluttonous and are not cleanly in their habits. Sumptuary laws, and old customs having all the force of laws, regulate many details of private life. Among the Corean virtues are hospitality, kindness to the poor and to neighbors, reverence for parents and for the aged, valor in war, and love of country.

Recent History.—In 1876 Japan, which had for many centuries claimed suzerainty over Corea, voluntarily relinquished her claim, and recognized Corea as independent. Corea, like so many other Eastern countries (Loo-choo, Anam, Siam, Burmah, Thibet), without any compulsion pays to China the submission due from a vassal state. In Loo-choo, very curiously, though Japan is the *de facto* suzerain, the native government persisted in paying China an unexact tribute until 1873, when the Japanese succeeded in breaking

up the practice. In Corea, however, the double allegiance has terminated in another way. Both in Corea and in Loo-choo the old Chinese suzerainty was voluntarily submitted to, as an ancient custom, while the Japanese in both countries were looked upon as intruders. Dissatisfaction in Japan with regard to Corean independence led to the Satsuma rebellion of 1877. The Corean port of Fusan (or Pusan) was opened to Japanese trade in 1877; that of Gensan (or Wonsan) in 1880, and later in the year that of Ningen or In-chiun. In 1880 the American Commodore Shufeldt made two ineffectual attempts to negotiate a treaty. He finally succeeded on May 7, 1882, after incredible difficulty, in obtaining a treaty opening certain ports to American commerce. In this he was greatly assisted by the Chinese foreign office. Within a month the English, French, and Germans had followed the American example, and obtained similar treaties. These treaties were not well received by the Corean conservatives. An insurrection followed, in which the queen, the heir-apparent, and the chief ministers of Corea were murdered, and most of the Japanese were driven from the country. A Japanese invasion soon put down the insurrection, and compelled the Corean government to make full restitution; but a Chinese army entered Corea soon after, with a view of maintaining Chinese supremacy. The chief insurgent was the Tai-wen Kun, or hereditary minister regent. The Chinese rescued this man from his enemies and took him over to China. In 1883 Corea sent a prince of the blood, with other high nobles, on a deputation to the United States, in which country they remained for several months. A census made in 1881 gives Corea a population of 16,227,885. (See W. E. Griffis, *Corea, the Hermit Nation*, New York, 1882.)

(C. W. G.)

CORINTH, the county-seat of Alcorn co., Miss., is at the intersection of the Memphis and Charleston Railroad with the Mobile and Ohio Railroad, 93 miles E. by S. of Memphis. It has a courthouse, a bank, 2 weekly newspapers and 2 monthly magazines, 7 churches, 2 seminaries, and some schools for colored children. At the outbreak of the Civil War in 1861 it was a growing village, and in the next year became noted as the scene first of a siege, and afterwards of a battle. It was then reduced almost to a waste, but has since recovered, and is a railroad town of some importance. Population, 2275.

I. *The Siege of Corinth.*—After the severe battle of Pittsburg Landing, April 6 and 7, 1862, Gen. Beauregard, commanding the Confederate army, retreated to Corinth, the strategic point, in defence of which the battle had been fought. He summoned reinforcements from every direction, and seemed ready to defend Corinth to the last extremity. He had of effective troops between 50,000 and 60,000. Gen. Halleck left St. Louis to assume command of the Federal army in the field April 9, and reached Pittsburg Landing on the 11th, bringing with him large reinforcements. Of his army, a little more than 100,000 strong, the left wing was under the command of Maj.-Gen. John Pope; the right under Maj.-Gen. George H. Thomas, and the centre under Maj.-Gen. Don Carlos Buell. Maj.-Gen. McClelland commanded the reserve. Gen. Grant, by title second in command, seems to have fallen under Halleck's displeasure, and having no command of troops, had also but little voice in council. He had, however, just before Halleck's arrival, sent an expedition up the Tennessee to Eastport to destroy the railroad bridge over Big Bear Creek, east of Iuka, and cut off communication in that direction with Richmond.

Halleck advanced upon Corinth with great caution. Though the weather was excellent, the roads good, and a vigorous pursuit ending in a prompt and vigorous attack might have at once destroyed the Confederate army, six weeks were consumed in marching fifteen miles. The rupture of the first strategic line, running

through Columbus and Bowling Green, by the fall of Fort Donelson, had thrown the Confederates upon a second line, of which Corinth was a vital point, and the capture or forced evacuation of Corinth would cut this new line from east to west, and force them upon a third running from Vicksburg to Mobile. The topography of Corinth greatly favored its defence; and the nineteen miles of distance from Pittsburg Landing, so cautiously traversed, gave the Confederates ample time to avail themselves of these advantages. It covered "Grand Junction," forty miles to the west, where the Memphis and Charleston Railroad is crossed by the Mississippi Central, from Halleck's advance. The town is enclosed between two creeks, and the ridges beyond forming an irregular cincture of about 15 miles, were strongly intrenched, and mounted with guns. The Grand Army of the Tennessee, which had moved so cautiously, at last reached Corinth. Thomas's right wing consisted of four divisions; Buell's centre corps had also four divisions; and Pope, who came up from Island No. 10 and New Madrid, to take part on the left, had 25,000 men. The latter general sent a detachment of one division under Gen. Paine to Farmington, which was held by a force of 4500 men under Gen. Marmaduke. This force did not wait for the Federal attack, but with hardly a show of resistance retired rapidly into the inner defences of Corinth, May 9. Beauregard at once sent a force of 20,000 men on this day to recover Farmington. Pope's advanced brigade was vigorously attacked by Van Dorn in front; and Price was to make a simultaneous attack on the flank, but failed to appear. However, Pope was driven out, and the Confederates again occupied Farmington. The first vigorous and effective movement of the Federal troops was made from their right by Gen. W. T. Sherman on Russell's house, which stood upon an elevation about a mile from the intrenchments. This was taken by a force under Gens. Denver and M. L. Smith, and strongly fortified. The main line of Halleck, concentric with the enemy's works, was about three miles distant. The railroads had been cut in rear of Corinth at Purdy and Glendale. On May 27 Col. W. L. Elliot was sent with two regiments of cavalry to destroy the railroad east of Iuka, which he did effectively. Everything was now ready for a general assault by the Federal army. On May 28, three strong reconnoitring columns, one from each of the three grand divisions, were pushed towards the town; and Sherman, from his point of vantage, moved forward and captured a house only one thousand yards from the intrenchments. On May 30 Pope opened with his batteries, but it was soon manifest that the enemy was evacuating the town. Indeed, Beauregard had issued orders of evacuation on the 20th, and everything had been ready to begin the retreat on the 26th. But it was postponed until June 1, on the morning of which day smoke and flames announced to the Federal army that the town was abandoned. Beauregard was in full retreat; the Federal troops marched in without apparent gain; but it was in reality, however sagaciously planned, a Confederate disaster. By the loss of Corinth, the second great line in the South-west was broken, and the Confederates were thrown back upon the third and last through Vicksburg, Jackson, Meridian, and Selma. Beauregard fell back upon Tupelo, and Halleck did not long pursue him.

On August 11 Halleck was called to Washington to the command of the entire army. Pope was promoted to the command of the new Army of Virginia; Buell was put in march towards Chattanooga; Gen. Grant was restored to the District of West Tennessee, with his headquarters at Memphis; the Army of the Mississippi was confided to Gen. Rosecrans, but Grant was now to defend with greatly diminished numbers—four divisions having been withdrawn from the Army of the Tennessee—the new strategic line of railroads which the Confederates had lost, from Memphis to Iuka. He was in person eight weeks at Corinth watching

Van Dorn and Price. On the other side Beauregard was relieved of his command by Bragg.

The link between this siege and the battle of Corinth is found in the complicated movements around the town of Iuka. Grant, who was watching the Confederate forces concentrating to attack him, learned that Price had come from the south to cross the Memphis and Charleston Railroad at or near Iuka, 21 miles east of Corinth; that he would make a feint to reinforce Bragg and to follow Buell, then marching upon Nashville, and would try to lure Grant out of Corinth or attack him there. Col. Murphy, who occupied Iuka with a small garrison, evacuated the town with such haste as to interfere with Grant's plans. It was now necessary for him to move a larger force on Iuka and beat Price, and then return rapidly to Corinth and beat Van Dorn's detachment, which was four days' march distant from Price. He sent Rosecrans with 9000 men by way of Rienzi to Iuka to attack Price from the south, and Ord with 8000 by way of Burnsville to make a similar demonstration from the north. The nature of the country and the difficulty of communicating orders caused the combined attack to fail. Price attacked Rosecrans vigorously, and was then able to retreat in good order and join Van Dorn to take part in the new assault upon Grant at Corinth.

II. *The Battle of Corinth.*—Upon the retreat of Price from Iuka Grant made ready to receive their attack. He went to Jackson for a short time, leaving Rosecrans in command at Corinth with about 20,000 men. They comprised Hamilton's division of two brigades; Davies' of two; Stanley's command of nine regiments, and a brigade under McArthur; with these were ten batteries. McPherson also joined Rosecrans with a brigade before the attack. The large scale upon which the defences of the town had been constructed by Beauregard was now greatly reduced to suit the diminished numbers of the garrison. Captain T. E. Prime, of the Engineers, laid out an inner line of intrenchments with batteries on the north front, enfilading the Bolivar and Chewalla roads, and also making a good cross-fire. Reconnoissances in force were sent out for some miles, but were soon fighting in retreat. On Oct. 3, Van Dorn came up the Chewalla road, driving the Federals with great impetuosity, and ranged in the centre, Price taking post opposite the Federal right, and Lovell opposite the left. The entire number of men was 28,000. Finding an interval between McArthur and Davies, the enemy pushed in, causing the latter general to fall back a thousand yards. So satisfied was Van Dorn with this day's work that he sent despatches to his superiors announcing a complete victory.

The next morning, just before day, the enemy attacked along the whole line, and the fighting was desperate. The columns of Price, Lovell, and Van Dorn were led by Villepigue, Rust, Maury, and Hébert. But the Federal artillery was admirably served, and the enemy's guns were soon silenced. About 9 o'clock Price made a vigorous attack on the right centre by the Bolivar road, although it was swept by the guns from the town. It is styled by the Confederate historian Pollard as "rash and magnificent." Their impetuosity carried a portion of the attacking party into the town, but the fire of inner batteries drove them out again. A similar attack was made on the left centre by Van Dorn; the column was driven back, came forward, was hurled back again and again, until at last, under the concentrated fire of double-shotted guns, they gave way to return no more. They began a most disastrous retreat, were pursued across the Hatchie—forty miles by an infantry force, and sixty by cavalry,—and were struck in the flank and scattered by Hurlbut and Ord. Never, after such valorous attacks, had there been a more signal discomfiture and ruinous retreat. The Confederate loss in this battle was 1423 killed, 5000 wounded, 2225 prisoners, 14 colors, and 2 guns. The Federal army lost 315 killed, 1812 wounded, and 232 prisoners.

CORK is the bark of the matured cork-oak (*Quercus suber*), an evergreen oak, which grows principally in the south of France, Algeria, Spain, Portugal, and in Tuscany. The tree is barked for obtaining the commercial product, cork, when the tree is about twenty-five years old; for although it sheds its bark naturally prior to this age, the product thus obtained has no commercial value. Where the tree is indigenous to the soil the inhabitants use cork extensively for many and varied purposes. Thus in Spain, beehives, kitchen-pails, pillows, etc., have been made out of it; in Morocco, drinking vessels, plates, tubs, and house-conduits; in Portugal, roofs for houses, lining for garden-walls, and fences for poultry-yards. The chief objection to using the wood is that it warps very easily, and cannot be obtained of sufficient length for most purposes. It is used for piles and in ship-building for curved pieces, which are kept under water, and is then fastened with copper bolts, as iron bolts cannot be used on account of the tannin in the wood. The wood is reddish-brown, and has a density when dry of from 0.787 to 1.560.

The cork tree requires a warm climate, yet it is found in Spain at an altitude of 1600 feet, and in Algeria at 3200 feet. The lowest average annual temperature at which it flourishes is about 60° Fahr. It grows best on siliceous soils, and on slopes where it has abundance of light and free circulation of air. Its blossoms appear in April or May, and the fruit ripens in the following autumn, though on some trees the acorns remain till December or January. In plantations cork trees continue to grow and be of service for their bark for two hundred years, though some authorities advise that trees 150 years old be cut down to make room for young ones. The tree varies greatly in size. In Spain it attains a maximum height of 60 feet, the trunk having a girth of 10 or 12 feet. In Algeria it reaches a height of 65 feet, the trunk measuring from 11 to 16½ feet in circumference.

It has only been within the present century, and indeed since 1850, that the importance of the cork crop has been appreciated in Spain; but now it is in some provinces reckoned one of their chief sources of wealth. It is now valued at eleven times its price in 1790. As the demand for stoppers increases daily, the cork plantations rise steadily in value.

The cork for commerce is obtained in the following manner: an incision is first made through the bark around the tree near the ground, and another similar cut close to the branches. These cuts are followed by others equally deep, made longitudinally, and dividing the bark into broad planks. The tree is then left; the sap has been stopped from circulation; the bark begins to dry and to curl outward, and shortly each strip is peeled off by hand. The tree is not killed by this process, which may be repeated every ten years, or in some places every seven years. There are two methods of preparing the bark for the market. By the first method, the *tables*, as the broad strips of bark are called, are heaped one upon another, their concave sides downward, in deep trenches, and being plentifully moistened are pressed beneath huge bowlders till thoroughly flattened out. They are then dried carefully before large fires, being turned constantly till quite dry and perfectly flat, when they are ready for the market. By the second method the damp pressure in the pits is dispensed with, the tables being simply laid with their convex sides toward the fire, and suffered to remain until their warp is lost and they become flat. The bark is inspected and assorted according to size and quality. The inferior portion, after the crust is burned off, is sold mostly for floats, whence it receives the name of fishing-cork. The first and sometimes the second coats of corks are useless for making stoppers.

The better qualities of cork are first boiled and scraped, and then blackened over a coal fire, the object

being to make the surface smoother and to conceal flaws. After being forwarded to the warehouse the largest slabs are cut into pieces of about 3½ feet in length, 18 inches in width, and ranging from ½ inch to 3 inches in thickness; for exportation the cork is next dried and packed into bales of 150 pounds each.

In the United States after the cork is received at the factory it is again assorted, and then thoroughly steamed in a chest designed for the purpose: the latter process softening the cork and rendering it easy to cut. Corks are made by hand and by machinery. If made by hand the cork-cutter uses a knife, which has a very thin and sharp blade about six inches long. This blade is tapering toward the point, which is truncated. It is constantly whetted upon the board from which rises the stake on which the cork rests during cutting. The cork is made in a tapering form by two semi-circular cuts.

One of the most improved machines for cork-cutting is the *Armstrong machine*. The cork-slab is passed from the bale upon an iron table, which is secured by lugs to a wooden table. The slab is then held against a wooden guide or gauge, which regulates the width of the strips into which it is to be cut by moving it up to a circular steel blade, which revolves like a circular saw, but has a sharp edge and the bevel all on the outside so that the cork cannot jam. The cork-strips thus obtained pass next to the cork-cutting machine proper, which has a hollow spindle driven by a pulley fixed at about the middle of its length. This spindle is capable of moving horizontally back and forward in its bearings in the two standards placed on either side of the pulley. On the right-hand end of the spindle is a flange, which runs in the groove of a lever by which the end-motion of the spindle is controlled. At the other end of the spindle is a hollow cylindrical cutter of fine steel, with a cutting edge at its end produced by bevelling off the outside. Through the hollow spindle, and reaching nearly to the end of the cutter, runs a fixed rod held by a set screw. Opposite the cutter-edge is a tail-block, the upper part of which is made of hard wood. A gauge-bracket is fastened in front of this block by means of a screw and nut, and the whole of the block is adjustable by means of a screw-handle. The operation of the machine is as follows: the operator places a strip of cork with his left hand upon the gauge-bracket in front of the tail-block, then with his right hand pulls toward him the lever which controls the end-motion of the hollow-spindle: the revolving cutter is thereby brought up against the cork-strip and forced through it. The operator then moves the right-hand lever back again, and the revolving spindle withdraws the cutter, carrying the cut cork in its bore. As soon as the fixed rod inside of the hollow-spindle before mentioned meets the cork it pushes it out and the cork drops. The machine has a capacity of 250 gross per day, and when once set the operator has merely to feed the cork-strips with the left hand, and operate the cutter-spindle by moving it forward and backward with the right hand.

To taper the corks they are fed by hand in a horizontal position down an inclined trough to a plunger, which operates vertically, and brings the cork up and against the flat end of a rapidly revolving lathe-spindle, which imparts to it a rotary motion. A steel blade revolving at a high speed is now traversed over the top of the revolving cork, cutting it taper and of the requisite diameter from end to end at one cut.

An ingenious cork-cutting machine is also that of M. A. Robert. The sheet of cork is first cut into square blanks approximating the finished cork in size. These are fed down, one at a time, between vertical guides, and descend upon a table, where they are met by a clamp, which grasps them and pushes them forward between spindles, the under one of which is spiked and the upper one toothed. While held in these the cork is rotated on its vertical axis against a swiftly moving hand-saw blade about two inches in width. This blade is constantly in motion, and in order to keep it sharp a horizontal grindstone is provided. The stone is actuated at intervals by a cam-wheel, driven by a worm and pinion from the main shaft, so that at every revolution of the latter the grindstone is brought into contact with the blade and rotated for a few seconds.

The cuttings from the different machines are utilized in the manufacture of *cork-board* by being ground and incorporated into paper pulp in mixing machines, and with powerful presses. The material is highly elastic, very light, and a non-conductor of heat and sound. Other uses for cork-cuttings are indicated in the *Encyclopædia Britannica*.

(A. F. H.)

CORLISS, GEORGE H., a mechanical engineer and manufacturer, was born in Easton, Washington co., N. Y., June 2, 1817. He completed his education at an academy in Castleton, Vt. His inventive genius first manifested itself in constructing a machine for sewing boots, shoes, and heavy leather, but up to the age of twenty-four he never had seen the inside of a machine-shop, nor, with the exception of the sewing-machine, had he ever exhibited any marked inclination for invention. In 1844 he took up his residence in Providence, R. I., and soon after associated himself in business with John Barstow and Edwin J. Nightingale under the name of Corliss, Nightingale & Co., for the manufacture of steam-engines. It was here that he began the development of his inventions of improvements in steam-engines, and in 1848 he completed and successfully set in operation an engine which embodied the essential features of what is known the world over as the "Corliss engine." During the same year the present works of the Corliss Steam-engine Company, in Providence, were commenced. They have a capacity for employing 1000 men—a statement, however, which fails to show the magnitude of the establishment, so effective are the labor-saving appliances introduced, most of which were devised by Mr. Corliss himself. His letters patent for improvements in steam-engines were granted March 10, 1849.

The great service Mr. Corliss has rendered the world through his inventions is recognized by the awards made to him by the highest scientific authorities. In 1867, at the Paris Exhibition, he carried away the highest competitive prize, although there were in competition more than one hundred engines. The late Mr. J. Scott Russell, the distinguished English engineer, who was one of the British commissioners to this exhibition, in his official report thus speaks of the Corliss engine: "The American engine of Corliss everywhere tells of wise forethought, judicious proportion, sound execution, and exquisite contrivance." In 1870 the Rumford medals of the American Academy of Arts and Sciences were awarded to Mr. Corliss; in presenting which Dr. Asa Gray said that "no invention since Watt's time has so enhanced the efficiency of the steam-engine as this for which the Rumford medal is now presented." In 1873 the award of the grand diploma of honor from the Vienna Exhibition was a distinction exceptionally noteworthy, from the fact that Mr. Corliss had sent neither engine nor machinery there, nor had he any one to represent him. Foreign builders had sent engines claimed to be built on his system, and placed his name on their productions. Hence the jurors awarded to Mr. Corliss "the diploma of honor" as "a particular distinction for eminent merits in the domain of science, its application to the education of the people, and its conducement to the advancement of the intellectual, moral, and material welfare of man." In 1879 the Institute of France bestowed upon Mr. Corliss the Montyon prize, which in the Old World is the highest honor known for mechanical achievements. In 1872, Mr. Corliss, under an act of Congress providing for the celebration of the one hundredth anniversary of American independence, was appointed a commissioner for the State of Rhode Island at the Centennial Exhibition in Philadelphia, and was chosen one of the executive committee of seven who were entrusted with the preliminary work. The great engine furnished by Mr. Corliss for this exhibition increased his already world-wide fame. The cost of this undertaking exceeded \$100,000. Prof. Radinger of the Polytechnic School of Vienna, pronounced this engine one of the greatest works of the day—"systematic in greatness, beautiful in form, and without fault, . . . in every detail a masterpiece." This engine has been transferred to the town of Pullman, near Chicago, where it furnishes the motive-power for the extensive works of the Pullman Car Company. The latest efforts of Mr. Corliss have been directed to the adaptation of

his engine to the pumping machinery of waterworks, and unprecedented practical results have already been achieved by these efforts. (J. R. B.)

CORMORANT (Lat. *corvus marinus*, "sea-crow;" Span. *cuervo marino*; Fr. *cormoran*), a large heavy web-footed water-bird of the order *Steganopodes*; family, *Phalacrocoracidae*; genus, *Phalacrocorax* and its subdivisions: related to Pelicans, and especially to the Snake birds or Anhingas (*q. v.*). As in all of the order the feet are totipalmate, all four toes being united by full webbing; the body is very stout; the neck long; the wings short; the tail large, fan-shaped, composed of 12 or 14 very stiff strong feathers denuded to their bases by reason of the shortness of the coverts; the bill is about as long as the head, stout or slender, terete, hooked at the end; the external nostrils are usually obliterated in adult life; the gape deep, reaching below the eyes, which are set in naked skin continuous with the covering of the bill; there is a small naked throat-pouch, of the same character as that which attains such enormous size in the pelican. The far backward position of the legs compels the cormorants to stand nearly upright, like loons or grebes; they are birds of heavy but powerful flight, and often pursue their prey by flying under water, like loons. Their food consists chiefly of fish, of which they devour enormous quantities, their voracity being proverbial. The plumage as a rule is glossy black, with peculiar metallic tints, and on the back a special arrangement by which each feather has a distinct edge of color, and therefore appears scale-like; but all the species do not present these features. Most species develop in the breeding season curious curly crests, or other filamentous feathers on the back or flanks, these special featherings being deciduous. The eyes are green as a rule—a color rarely seen in the eyes of birds. Cormorants inhabit all parts of the world; and though found on various inland waters and along low shores, they more particularly haunt rock-bound coasts, where they congregate in the breeding season in countless numbers, laying their eggs in rude bulky nests on the ledges of cliffs, or even on the bare rock; the filthiness of their rookeries is simply indescribable. The eggs are generally two in number, sometimes single or triple, narrow and elongate, thickly covered with a white chalky incrustation, beneath which is the pale greenish shell proper. The young are hatched naked and helpless, requiring to be assiduously nourished for a long period; they are fed by regurgitation of the macerated contents of the parents' stomachs into their open mouths.

There are about twenty-five species, seven or eight of which inhabit North America. 1. The Common Cormorant (*P. carbo*), of the Atlantic coast, is the same as that of Europe. This is one of the largest, with 14 tail feathers, and the throat-pouch heart-shaped; the length is about 3 feet, the wing 12 or 14 inches, the tail 6 or 7. The plumage is glossy greenish-black, the feathers of the back bronzed gray with black edging; the gular sac yellow, white bordered; there is a small occipital crest, a white flank-patch, and numerous thready white plumes on the head and neck in the breeding season. This breeds in Labrador and Newfoundland, migrating south in winter to the Middle States. 2. A species of the widest distribution, both coastwise and in the interior, is the Double-Crested Cormorant (*P. dilophus*). It is nearly the size of the last, and of similar colors; but the gular sac is convex behind, and there are only 12 tail-feathers. The cormorant so abundant in the mangrove swamps of the Southern States is a variety of this species (*P. floridanus*); and the little-known *P. cinnatus* of the Alaskan coast is supposed with reason to hold a like relation with the stock-form. 3. The Mexican Cormorant (*P. Mexicanus*), which extends some distance up the Mississippi valley, resembles the last, but is much smaller, with less convex gular sac.

of an orange-color, white-edged; this is only about 2 feet long, and the general plumage is intensely lustrous with violet-purple. The remaining species all have the gular sac heart-shaped behind, as in *P. carbo*, but only 12 tail-feathers. 4. In Brandt's Cormorant (*P. penicillatus*) of the Pacific coast of the United States, the sac is dark blue, with a fawn-colored gorget behind it. The plumage is dark glossy green, changing to violet or steel blue on the head and neck, with long white filamentous feathers in a series down each side of the neck. This species has the scale-edged feathers of the back above noted, but in less degree. Nothing of the sort is seen in any of the following species. 5. In the little-known Pallas' Cormorant (*P. perspicillatus*) of the N. Pacific coast, the shafts of the tail-feathers are said to be white, and straw-yellow filamentous feathers are described as springing from the sides of the neck. 6. The Red-faced Cormorant (*P. bicristatus*) swarms on some of the rocky islands in Bering's Sea. In this the feathers of the forehead do not reach the bill, being cut off by red naked warty skin; the base of the under mandible is blue; there is a medium black crest on the head, and another on the nape; a white flank-patch; the general plumage is richly iridescent, without distinction of the dorsal feathers. 7. The Violet-green Cormorant (*P. violaceus*) resembles the last, but lacks the peculiar markings about the face; it is much smaller, with a very slender bill, and otherwise different. It inhabits the Pacific coast at large, breeding as far south at least as the Farallone Islands. Species of other countries, very different from any of the foregoing, must be passed over. (E. C.)

CORNELL, EZRA (1807-1874), the founder of Cornell University, was born at Westchester Landing, N. Y., Jan. 11, 1807. His father, who belonged to the Society of Friends, having removed to De Ruyter, established a pottery and also taught school. The son learned his father's trade, and early displayed great mechanical ability. In 1826 he removed to Homer, N. Y., where he made wool-carding machines, and in 1828 to Ithaca, where he was employed in the machine-shop of a cotton-mill, and afterward in a flour-mill. For fifteen years he was partly employed in mill-work and partly in agriculture. In 1843 he became connected with the practical application of the electric telegraph, then recently invented by Prof. S. F. B. Morse, and devised a machine for laying pipes underground to contain the wires. When this plan was abandoned, however, on account of imperfect insulation of the wires, Mr. Cornell still devoted his energies to the promotion of the new invention. He was made assistant superintendent, and substituted poles for pipes. The line was erected between Baltimore and Washington in time to report the nominations of James K. Polk and Henry Clay, the conventions of both parties, Democratic and Whig, being held in Baltimore in May, 1844. Yet even this was not sufficient to ensure the success of the telegraph, and leading newspapers as well as scientific men refused to countenance the undertaking. In 1845, Mr. Cornell superintended the construction of the line between Philadelphia and New York. A year later he erected that from New York to Albany, and gradually lines were extended in all directions. With firm faith in the new enterprise and a remarkable foresight of its utility he invested the profits of his early labors in telegraph stocks as well as in Western lands, and the subsequent rapid increase in value of these investments gave him a splendid fortune. In 1862 he was chosen president of the New York State Agricultural Society, and gave \$50,000 for the endowment of a public library at Ithaca, where he resided. In 1863 he was elected to the assembly, and in 1864 to the State senate. Here his attention was attracted by the grant of land made to the several States by Congress in 1862 for the promotion of agricultural education. New York by the terms of the act was entitled to 990,000 acres, but two institutions to which this grant had been awarded proved unable to

comply with the conditions attached. Mr. Cornell then conceived the idea of a university "where any person can find instruction in any study." A charter of incorporation was secured, and the university established at Ithaca in 1868 with an endowment of \$500,000, which afterwards he greatly increased. Senator Andrew D. White, who had given much aid in carrying out the plan and securing the land-grant from the State, was made the first president. The advice of the most prominent educators was sought in regulating the courses of study, and eminent professors appointed in the different departments. Mr. Cornell undertook the management of the location and sale of the land-scrip with such success as to enhance its value greatly. Henceforth he devoted himself to watching over the interests of the university which bears his name. He died at Ithaca, N. Y., Dec. 9, 1874.

CORNELL COLLEGE, an institution of learning at Mount Vernon, Linn co., Iowa, was chartered in 1857, and graduated its first class in 1858. It had originally been a seminary, founded in 1852. The town and college are situated on an elevation rising from a beautiful valley, and affording fine views in every direction. The good natural drainage and pureness of the air afford conditions highly favorable to health. The college has four buildings, all of large size and substantially built. The chapel is a building of fine architectural appearance; its auditorium having seats for fifteen hundred persons, while the first story gives ample space for library, museum, and school assembly-room. The college is fairly supplied with scientific apparatus and has a library of 6500 volumes, additions to which are constantly made. There is a good chemical laboratory, and the students do much field-work in engineering.

Four courses of study are provided—classical, philosophical, scientific, and civil engineering; each requiring the same amount of preliminary work and being completed in four years. In connection with the college is a large preparatory department, a flourishing conservatory of music, and a successful art school. Instruction is also given in the theory and practice of teaching to those students who desire it. Classes for this purpose are formed in both the preparatory and the collegiate department. An army officer has been detailed for several years by the secretary of war to teach military drill, and the male students have been much benefited by the drill.

The college is under the patronage of the Methodist Episcopal Church, and is supported by the two conferences occupying the northern part of Iowa. It received its name from its early friend, W. W. Cornell, of New York city, and has been liberally aided by Rev. G. B. Bowman, D.D., Bishop L. L. Hamline, and other prominent Methodists. Bishop J. F. Hurst, LL.D., is president of the board of trustees. The alumni of the college number 255. They have a vigorous organization, and have sustained the chair of mathematics since 1873. The annual interest of their endowment fund is now sufficient to pay the salary of the professor. Rev. W. F. King, D.D., has been at the head of the institution for twenty years. The number of students in 1883 in the collegiate department was 136, of whom 42 were ladies; the number in the other departments was 373, making a total of 509.

CORNELL UNIVERSITY is an institution of learning at Ithaca, N. Y. The college buildings stand on a hill east of the village, and overlook the town, with the hills to the south of it and Cayuga Lake to the north. In 1862 the national government granted to the several States public lands, the proceeds of which on their sale should be devoted to the establishment and maintenance of schools of agriculture and the mechanic arts. Under this act the share of New York was 990,000 acres. Some of the States distributed their portions among their existing institutions, and the market was at once flooded with the land-scrip, which in consequence brought only about fifty cents an

acre; but New York, after some unsuccessful experiments, was induced to accept the proposal of Ezra Cornell, a member of the State Senate, who offered to add \$500,000 from his private fortune on condition that the whole fund should be appropriated to the founding and endowment of a single institution. Foremost among those who opposed the division of the fund and supported Mr. Cornell's proposal was Senator Andrew D. White, of Syracuse. The offer was accepted, and the site of the new institution was fixed at Ithaca, the home of Mr. Cornell, who, besides fulfilling his pledge, made an additional gift of over 200 acres of land for an experimental farm, and devoted himself wholly to the organization of the enterprise. In recognition of these gifts and services the legislature named the embryo university after its chief benefactor.

The leading object of the university, as stated in the charter, is "to teach such branches of learning as are related to agriculture and the mechanic arts, including military tactics;" but other branches of science and knowledge are embraced in the plan of instruction. "Persons of every religious denomination, or of no religious denomination, are eligible to all offices and appointments." The board of trustees, moreover, must be neither sectarian nor irreligious; "at no time" should "a majority of the board be of one religious sect, or of no religious sect." "The governor and lieutenant-governor, the speaker of the house of assembly, the superintendent of public instruction, the president of the State Agricultural Society" are *ex officio* members of the board of trustees, and one student from each assembly district, selected annually from the public schools by competitive examination, is entitled to education in the university free of all charges for tuition. The board of trustees, when complete, consists of twenty-four members, three of whom are elected every year to serve for a term of five years. Of these two are chosen by the board itself, and one by the alumni.

Senator White resigned his professorship of history at the University of Michigan and in 1868 accepted the presidency of the new institution, which in October of that year opened its doors for the admission of students. The faculty consisted of twenty-five professors, nineteen of whom were resident and six non-resident. The former were mostly young men, but included Goldwin Smith, William Channing Russel, and Evan W. Evans. The system of non-resident professors was a device to secure to students lectures and instruction from men of ability in all parts of the country who could not become permanently attached to the university. This class was represented at the outset by Louis Agassiz, James Russell Lowell, George William Curtis, and Theodore W. Dwight. Besides these there were four assistant professors and three instructors. In the first year 388 students were received. Within the scope of the instruction were included courses in agriculture and the mechanic arts, and also general courses in science, philosophy, and the classics. Special prominence was given to studies in history and political science. Students were allowed much freedom in the choice of their studies, and were not subjected to a daily marking system. In order to aid self-supporting students as much work as possible upon the university farm and grounds, and in the workshops and buildings, was assigned to them.

The history of the university is that of rapid but healthful growth. Its development has continued strictly in the lines laid down at its beginning. During the earliest years the college grounds were graded and beautified, at an expense of over \$50,000; and in 1870 Mr. John McGraw, of Ithaca, added to the two original buildings the noble central edifice. In its tower his daughter placed a chime of bells. Hiram Sibley, of Rochester, erected and endowed the Sibley College of Mechanic Arts; and William Kelley, of Rhinebeck, contributed an extensive collection of

mathematical works. Prof. Goldwin Smith gave a large part of his private library; President White, his rich collection of works on architecture; Rev. Samuel J. May, of Syracuse, his books and pamphlets relating to the anti-slavery struggle in America; and Mr. Green Smith, of Geneva, his fine collection of American birds. These are but the more important of the numerous gifts to the new foundation during the first three years of its existence. In 1872 the university accepted the offer of the Hon. Henry W. Sage for the erection of a building as a residence for young women, on condition that they should henceforth be admitted to all the privileges of the institution on the same terms as young men. The Sage College for Women was at once built and endowed at an expense of \$250,000; and to this gift Mr. Sage soon added another, the University Chapel, while one of his sons gave an organ, and another endowed the university pulpit. Until his death, in 1874, the university continued to owe much to the bounty of its founder. The internal growth of the university during these years kept pace with this outward prosperity. The number of professors, assistant professors, and instructors had increased to forty-three. Full courses in architecture and in English literature had been added to the curriculum, and the older courses had been much extended; the number of students exceeded 500, of whom 40 were women. At various times Pres. White was absent on account of public duties, and for two years was American Minister at the court of Berlin. In 1881 the advantageous sale of a large portion of the university's lands put the whole institution upon a better footing. The school of history and political science was at once reorganized and a four-year course marked out. Prof. Moses Coit Tyler was called to fill a chair of American history, and new lecture-ships in international law, political economy, and constitutional history were established. Large additions were made to the scientific and technical apparatus. A new laboratory for the departments of chemistry and physics, a drill-hall for the military department, and an astronomical observatory were erected. And just at the beginning of these preparations came the munificent gift of Mrs. Jenny McGraw Fiske, making the university library the richest in the land.

The following statement shows the condition of the university's funds in 1883:

Land scrip in comptroller's hands.....	\$473,412.87
Current land contracts.....	2,482,684.61
Estimated value of unsold lands.....	1,500,000.00
Real estate (exclusive of western lands).....	713,672.52
Equipment of departments.....	289,889.01
Mr. Cornell's endowment gift.....	628,596.61
The Sage College " " " ".....	125,000.00
" " Serrmon " " " ".....	30,000.00
Mr. Sibley's " " " ".....	30,000.00
The Woodford Prize Fund.....	1,500.00
The Horace K. White Prize Fund.....	500.00
Mrs. Jenny McGraw Fiske's gift.....	1,500,000.00
Total.....	\$7,721,255.62

The university faculty (1884) consists of forty-four resident and six non-resident professors, besides instructors and examiners, and is divided into the following special faculties corresponding to the several departments of study: Agriculture, Architecture, Chemistry and Physics, Civil Engineering, History and Political Science, Ancient Classical Languages, Germanic Languages, Romance Languages, Oriental Languages, Mathematics, the Sibley College of Mechanic Arts, Military Science, Natural History, Philosophy and Letters.

The courses in agriculture are intended to fit young men to be enlightened farmers. Instruction is given in applied agriculture, agricultural chemistry, economic entomology, horticulture, and veterinary science, both by recitations and lectures. Practice in the chemical, botanical, entomological, and veterinary laboratories is required, and a certain amount of time is given to work in the barns and upon the farm. The department is well equipped, possessing, besides its experi-

mental farm and stock, much illustrative material in the form of models, collections, and apparatus.

The whole ground of education in architecture, practical, scientific, historical, and æsthetic, is covered as completely as is practicable in a four-year course. The equipment of this department includes, among other things, the White architectural library and the most extensive collection of architectural photographs yet brought to America.

Save for the special attention given to agricultural and industrial chemistry, the instruction in chemistry and physics differs little from that at other American universities of the first rank. There are two professors, one assistant professor, and two instructors in chemistry, and a professor and an assistant professor for physics. The physical and chemical laboratory is most complete.

The department of civil engineering has been very successful. In addition to the regular four-year course a five-year course, giving more option in the choice of studies, has been arranged for special engineering students. Instruction is also given in mining engineering, and a school of mines, with full courses, is about to be established.

The school of history and political science was not fully established until 1881. The instruction in history includes courses of lectures on general history, ancient and modern, on English history, on American history, and on the philosophy of history, besides text-book and recitation work. Political and social science is treated under the heads of political economy, theoretical politics, systematic politics, international law, and American law and jurisprudence. *Seminaries* in American history and in political science have been established, and much of the best work of the course is done in these.

As regards languages, the field of instruction is wide. Greek is required only in the course in arts, but Latin belongs also to the courses in Literature, Philosophy, and History and Political Science. Though none of the Oriental languages are necessary for any baccalaureate degree conferred by the university, classes in Hebrew, in Arabic, and in Sanskrit are formed nearly every year; and modern Persian, Chinese, and other eastern tongues have been taught. German and French form an essential part of nearly all the general courses; but Italian, Spanish, and other modern languages are wholly optional. Gothic, old and middle high German, and the Scandinavian and Netherlandish languages are taught to advanced students. Anglo-Saxon is a required study in the course in English literature.

The instruction in mathematics, though thorough, has no peculiar features. The Sibley College of Mechanic Arts takes its name from the Hon. Hiram Sibley, of Rochester, to whose benevolence it owes its building and equipments, together with the endowment of its main professorship. The building includes, besides lecture-rooms, rooms for free-hand and mechanical drawing, and the machine-shop; and connected with it are a brass and iron foundry and a blacksmith-shop. Each student in mechanical engineering is required to devote two hours a day to work in the shop, which is fully equipped with all the ordinary hand and lathe tools used by machinists, as well as with many of the more complicated machines and attachments, with tools of accuracy for experimental work, and an exhaustive collection of mechanical models.

It being a special requirement of the charter that instruction in military science should be a feature of the institution, all male students, save foreigners, laboring students, and those physically unfitted, are required to provide themselves with the university uniform and to take part in military drill during the first and third terms of the first and second years. This instruction in tactics is under the charge of an officer detailed for the purpose by the United States

government, who, in addition, delivers each year a course of lectures upon military subjects.

The department of natural history is divided into sub-departments of botany, geology, palæontology, and zoölogy. The instruction in each includes laboratory and field work, as well as lectures; and the illustrative collections are very full. Thus the Newcomb collection of shells (embracing more than 20,000 species) is the finest in America; and the Hartt collections of South American fossils and fishes are quite unique. Both the native flora and the local facilities for geological and palæontological research are exceptionally rich.

The department of philosophy and letters is remarkable for the great fullness in the course in English literature.

The university collections and apparatus, as a whole, constitute one of the largest college equipments in the United States, the apparatus for scientific and technical study being especially complete.

The library, which already ranks third among the college libraries of the country in point of size and value, containing above 50,000 volumes, has recently become the most richly endowed of American libraries, and is growing rapidly. Its collections of periodicals, literary, scientific, and technical, are especially full. In works relating to architecture, to the mathematical sciences, and to oriental philology, the library is also very rich.

The courses of study have been divided into general, special, and optional courses. The first class comprises: (1) the course in Arts, leading to the degree of Bachelor of Arts, corresponding to the regular classical course of American colleges; (2) the course in Literature, leading to the degree of Bachelor of Literature, which substitutes for the study of Greek a thorough training in English literature and the modern languages; (3) the course in Philosophy, or Latin scientific course, leading to the degree of Bachelor of Philosophy; (4) the course in Science and Letters, which leads to the same degree but aims at a somewhat more general culture than the last named. The special courses correspond in the main to the several departments of instruction, and are as follows: (1) Agriculture, two courses, a four-year course leading to a degree of Bachelor of Agriculture, and a three-year course not leading to a degree; (2) Architecture, leading to the degree of Bachelor of Architecture; (3) Chemistry and Physics, leading to the degree of Bachelor of Science; (4) Civil Engineering, two courses, a four-year course leading to the degree of Bachelor of Civil Engineering, and a five-year course leading to the degree of Civil Engineer; (5) History and Political Science, leading to the degree of Bachelor of Philosophy; (6) Mathematics, leading to the degree of Bachelor of Science; (7) Mechanic Arts, leading to the degree of Bachelor of Mechanical Engineering; (8) Natural History, two courses, a four-year course leading to the degree of Bachelor of Science, and a two-year course (preparatory to the study of medicine) not leading to a degree. Optional courses may be marked out by students themselves, with the approval of the faculty, and do not lead to degrees. Post-graduate courses, leading to advanced degrees, are laid down in most of the departments; in these, as elsewhere, the field of election is very large.

The regular charge for tuition is \$75 a year; but tuition is free to students in agriculture, to students holding scholarships from the State, and to resident graduates. No fellowships or scholarships have as yet been established save those provided by the State of New York at the outset. Under this provision 120 students each year, selected by competitive examination from the assembly districts of the State, are entitled to enter the university and pursue a four-year course of study free from all charge for tuition. A loan fund also exists.

The university buildings are at present ten in number, and form two main groups: (1) the quadrangle,

or stone group, at the north, containing the lecture-rooms, laboratories, library, and museums; and (2) the brick group, at the south, comprising the University Chapel, the Sage College for Women, and the gymnasium. Another building, the Cascadilla Place, is at the entrance to the grounds; and the campus is bordered on the east and west by the residences of professors. Cascadilla Place, an imposing structure of gray stone, is now, by reason of its distance from the other buildings, used mainly as a place of residence for members of the faculty. The North and South Universities, built of stone quarried upon the grounds and unimpressive in appearance, are the oldest of the college buildings, and contain the greater part of the lecture-rooms, as well as the university offices and the halls of the literary societies. Between them is the McGraw building, also of native gray stone, and the largest of the group. The body of the building contains the library and museum, and the two wings the departments of geology and zoölogy. In its tower, which commands a view of the entire surface of Cayuga Lake, are the great bell of the university, the chimes, and the university clock. The physical and chemical laboratory is a handsome edifice of red Medina sandstone, at the north-west corner of the quadrangle. East of this, and at the extreme north of the campus, stands the Sibley College of Mechanic Arts, with its appendages, overlooking the deep ravine of Fall Creek, which bounds the university grounds. The departments of civil engineering and veterinary science occupy in common a large temporary building of wood, to the east of the McGraw. The most important building of the brick group is the Sage College, which occupies a commanding knoll at the south-east of the campus. It is a quadrangular edifice, the most spacious of the university buildings, and is mainly a home or dormitory for women students, accommodating about 100 pupils; but it also contains the commodious lecture-rooms, museums, laboratories, and green-houses of the department of botany. The University Chapel, situated midway between the Sage College and the South University, is a Gothic structure of brick with stone trimmings. It has two audience-rooms—nave and transept—the larger of which will seat 500 persons. The gymnasium stands at the south-west corner of the campus proper, overlooking Cascadilla ravine to the south. A new library edifice worthy of the splendid endowment of that department is soon to rise at the south-western angle of the stone quadrangle. An endowed college hospital, the gift of the late Mrs. Fiske, and an observatory are the most recent additions to the university buildings. Among these buildings ought to be included the residence of the president, on an eminence at the east of the campus, and also the mansion of the late Mrs. Fiske, adjoining the campus at the north-west. The former was erected at the private expense of President White, and designed by him as a gift to his successors; the latter is at present used by the university as a museum of art, industrial and general.

Women students stand in all respects upon the same footing as young men, save that they are exempted from military drill. Since their admission in 1873, 58 have been graduated; and the number actually in the university at any one time is between 50 and 60. A majority of these reside at the Sage College; though some make their homes in private families.

As a part of the public-school system of the State, the university cannot, if it would, place the religious instruction of the students in the hands of any sect. Religious services are, however, held regularly in the University Chapel; and during the fall and spring terms its pulpit is filled weekly by clergymen of the various denominations. These services are supplemented by the meetings of the University Christian Association, held in one of the university buildings. While students are not compelled to attend any of these religious exercises, every effort is made to attract them thither.

In the early years of the university a systematic effort was made to ascertain how far it is possible for a student to support himself by manual labor while carrying on a course of university study. The prices paid were the same as would have been paid to other laborers doing the same work. The result of this experiment was to show that a young man skilled in some handicraft—carpentry, masonry, type-setting, engraving, machine-construction—might in many cases partially, and in some cases wholly, maintain himself; but that young men who came relying entirely on unskilled labor—and by far the greater part belonged to this class—very seldom possessed the combination of physical and mental strength required for success. The wages of unskilled labor were too low and the work too exhausting. So long, however, as there was work to be done in the grading and improvement of the university grounds, many aided themselves materially by this means. The university still gives its janitorships to students, and there is some demand for labor upon the university farm. The university press affords a constant means of self-help to students skilled in the art of printing; and experience has shown that few students are more successful than those who thus work their way through. But the university does not guarantee employment to any student.

CORNING, one of the county-seats of Steuben co., N. Y., is on the Chemung River, 132 miles S. E. of Buffalo and 17 miles W. of Elmira, on the New York, Lake Erie, and Western Railroad. The Corning and Antrim Railroad connects it with the coal-fields of Tioga co., Pa., and it is a terminus of the Syracuse, Geneva, and Corning Railroad. It has a court-house, opera-house, 4 hotels, 2 weekly newspapers, 5 schools, a public library, 5 churches, an orphan asylum, and water-works. Its industrial works comprise glass-works, engine-works, railroad-shops, machine-shops, 2 planing-mills, sash- and blind-factory, and a flour-mill. It is at the head of the Chemung canal and was named from Hon. Erastus Corning. It was incorporated in 1848 and made a half-shire in 1854. Population, 4802.

CORONER. An officer of the government in England and countries of English origin, so called from *corona*, the crown, because the *coronator* or "crown" was formerly a deputy of the king charged with important duties. But from the reign of Elizabeth downward the office has fallen into incompetent hands, and has occasioned much ridicule and some abuses. Legally the coroner may act for the sheriff, or may serve a writ upon the sheriff, but his chief duty has been, for many years, to inquire into the circumstances attending violent deaths. In Scotland there is no coroner, but a "procurator-fiscal," whose duties are those of the French *procureur* or public prosecutor, attends to the duties of a coroner, as the *procureur* does in France, and as a corresponding official does in Austria. In Prussia the judges of the primary courts, assisted by surgeons and other officers of their courts, investigate the death of persons under suspicious circumstances; and this practice prevails in Connecticut, and perhaps a few other American States. But generally the English usage, which has prevailed since Alfred's reign, has been followed in the United States, and coroners, aided by special juries, hold inquests and return verdicts. In Massachusetts, before 1877, these inquests became so costly and useless, and were occasionally so much abused by malicious or mercenary coroners, that a summary law was passed in that year abolishing the office of coroner. Instead of it, the office of "medical examiner" was created, the term to be seven years (as of coroners), but the number limited to seventy,—whereas formerly there were nearly fifty coroners in Suffolk county alone. These examiners are to be all medical men, and upon due notification are to view and report upon dead bodies, holding autopsies and special inquiries when needful. The

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new system was adopted chiefly upon the representations of Mr. T. H. Tyndale, a Boston lawyer, whose investigations, following those of Mr. Herschel, an English lawyer, in 1876, convinced the Massachusetts legislature that a change was expedient. The new system has worked so well that other States are preparing to adopt it. It is less expensive to the public than the coroner system, gives less annoyance to individuals, and promotes better the ends of public justice; since, when necessary, the public prosecutor and the primary courts take part in the proceedings, as in France and Germany. In England the office of coroner fell into much contempt, and was the occasion of many abuses, some of which still prevail, although the office is a more dignified and important one there than it was one hundred years ago. Mr. Farrer Herschel's attack upon the English system of coroners and juries has attracted attention; but the traditional office still exists there, and the old system survives, although better guarded than in most of the United States.

See *Proceedings of the British Social Science Association for 1876*, and of the *American Social Science Association for 1877*; also the publications of the Massachusetts Medico-Legal Society, which receives reports from all medical examiners. (F. B. S.)

CORPORATION. The old Aryan household, the antecedent and necessary predecessor of the modern family founded on kinship, has been justly considered by Coulanges and others to be the progenitor of the modern corporation. "The household was thus an association formed upon religious belief and contemplating religious objects. But it was something more: it was a permanent association. It was not intended to pass away and be re-formed like the generations of men. It was constructed, and was meant to endure forever. It was, in our technical language, a corporation. It had perpetual succession. It included in its members both the living and the dead." (Hearn, *Aryan Household*, p. 66.) We view institutions from the family stand-point; but the modern family, however it was organized and established at first, was unknown when the early races began those forms of living, which are now developing into what we call civilization. This enlarged power of personality, this principle of succession created first the king sole in his corporate functions, then the church with various guilds and charitable organizations, the free city, and the modern municipality, and finally the commercial, the moneyed, the industrial corporation. The Roman *collegium* was the main vehicle which brought over these varied institutions. The element of sovereignty, carefully suppressed by the Romans, developed afterward into the municipality, though this point is a matter of dispute. The civil government proper, whether imperial, feudal, or kingly, was constantly restraining these associations, which tended to assume power and to encroach upon the claims of the sovereign. The ordered limits of the modern state give free play to many social tendencies, which mediæval governments regarded as seditious. The political functions of the corporation are now well classified, the religious have become consolidated in the various forms of the Christian church; while the purely social, the charitable and friendly, as distinguished from the economic and industrial functions, have found expression in organizations of their own.

We would call attention to it as a social agent, an instrument for working out those desires which are common, and which can be put forth by the individual only in combined action with his fellows. The early experience of America, in its struggles with a powerful kingdom, its first feeble organization under the Confederation, its largeness of territory and sparseness of population had developed two kinds of capacity in its people. A self-reliant race of freemen grew up, who soon found that they must trust in each other and rely

upon common action, in the same measure that they trusted in themselves and followed the bent of their own desires. The same spirit which founded the American Union, and welded it finally into a free but imperial government, impelled the citizens in common life to combine for every kind of enterprise. In no country have law and the common business of life so fused and interpenetrated as in this republic. The lawyer is the priest of the commonwealth. The American lawyers found in the old Roman *collegium*, the then inchoate English corporation, a tool half ready to their hand. They forged it anew, and used it constantly in the growing life of the new country.

The power of creating corporations was denied to the general government by the party which would limit its prerogative. But Hamilton argued that sovereignty resided in the government of the United States, and that the power to create these civilizing combinations was a part of the sovereign authority. The Supreme Court sustained him, but the State legislatures have been the chief creators of our corporations. The terms *public* and *private* hardly suffice to define corporations, but they have been much used in this country. They distinguished a *public* from a *political* corporation, where the former had certain social attributes which were united with partial political attributes. If the stock in the Bank of the United States had belonged *exclusively* to the government, then it would have been a *public* institution in one sense; but inasmuch as there were other stockholders it became a *private* corporation, and the State took the place and the rights of an individual stockholder, in that act divesting itself of its sovereignty.

"The main distinction between public and private corporations is, that over the former the legislature, as the trustee or guardian of the public interests, has the exclusive and unrestrained control; and acting as such, as it may create, so it may modify or destroy, as public exigency requires or recommends. . . . Private corporations on the other hand are created by an act of the legislature, which, in connection with its acceptance, is regarded as a *compact*, and one which, so long as the body corporate faithfully observes, the legislature is constitutionally restrained from impairing, by annexing new terms and conditions, onerous in their operation, or inconsistent with a reasonable construction of the compact." (*Angell & Ames on Corporations*, § 31, chap. 1.)

Overseers of the poor, supervisors of a county and of a town, loan officers of a county, school districts, etc., many semi-public bodies, acting in the public interest, are *quasi* corporations.

"They were defined by Chief-Justice Parker to be not bodies politic and corporate, with the general powers of corporations; and the reasoning advanced to show their defect of power is conclusive. The same may be said of towns and other municipal societies; which, although recognized by various statutes and immemorial usage, as persons or aggregate corporations, with precise duties which may be enforced, and privileges which may be maintained, by suits at law, yet are deficient in many of the powers incident to the general character of corporations. They may be considered, under our institutions, as *quasi* corporations with limited powers, co-extensive with the duties imposed upon them by statute or usage; but restrained from a general use of the authority which belongs to these metaphysical persons by the common law."

The "sole" corporation survives in America in a few instances. Where the usages of the Church of England had been adopted in the colonies and the common law had begun its work tacitly, "the minister of the parish was seised of the freehold, as *persona ecclesiæ* in the same manner as in England; and the right of his successors to the freehold being thus established, was not destroyed by the abolition of the regal government nor can it be divested even by an act of the State legislature." These historic and prescriptive rights were maintained by the great jurists Story and Shaw.

We must consider the experience of our forefathers,

how they hated hereditary aristocracy and all dominating privilege, in order that we may appreciate this devotion to the best spirit of law and order. The Episcopal church, naturally conservative and loyal, had not been a popular institution in the Revolution. And the revolutionary patriots had imbibed a fierce feeling against all forms of society which could limit or restrain the aspirations, the development, the freedom of the individual man. Observers looked for the downfall of this new experiment in government, from these very causes. The fathers endured patiently the mystic obligations of the legal corporation and never laid their legislative hand on any of its time-honored privileges. This common characteristic of the American people has not been recognized sufficiently. They can serve as well as command, give as well as take, share as well as seize.

"It is remarkable," said Chancellor Bland, of Maryland, "that there is no instance of the creation of any body politic of this description (private) under the provincial government; but since the establishment of the republic, they have increased and multiplied to a very large and still rapidly growing family."

Chancellor Kent said their growth was "astonishing," and New York attempted to check their formation in 1821. But the principle of growth sprung from the necessities of the people, and the legislature could not prevent the increase. At the same period it was said "their facility of action has become a matter of public importance," and the courts modified their practice to enable them to work more freely.

The free employment of this means of association and combination has affected every social issue in American history. In finance and in travel, communication and transportation, it found its greatest opportunity and largest development. Capital was the chief necessity and inter-communication was hardly less necessary in the new and widely extended community.

Immediately after the Revolution banks of issue and deposit began to be incorporated in the larger towns. In the opening of this century they had extended into villages and even hamlets. This ill-regulated currency, poor as it was in comparison with the secured paper money of these days, was nevertheless a boon to a struggling community. One must see the influence of a bank of deposit and discount in poor and half isolated communities in order to comprehend the blessings of better mercantile system and better regulated credit which it affords. The unsafe and miserly hoarding of barbarism becomes the orderly and thrifty venture of civilization. Ship-owners associated themselves, not with all the legal, but with the efficient, powers of the corporation, and developed the finest race of shipmasters possible in the times when commerce was a matter of individual venture, rather than of mechanical arrangement. The co-operative system of their whaling-ships made that enterprising fleet the wonder of the world.

Textile manufactures were well under way when the century had completed its first quarter, and the larger enterprises were forwarded by the same means. Canals were dug generally, though not always, with the aid of the State. Then railroads, the most powerful engines of our present civilizations, were projected timidly, on short and hesitating lines. We must not infer that the simple American citizens and legislators did not know what they were doing when they built up these incorporated beings, these creatures instinct with a fecundating life, new to the world of those days. When the early railroads sought for their charters the opposing lawyers startled the assembled farmers by the picture they drew of this suzerain with more than feudal powers, which was to come among them and run his great iron feelers through their farms and barnyards. In *mortmain*, with the dead hand, reaching out from a ghoulish past, would this creature seize upon their land and hold it to tyrannize over their chil-

dren. The grantors provided that the land should revert to the owners when the corporate incidents of the railroad should have ceased. But the most ludicrous theory of burgher independence, in the light of our modern experience, was the provision made for any individual to run his own vehicles over these semi-public highways, at his own expense, on paying fair tolls. To run one's own locomotive and train over one of Vanderbilt's or Gould's lines in these days would be a ghastly kind of independence or comfort.

They built quite as well as they knew. Judge Marshall in the famous Dartmouth College case, which marked an era in the corporation law of this country, says: "the great object of an incorporation is to bestow the character and properties of individuality on a collective and changing body of men." But this process is subject to limitations growing out of the experience of Rome and the more concrete common law of England. In the Ashton railway-carriage case, legal opinion was divided. One party of judges held that "the common law incidents of a corporation adhere, unless expressly removed by the legislature;" and the other held that "the contract could not have been ratified by the unanimous assent of the whole corporation." An individual can make a contract at will if he violate no law. But a corporation, while it has received powers from the State, also surrenders to its progenitor some powers which the individual naturally holds (Brice: *Ultra Vires*, Green's Am. ed., pp. 31, 32). Chief-Baron Manwood was right when he demonstrated that corporations have no souls. As he laid down, none can create souls but God; corporations are created by the king; therefore a corporation can have no soul. The instinct of the jurist was wiser than his logic. In our view, the ruler can formulate and register; he cannot create. The creative powers of the sovereign have gone with the old dogma of divine right into the night of the past. The powers which civilization has engendered are reduced to order and legitimated by the sovereign power of the State; their vitality and essential life come from the power which is anterior to and above the head of the State.

All corporations must pass through this gate which divides them from persons, though the way leading to it is blind and perplexing. The doctrine of *ultra vires*—the abuse of power by going beyond its limits—is modern and has grown under the hands of the jurists. They saw with true wisdom that the spirit which controls a person could not be present in a body which acts through agents, and that a perpetual succession could not continue to accumulate all the legal and social rights of persons—beings whose powers cease and are renewed with every generation. The result of this evolution cannot be foreseen, but its operation is certain. Managers of corporations and their attorneys constantly assert that they can do as they please, having the control of their own property. But it is clear that the one thing these favored creatures lack under the law is the power of self-willing which goes with individual freedom, and goes with that only. Sooner or later the orderly development of law will bring these large-limbed creatures of civilization into close harmony with the larger and common interests of society.

With the latter half of the century began the great consolidating movement in railway corporations. The local institution, created for the wants of one neighborhood, though that locality might be one of the great States, proved too narrow for the continental wants and aspirations of the American people. The Pacific lines, linking oceans together, gave a further impulse to this natural movement. By the union of charters, and far-reaching contracts and leases, monster lines were projected and operated under one management. The sagacity of Cornelius Vanderbilt, who began the business of transportation in a small ferry-boat and ended in the largest railway business of the world in his day, fully comprehended the need of the

time. He moved freight at rates which would have been impossible under the old system. The great Pennsylvania and Baltimore lines were quick to rival and even surpass him. The transportation of freight, costing 2.153 cents per ton per mile in the United States of 1866, was reduced to .866 cent in 1880, a reduction of 60 per cent.

There are those who treat laborers as a peculiar class, outside our whole society, with passions alien to it, and rights opposed to it. The members of society who do not labor, and the holders of capital especially, are presumed to have interests which certainly oppose, and often oppress, the laborer. The corporation is held by these sciolists to be an essential antagonist and oppressor of the laboring class. Let us consider what has been the result to the laborer of this development of railway freight transportation, that most striking industrial achievement of the corporation. A man standing on the Atlantic seaboard, by two days' labor with his shovel, can bring to his own door his year's subsistence, grown half a continent away. In this social movement capital and the organizing skill which conducts it become the servant of the laborer. We can hardly perceive, or even imagine, any better mode of serving a simple son of toil. He can put forth his effort on the ground, where it is most needed, or best paid; he can bring his food to that point from the place of its cheapest production for a trifling sum. The peculiar hardship of the laborer, under all circumstances, doubtless is a certain fixedness and immovability as compared with capital, which in its quick form is ever fluid and portable. In the above process, by these great consolidated movements, he can put himself where capital moves with the greatest energy, and at the same time he can bring to himself, at the lowest possible cost, the products of the earth—commodities, capital—which he must consume to maintain his own and his family's life.

The corporate method forms an excellent reservoir for capital, and the world has discovered as yet no means by which its benefits can be so widely distributed.

The savings institutions are the richest corporations in the United States after the railways; their deposits are in small sums, widely scattered, and are largely the property of artisans and laborers. The stock of national and State banks is shared among numerous holders. Wherever we find the most intelligence and the best administration of affairs, there is the most corporate life and activity.

This great agent of modern society, this sprite larger and mightier than all the goblins fancy ever conjured under the magician's wand, has developed not all its powers as yet. It is now on trial at the bar of public opinion, and one party aims to subject it to the will of the majority working through the State by ordinary legislation and administration. Others believe that the present evils of transition would be made worse by thus tampering with an institution which was cleared from the political machine by long and patient social development. Political administration is of necessity clumsy, slow, and cumbersome. The checks and balances of the best State executive must hamper the social energies which civilization is evolving with ever-increasing force and variety. The corporation, beginning in the religious instinct, has been fostered by the common law. It is the social side of combined power, as distinguished from the political side—a branch shooting from the main trunk of the State, homogeneous with the parent stock, but producing different results. It gives to the commonalty some essential attributes of an aristocracy. For any one can buy a share in an industrial corporation, and thus take part in its advantages of succession, its consolidated social force. Or if the commonalty do not take part directly, they share indirectly through the service which the corporation must render to the whole of society by its close interpretation of social wants.

In the higher politics which govern the people ultimately these essential divisions and historical variations must be recognized. We may inspect and partially regulate corporations, through the political administration of the State, which charters them. The definite control of these mystic persons must be judicial, and must come through the *ultra vires*, the due process of the courts, which always moves in harmony with social development. To confound and confuse these mighty social issues would carry the American civilization—the most powerful the world has known—into a sea of unknown troubles. (W. B. W.)

II. CORPORATION in Law.—An aggregate corporation is an ideal body created by law, composed of individuals united under a common name, the members of which succeed each other; so that the body continues the same irrespective of the changes in its membership. (2 *Kent's Com.*, 215.) A corporation is vested by the policy of the law with a capacity of acting in several respects as a natural person, as to taking and granting property, contracting obligations, suing and being sued, and of enjoying privileges and immunities in common, and a variety of political rights more or less extensive according to the design of its institution, either at the time of its creation or at any subsequent period of its existence. (*Kyd on Corp.*, vol. i., p. 13.)

Corporations may be either—1, *Public*; or, 2, *Private*. The most usual instance of the former is a municipal corporation created for governmental purposes, or any corporation entirely under the management of the commonwealth or of the United States government. *Nations* or *States*, as bodies politic, become moral persons susceptible of obligations and laws; and in this broad sense of the word the United States may be termed a corporation, and so may each of the States.

Private corporations are such as do not fulfil any functions of public government, and are not wholly within the immediate control of the government. The word *private* is not used here in its popular acceptance, for in that sense nearly every corporation is public, inasmuch as nearly all are created for public benefit. A railroad, canal, or turnpike company is a familiar illustration of this class of corporations.

Private corporations, again, are either *ecclesiastical* or *lay*. Ecclesiastical or religious corporations, as they are usually called in the United States, are created to enable religious societies of various denominations to manage with greater facility their temporal concerns. Lay corporations are those private corporations which are not under the immediate control of some religious society.

Corporations, considered with respect to the individuals which compose them, are either *sole* or *aggregate*. A sole corporation, as its name implies, consists of but one person. Such are very rare in the United States, except in those States where the religious establishment of the Church of England was adopted while they were still colonies, and where, according to the old common-law rule, the minister of the parish is seised of the freehold as "*persona ecclesie*." In such case, the right of his successors, thus established, is held not to have been destroyed by the abolition of the regal government at the Revolution; nor can it be divested even by an act of the legislature. (9 *Cranch*, 328.) The capacity of a sole corporation to hold property in succession is confined to real estate; personal property cannot be so held. (9 *Cranch*, 43.) All corporations which are composed of more than one member are aggregate corporations. (E. F. S.)

CORPUS CHRISTI, the county-seat of Nueces co., Texas, is on the west shore of Corpus Christi Bay, 7 miles S. E. of the mouth of the Nueces River, and 178 miles south of Austin. It has communication with Mexico by the Texas-Mexican Railroad, and, having an excellent harbor, carries on extensive trade both by land and sea. It has 2 banks, 2 weekly newspapers, 7 churches, a convent, and several good schools. The land rises abruptly from the business

part of the town to a height of 80 feet, and then extends into the prairie. The American army, under Gen. Z. Taylor, encamped here for some months in 1845, previous to the Mexican War. Population, 3257.

CORRY, a city of Erie co., Pennsylvania, is at the intersection of the Philadelphia and Erie Railroad with the New York, Pennsylvania, and Ohio Railroad, and the Buffalo, New York, and Philadelphia Railroad, 37 miles S. E. of Erie and 5 miles S. of the New York State line. It has 2 national banks, 2 opera-houses, 14 hotels, 2 weekly newspapers, 12 churches, a high school and 5 other schools, a park, gas-works, fire department, a board of trade, and telephone exchange. It has 26 manufacturing establishments, producing steam-engines, boilers, oil-well tools, pails and tubs, furniture, shingles, brooms, cigar-boxes, and leather. In 1861 it was simply a railroad station, but it grew into a town when petroleum was discovered in the neighborhood. In 1866 it was chartered as a city. Population, 5277.

CORSICANA, the county-seat of Navarro co., Texas, is at the intersection of the Houston and Texas Central Railroad with the Texas and St. Louis Railroad, 16 miles west of Trinity River and 180 miles N. E. of Austin. It has a fine court-house, 2 hotels, a bank, 3 weekly newspapers, 9 churches, and good schools. It has 2 machine-shops, 2 planing-mills, a flour-mill, and a cotton-compress. It was settled in 1848. Population, 3373.

CORTLAND, the county-seat of Cortland co., N. Y., is on the Tiogonia River, and at the junction of the Syracuse, Binghamton, and New York Railroad with the Utica, Ithaca, and Elmira Railroad, and a branch of the New York and Oswego Midland Railroad, 36 miles south of Syracuse, and 125 miles directly west of Albany. It has 3 banks (1 national), 3 weekly newspapers, 6 churches, a State Normal School, an academy, and other schools. It has 5 wagon-works, manufactories of mowing-machines, wire, folding-chairs, and other industries. Population, 4050.

CORUNDUM. In the United States corundum is most abundantly found in close connection with the great belt of rocks, consisting, in their unaltered condition, of granular chrysolites, but generally changed into serpentines, talc- and chlorite-slates which stretch with more or less interruption from Massachusetts into Alabama. In many of the localities it occurs in sufficient quantity for extensive mining operations, as in Chester, Mass., Chester co., Pa., in Macon, Clay, Jackson, Madison, and Haywood counties, N. C., in Laurens co., S. C., Towns co., Ga., Tallapoosa and Coosa counties, Ala.

A careful investigation of these occurrences has revealed the very interesting fact that many of the rocks in which corundum is found are the results of its alteration, and that it is only a remnant of large bodies which must have existed originally. By simply uniting with water, corundum Al_2O_3 is changed into diaspore $H_2Al_2O_4$, or beauxite $H_4Al_2O_5$; by taking up iron- and magnesium-oxides, it is converted into a variety of spinel $(Fe Mg) Al_2O_4$; its combination with silicic oxide gives rise to the two forms of Al_2SiO_5 , fibrolite and cyanite; if, besides, some alkalis, alkaline earths, and water enter into combination, minerals of a more complicated composition result, such as zoisite, several kinds of feldspar, as anorthite, andesine, oligoclase, and albite, or various micas, as muscovite, paragonite, and margarite, but also several chloritic minerals, viz.: prochlorite, kerrite, maconite, calsageite, willcoxite, and others. All these changes have been observed, and many of the large belts of mica- and chlorite-schists, paragonite and pyrophyllite slates bear evidence that they once were corundum, altered into their present condition, as Prof. I. D. Dana expresses it, by pseudomorphism on a broad scale. (F. A. G.)

CORVIDÆ (Lat. *corvus*, a crow), a family of oscine passerine birds, with scutellate laminiplantar

tarsi, 10 primaries, more or less cultrate bill, and usually dense nasal plumules concealing the nostrils; related to the starlings and birds-of-paradise, and comprising the ravens, crows, rooks, daws, choughs, pies, jays, etc. It is a large cosmopolitan family comprising some 175 species and 25 or 30 genera, but one not easy to define with precision, owing to the diversity of the forms which the term is allowed to cover. The most aberrant members are probably the piping crows of Australia (*Gymnorhina*). The choughs are another special group (*Fregilina*). Most of the *Corvidæ*, however, fall in the two sub-families of the crows proper (*Corvinæ*) and jays (*Garrulina*). See CROW. (E. C.)

CORWIN, THOMAS (1794-1865), an American statesman, was born in Bourbon co., Ky., July 29, 1794. His father had removed from New Jersey to Kentucky, and in 1798 crossed the Ohio River into the North-western Territory. Settling near what is now Lebanon, Warren co., Ohio, he was afterwards elected to the State legislature. Thomas improved his scanty opportunities for education, and having entered the county clerk's office in 1814, he soon after began to study law. He was admitted to the bar in 1818, and his ability, readiness, and eloquence soon gave him prominence as an advocate. In 1822 he was elected to the State legislature, where he served for seven successive years. In 1830 he was sent to Congress, where he was an ardent supporter of Henry Clay, and was prominent in the councils of the Whig party. In 1840, when Gen. W. H. Harrison was its presidential candidate, Corwin received the nomination for governor of Ohio, and during that exciting campaign spoke in nearly every county of the State. His fame as a political orator was fully established, and he was elected governor for two years. In 1845 he was chosen United States Senator, and during his term opposed the annexation of Texas and the war with Mexico. His speech on the latter is one of his ablest efforts. On the death of Pres. Taylor in 1850, Vice-Pres. Fillmore succeeded, and in reorganizing his Cabinet appointed Mr. Corwin Secretary of the Treasury. At the close of his term he resumed the practice of his profession in Ohio, but in 1858 he was again elected to Congress as a Republican. When civil war was imminent he exerted himself to effect a compromise. Pres. Lincoln in 1861 appointed him minister to Mexico, where he remained until the arrival of Maximilian in May, 1864. He then returned to Washington, where he was engaged in professional duties until his death, Dec. 18, 1865.

COSHOCTON, the county-seat of Coshocton co., Ohio, is on the Muskingum River, at the confluence of its branches, the Walhounding and the Tuscarawas Rivers, and on the Pittsburg, Cincinnati, and St. Louis Railroad, 26 miles N. of Zanesville, and 69 miles E. N. E. of Columbus. It has 2 banks (1 national), 6 churches, 2 schools, 4 weekly newspapers (1 German). It has 2 flour-mills, a paper-mill, and a manufactory of steel springs and axles. It was laid out in 1802 under the name of Tuscarawa, which was changed in 1811, and was incorporated in 1833. Population, 3044.

COSTA, SIR MICHAEL (1810-1884), musical composer, born at Naples, Feb. 4, 1810. While a student at the Royal Academy of Music in that city he performed the following works of his own composition: In 1825, *L'Immagine* (cantata); in 1826 and 1827, the operas *Il Delitto Punito* and *Il Sospetto Funesto*, a mass, three symphonies, and *La Passione*. In 1828, Costa wrote the semi-seria opera *Il Carcere d'Ildegonda* for the Teatro Nuovo, and in the following year *Malvina* for Barbaja, the manager of San Carlo. On being sent to Birmingham to direct the performance of the choral work *Super Flumina Babilonis*, which was composed by his teacher, Zingarelli, Costa received professional engagements that induced him to remain in England. In 1830 the ballet *Kenilworth* was written, and in 1832 another ballet, *Une Heure à Naples*. The follow-

ing year *Sir Huon* (also a ballet) and the celebrated quartette *Ecco quel Fiero Istante*, which, having been sung repeatedly in the concert-room for half a century, may now be heard set to sacred words in churches in America. In 1837, Costa's opera *Malek Adhel*, which did not meet with great success in Paris, was received with more favor in London. His only other opera, *Don Carlos*, was produced in 1844. In 1855 he wrote the oratorio *Eli*, and in 1864 his last oratorio, *Naaman*, both for the Birmingham festivals. In 1869 he received the honor of knighthood from Queen Victoria, having previously been decorated by several European sovereigns.

The oratorios *Eli* and *Naaman* are Costa's most ambitious works. They are not, however, in the highest style of choral writing, but show a want of ability to combine many melodies simultaneously, and even the power to create musical ideas capable or worthy of being developed in choral fugues. The Italians have ceased to exercise themselves in such forms of writing, and hence the ancient ecclesiastical music of their country is superior to that of the present day. Costa seems to have tried to atone for this want of skill in the invention and development of noble musical motives by making his work dramatic in form, depending upon incidents, violent contrasts, plot, startling situations, and an imagined action, rather than upon musical effects, as Handel did; as for instance, in the *Messiah*. From this point of view also it will be seen that the latter work leads to a contemplation and meditation of the moral outcome of the whole subject-matter, while the former works lead more to a consideration of the circumstances, and may eventually become tedious as twice-told tales.

In 1849, Costa became conductor of the Birmingham festivals; in 1857, conductor of the great triennial Handel festivals at the Crystal Palace, Sydenham; while at the opera-house and the concerts of the Sacred Harmonic Society in London his powers as an organizer and director have gained for him universal fame, which will endure when his compositions lie buried in silence. He died April 29, 1884. (S. A. P.)

COSTA RICA (REPUBLICA DE COSTA RICA), the most southern state of Central America, comprises an area of 21,495 square miles. The constitution of 1871, which had been in effect only nominally at any time, was entirely suspended in 1878 by Gen. Tomás Guardia, who had obtained the chief power in September, 1877. In 1880 he frustrated an attempt made to restore constitutional government. Guardia died July 6, 1882, and Gen. Prospero Fernandez was elected president, Aug. 10, 1882. The arbitrary rule of Gen. Guardia seems to have repressed the revolutionary tendency. He preserved peace with the neighboring states, though the still unsettled boundary-disputes with Nicaragua on the north and Colombia on the south seemed at times to threaten war. His administration, however, was extravagant in expenses, and plunged the country deeply in debt. President Fernandez directed his attention first to the extinction of the home debt, but the measures taken with this object produced a serious panic in the capital, San José, though confidence was afterward somewhat restored. He has also endeavored to make arrangements with the foreign bondholders for advances sufficient to complete the interoceanic railroad, on the ground that only in that way can they recover the amounts already invested.

Finances.—The total home debt is stated officially at \$1,167,820, and by the plans now in operation it will be extinguished in 1888. The foreign debt consists of two loans—that of 1871, at 6 per cent., amounting to £940,300; and that of 1874, at 7 per cent., amounting to £2,335,700. The total revenue for the year ending April 30, 1884, was stated at \$1,607,425, and the expenditure at \$2,504,130.

In 1883 the total number of vessels entering the ports of Costa Rica was 336, of which 21 belonged to that country, 213 to other Spanish-American countries, 39 to

the United States, 30 to Great Britain, 14 to Germany, 12 to France, and 7 to other nations. The chief export is coffee, of which 13,635 tons, valued at \$3,512,445, were exported in 1882, chiefly to England. The other chief articles of export are india-rubber, leather, and skins. In recent years some attempts have been made to develop the cultivation of tobacco, sugar-cane, etc.

COTTA, BERNHARD (1808–1879), a German geologist, was born at Kleinen-Zillbach, in Thuringia, Oct. 24, 1808. His father, who was director of the Forest Academy of Tharandt, near Dresden, taught him mineralogy, and the elements of geology. From 1827 to 1831 he studied at the School of Mines of Freiberg, and in 1832 passed to Heidelberg, where he received the degree of Ph. D. In 1841 he became secretary of the Academy of Tharandt, and in 1842 was appointed Professor in the Freiberg School of Mines. He died in that city on Sept. 14, 1879. His first work, *The Dendrobiths* (1832), marked him as a diligent investigator. He then commenced researches in geognosy, in conjunction with Naumann, and published a geognostic map of Saxony. This valuable work occupied ten years (1832–42), being accompanied by several volumes of commentaries and explanations. Cotta also prepared a geognostic chart of Thuringia (1843–48). Besides these maps, his more important works are *Geognostische Wanderungen* (4 vols., 1836–38); *Anleitung zum Studium der Geognosie und Geologie* (1839); *Briefe über Alex. von Humboldt's Kosmos, ein Commentar* (1848–51); *Geologische Briefe aus den Alpen* (1850), published after two journeys of exploration in the Alps and in Italy, 1843 and 1844; *Ueber den innern Bau der Gebirge* (1851), which contains his theory of the history of creation; *Geologische Briefe*, a popular work; *Lehre von den Erzlagertstätten* (1855); *Deutschlands Boden* (2d ed., 1858); *Geologie der Gegenwart* (3d ed., 1871); and a work on phrenology, *Gedanken über Phrenologie* (1845).

COTTON, JOHN (1585–1652), one of the first ministers of Boston, was born at Derby, England, Dec. 4, 1585. He was educated at Trinity College, Cambridge, and was afterwards fellow of Emmanuel College, lecturer, and tutor. In 1612 he became vicar of St. Botolph's Church, Boston, Lincolnshire, where he remained twenty years, gaining a wide reputation as a Puritan preacher and controversialist. Being cited to appear before Archbishop Laud's court in 1632, he sought safety in flight, and finally came to Boston, Sept. 4, 1633. Within two months he was ordained teacher of the church there, and soon exerted a wonderful influence, as is shown in part by his introducing the practice of observing the Sabbath from evening to evening which long prevailed in New England. In 1630 he was appointed by the general court to prepare a code of laws for the colony. This task he performed, taking the laws from the Old Testament, but the *Body of Liberties* drawn up by Nathaniel Ward was preferred and adopted. Cotton's *Abstract of the Laws of New England*, however, was published in England in 1641 as if actually in use. He was a strong upholder of theocratic government, and in his controversies with Roger Williams maintained the right of the civil government to interfere in matters of religion and punish heretics. His treatise on *The Keys of the Kingdom of Heaven, and Power thereof*, was answered by Williams in the *Bloody Tenet of Persecution for the Cause of Conscience*, 1644, and defended by Cotton in *The Bloody Tenet Washed and made White in the Blood of the Lamb*, 1647; but Williams rejoined in *The Bloody Tenet made more Bloody by Mr. Cotton's Endeavors to Wash it White in the Blood of the Lamb*, 1652. Cotton also published a catechism called *Milk for Babes*, a treatise on civil government called *Meat for Strong Men*, and *Singing of Psalms a Gospel Ordinance*. His sincere piety, pastoral fidelity, and long-continued political influence well entitle him to the name of "Patriarch of New England." He died at Boston, Dec. 23, 1652.

COTTON.

CHAPTER I.

COTTON PRODUCTION AND CONSUMPTION.

Out of nearly twenty varieties of the cotton plant (*Gossypium*), two only are cultivated in the United States. The first of these is the "Sea Island" (*G. Barbadosense*), which is grown upon the islands on the coast of South Carolina, in Florida, and upon the coast of Texas. This produces a fibre well known for its length and silky quality. It is used in the finest work for laces, spool cotton, fine muslins, and other similar purposes, but it constitutes a very unimportant part of the cotton crop. (See TABLE I.)

TABLE I.—Sea Island Cotton.

Season.	Florida.	Geor- gia.	S. Car- olina.	Texas, etc.	Total crop.	Shipments.	
						To North. ports.	To Europe.
1874-75.....	8,139	1,074	7,308	166	16,687	7,877	8,972
1875-76.....	7,598	2,121	4,722	74	14,515	7,938	6,418
1876-77.....	10,832	2,558	4,933	29	18,352	10,981	6,828
1877-78.....	11,675	3,556	6,249	30	21,510	13,031	9,413
1878-79.....	10,214	2,052	7,133	202	19,601	10,039	9,662
1879-80.....	11,300	3,420	10,142	.....	24,862	12,119	12,474
1880-81.....	16,950	3,179	14,868	24	35,021	17,059	17,093
1881-82.....	20,992	6,049	10,796	25	37,862	30,147	8,691
1882-83.....	16,898	3,126	16,591	94	36,709	21,941	14,837

The second variety, which constitutes the great commercial crop, is the woolly seed cotton (*G. hirsutum*), which is grown throughout the Cotton States, and forms so important an element in the commerce and industry of the country. (See TABLES II. and IV.)

This fibre furnishes the best material for clothing the larger portion of the human race in comfort and at low cost. It is the only fibre which may be gathered and immediately spun and woven, without any mechanical or chemical process of preparation. The finest woven fabric made of cotton yet known in the world is made, even at this present time, with implements as primitive as the flint of the pre-historic races. The Dacca muslin, known as the "woven wind" of India, still constitutes the most perfect specimen of a woven cotton fabric which can be found. Finer yarn has been spun upon modern machinery than that of which this woven fabric consists, but none so perfect as this example of a textile fabric has yet been woven upon modern machinery. In making these fine muslins, the cotton fibre is separated from the seed by the use of a bow of bamboo strung with the gut of an animal; it is carded with the bone of a fish; twisted into thread by the use of a distaff, and woven on a primitive loom made of bamboo reeds. The work is done by a weaver sitting on the edge of a hole in the ground, under the trees in a tropical climate, and can only be performed in the early morning, when the atmosphere is slightly humid.

Between this prehistoric type of work and the great factory of modern times there can be found but two really original inventions—the method of extending the strand of cotton prior to twisting by the revolution of rollers, applied first by Arkwright little more than a century ago, and the invention of the saw-gin by Eli Whitney toward the close of the last century. All else in the great factory is but an evolution of apparatus of prehistoric type. Changes have occurred in the detail of each machine, but not in the substitution of new machines upon a different principle.

This fibre, which is so useful and with which the larger part of the human race is clothed, is the wing of the seed, and is composed chiefly of elements drawn from the atmosphere. In the immature seed, before the boll is burst, it is a cell containing watery

sap, wrapped in many folds around the seed, to which seed in the variety known as *Gossypium hirsutum* it is attached. When the seed approaches maturity the sap condenses, the fibre ceases to be cylindrical, collapses longitudinally, and takes the form of a twisted ribbon, showing convolutions always in the same direction, something like a corkscrew or a shaving. It then becomes elastic, bursts the boll, and hangs ready to be gathered, or to be blown by the wind, carrying the seed with it. Cotton may be spun, because by means of these convolutions each fibre adheres to the others. Any person may gather the cotton from the boll, and with the finger twist the thread; then by the use of the teeth double and twist again, and make a strong cord of almost any length. All other fibres require mechanical or chemical treatment before this can be done.

TABLE II.—American Crops, Exports, and Consumption of Cotton Since 1841.

Season.	Total crop in thou- sands of bales.	Exports.			Home Consumption.	
		To Great Britain.	To Con- tinent of Europe.	Total Exports.	Northern Mills.	Southern Mills, etc.
1841-42.....	1,684	936	529	1,465	268	No estimate. 75
1842-43.....	2,379	1,470	540	2,010	325	
1843-44.....	2,030	1,202	427	1,629	347	
1844-45.....	2,394	1,439	645	2,084	389	
1845-46.....	2,100	1,102	565	1,667	423	
1846-47.....	1,779	831	410	1,241	428	
1847-48.....	2,423	1,324	534	1,858	532	
1848-49.....	2,840	1,538	690	2,228	518	
1849-50.....	2,204	1,107	483	1,590	488	
1850-51.....	2,415	1,418	571	1,989	404	
1851-52.....	3,126	1,669	775	2,444	588	111
1852-53.....	3,416	1,737	791	2,528	650	153
1853-54.....	3,075	1,604	715	2,319	592	145
1854-55.....	2,983	1,550	694	2,244	571	135
1855-56.....	3,665	1,921	1,034	2,955	633	158
1856-57.....	3,094	1,429	824	2,253	666	154
1857-58.....	3,257	1,810	780	2,590	452	143
1858-59.....	4,019	2,019	1,002	3,021	760	167
1859-60.....	4,861	2,669	1,105	3,774	793	186
1860-61.....	3,849	2,175	952	3,127	650	193
1861-65.....	.....	.....	.....	.....	.....	.....
1865-66.....	2,278	1,262	293	1,555	541	127
1866-67.....	2,233	1,216	341	1,557	573	150
1867-68.....	2,599	1,228	428	1,656	800	168
1868-69.....	2,434	989	458	1,447	822	173
1869-70.....	3,114	1,475	704	2,179	777	80
1870-71.....	4,347	2,368	800	3,168	1,072	91
1871-72.....	2,974	1,474	483	1,957	977	120
1872-73.....	3,874	1,920	756	2,676	1,063	138
1873-74.....	4,130	1,852	959	2,811	1,192	128
1874-75.....	3,831	1,833	841	2,674	1,071	130
1875-76.....	4,632	2,005	1,227	3,232	1,220	134
1876-77.....	4,474	1,994	1,034	3,028	1,302	127
1877-78.....	4,774	2,047	1,309	3,356	1,345	151
1878-79.....	5,074	2,053	1,413	3,466	1,375	198
1879-80.....	5,761	2,554	1,510	3,864	1,574	223
1880-81.....	6,606	2,832	1,733	4,565	1,713	230
1881-82.....	5,456	2,295	1,256	3,551	1,677	287
1882-83.....	6,950	2,886	1,838	4,724	1,759	313

The history of cotton spinning in this country, as well as in others, shows constant improvement in the condition and earnings of the operatives and increased abundance at lower cost to the consumer. Since 1840, when cotton manufacturing had become an important branch of industry in this country—at which date the mills of the United States were operated by the daughters of the native farmers—such changes have occurred in the perfection of the machinery and the construction of the factory as to have compassed the following results: The number of operatives required to do the work at the present time in higher, lighter, and better ventilated factories is only one-half what it was then. The earnings of the operatives are more than double per hour, nearly double per day, although the hours of work are now only ten to eleven per day against thirteen to fourteen at the former period

named, while the cost of the work in the pound or yard of cloth is much less than it was then.

The great alleviation in the labor required for clothing the people of this and other lands may perhaps be presented in a yet more striking way. In the Atlanta Cotton Exposition (1882) were to be found the representatives of the art of making homespun fabrics from the mountain section of the South—two carders, using hand-cards; two spinsters, working spinning-wheels; and one weaver, working a hand-loom. The five together, working ten hours, were capable of making *eight* yards of coarse cotton fabric in a day. They are the representatives of a considerable population of the middle or mountain section of the South, whose land had not until recently been penetrated by the railroad, and who have been cut off from commerce with other parts of the country. The same number of persons operating modern machinery in a New England factory are capable of producing 800 yards of the same cloth, or one-hundred-fold as much in a day. There are now about 170,000 persons employed in all the cotton factories of the United States in making woven cotton fabrics. Of these about 10,000 are employed upon goods which are exported; the remainder serve to supply the home demand. If all this work were done by hand, at the measure of those whose work has been described, it would take 16,000,000 of the present population of the United States to make the quantity of cloth now consumed, and the cloth would be of a much coarser kind. When it is considered that by far the larger part of the popu-

lation of the globe is at this day clothed in cotton fabrics made by hand, the future scope of industry and commerce becomes apparent.

TABLE III., explained in the following report, was prepared by Mr. Thomas Ellison, of Liverpool, in 1879, to show the consumption of cotton in the world at that time. A moderate increase has taken place since the date of this table, but it will suffice to give the rule:

"In the following statement we give an approximate account of the quantity of cotton consumed in each country in Europe and the various groups of countries in Asia, Africa, America, and Australia. The population figures represent thousands ($86,260 = 86,260,000$); the quantities of cotton and cotton goods represent millions of pounds ($142.5 = 142,500,000$ lbs.) There are three columns of quantities: First, the raw cotton spun in each country; second, the *weight* of goods and yarns imported into each country from Great Britain; and, third, the total of these two. The table also shows the *per capita* consumption in each country of raw cotton, of goods, etc., imported from England, and the aggregate of both. The population of Russia includes that of Asiatic Russia. The whole of the figures refer to the year 1877. In the column of "Goods imported from Great Britain" there is a blank opposite Switzerland, because the shipments are sent *via* other countries. A large part of the Swiss production goes to Turkey and to various continental countries. Part of the production of Holland goes to Java, and part passes to Germany, Switzerland, etc. Belgium also forwards largely to the interior of the Continent. The exceptionally large consumption of cotton in the United States is owing to the smaller *per capita* consumption of wool and flax compared with Europe. Moreover, the figures include goods imported.

TABLE III.—Consumption of Cotton throughout the World.

Countries.	Population in thousands.	Raw cotton consumed.		Goods imported from Great Britain.		Total consumption.	
		Millions of pounds.	Per head.	Millions of pounds.	Per head.	Millions of pounds.	Per head.
Russia.....	86,260	142.5	1.65	2.6	0.03	145.1	1.68
Sweden and Norway	6,291	24.8	3.94	8.0	1.27	32.8	5.21
Denmark	2,023	.....	.....	5.0	2.47	5.0	2.47
Germany.....	42,727	249.1	5.83	65.2	1.52	314.3	7.35
Austria.....	37,331	101.3	2.71	7.9	0.21	109.2	2.92
Holland.....	4,130	13.8	3.34	43.0	10.41	56.8	13.75
Belgium.....	5,336	43.2	8.09	17.4	3.26	60.6	11.35
Switzerland.....	2,776	42.5	15.30	.....	.....	42.5	15.30
France.....	36,916	230.0	6.23	19.9	0.54	249.9	6.77
Spain and Portugal.....	21,275	79.9	3.75	25.7	1.21	105.6	4.96
Italy and Malta.....	26,948	52.8	1.96	51.1	1.59	103.9	3.85
Greece.....	1,450	.....	.....	6.9	4.75	6.9	4.75
Turkey, Roumania, etc.....	15,353	.....	.....	37.0	2.40	37.0	2.40
Total Continent of Europe.....	288,806	979.9	3.39	289.7	0.99	1,269.6	4.38
Great Britain.....	34,160	195.7	5.72	.....	.....	195.7	5.72
Total Europe.....	322,986	1,175.6	3.63	289.7	0.89	1,465.3	4.52
Turkey, Persia, etc.....	24,540	.....	.....	38.0	1.54	38.0	1.54
India.....	250,000	295.0	1.18	330.0	1.32	625.0	2.50
China.....	435,000	1,000.0	2.29	100.0	0.23	1,100.0	2.52
Japan.....	33,620	65.0	1.98	20.0	0.59	85.0	2.52
Siam, Java, etc.....	12,500	.....	.....	30.0	2.40	30.0	2.40
Total Asia.....	755,660	1,360.0	1.79	518.0	0.69	1,878.0	2.48
Egypt and North Africa.....	17,000	.....	.....	34.0	2.00	34.0	2.00
West, South, and East Africa.....	13,000	.....	.....	28.0	2.15	28.0	2.15
Interior of Africa.....	200,000	.....	.....	.....	.....	.....	.....
Total Africa.....	230,000	.....	.....	62.0	0.26	62.0	0.26
United States and Canada.....	48,850	628.0	12.85	22.0	0.45	650.0	13.30
Central and South America and West Indies.....	43,250	.....	.....	135.0	3.12	135.0	3.12
Total America.....	92,100	628.0	6.82	157.0	1.70	785.0	8.52
Australia.....	2,650	.....	.....	15.0	5.66	15.0	5.66
The world.....	1,403,396	3,163.6	2.26	1,041.7	0.74	4,205.3	2.98

"Official reports show that the consumption of cotton goods in India is about two and a half pounds per head per annum. We have assumed that a similar rate of consumption obtains in China and Japan. Russia imports some cotton from her Asiatic possessions; the quantity varies considerably. In 1861 it was only 150,000 poods of thirty-six pounds each; during the American War it rose to 750,000 poods; since then it has fallen off. Some cotton is grown and manufactured in the interior of Africa, but it is impossible to say how much. We cannot take the population as a basis, as estimates of *that* range from 150,000,000

to 400,000,000. We have adopted 200,000,000 in addition to the estimate of the number of inhabitants on what may be termed the margin of the Continent. Some native cotton is also consumed in Turkey and in the various countries of South America. The entire production of cotton in the world may be estimated as follows:

	Pounds.
Imported into and consumed in Europe.....	2,217,000,000
Consumed in the United States.....	628,000,000
Native consumption in India, China, etc.....	1,360,000,000
Total as above.....	4,205,000,000

Native consumption in Turkey.....	20,000,000
Native consumption in Africa, one pound per head....	200,000,000
Native consumption in South America, etc.....	40,000,000
Received by Persia from Bokhara, etc.....	15,000,000
Total crop of the world.....	4,480,000,000
Equal to bales of 400 pounds.....	11,200,000
of which about one-half is grown in the United States. One-half of the whole is also spun in Europe."	

This table, prepared by Mr. Thomas Ellison in 1879, is perhaps the only one which attempts to give a computation of the actual consumption of the world, both with respect to the commercial crop and to that which is made use of in the domestic or hand manufacture, as in China, Asia, and other countries which are still supplied mainly with hand-made fabrics.

Since 1877, however, there has been a vast increase in the commercial crop. The consumption of cotton by the factories of Great Britain, the continent of Europe, and the United States reduced to even bales of 400 lbs. each is stated in thousands of bales as follows:

	Great Britain.	Continent of Europe.	United States.	Total.
1877-78.....	3,038	2,509	1,841	7,388
1878-79.....	2,843	2,596	1,906	7,345
1879-80.....	3,350	2,750	2,120	8,220
1880-81.....	3,572	2,956	2,274	8,802
1881-82.....	3,640	3,198	2,302	9,140
1882-83.....	3,770	3,437	2,420	9,627
	20,213	17,446	12,863	50,522

The average commercial bale of the United States of the crop of 1882-83 weighed 460 lbs. In the same season the average weight of Egyptian packages was 658 lbs.; of Brazilian, 173 lbs.; of West Indian, 160 lbs.; of Smyrna, 350 lbs.; and of East Indian, 390 lbs. The total consumption of what is here designated as the commercial crops, namely, those which are reported in the markets of the United States and Europe in the year 1882-83, was 9,627,000 bales of 400 lbs. each; equivalent to 8,371,300 bales of the weight of the American bale of 460 lbs. each. The American crop now ranges from 6,000,000 to 7,000,000 bales, and the cotton of the United States still retains its supremacy.

How far the increased production of cotton fabrics of Europe and the United States has displaced the hand-made fabrics of other countries since Mr. Ellison's table was compiled it is impossible to say; but it is probable that the larger part of the increased production will be accounted for in the increased consumption of the civilized nations rather than in any very great displacement of the hand-made fabrics of other nations.

Mr. Ellison has used a very conservative estimate in respect to the average use of cotton in China, a country of which a large proportion of a dense population dwells in a climate where the temperature is severe in winter. A better estimate of their consumption, confirmed by a gentleman holding a high official position in the customs department of China, is that the average is 5 pounds per head. The machine-made fabrics of Europe and America combined have as yet reached only a small fraction, not exceeding 5 or 10 per cent. of the people of China.

The United States now produce an annual crop of nearly 7,000,000 bales of cotton (American weight). From the computations which have been submitted, it seems probable that the unknown crop of cotton of the world is nearly equal to the known or commercial crop. If the Chinese be estimated at 400,000,000 people consuming 5 pounds each, we find in that single country a requirement of 5,000,000 bales of cotton of 400 pounds each; which would give 2,000,000,000 pounds of cloth. Our present crop is made upon an area of about 26,000 square miles, which is nearly twice the area cultivated in 1870; but the area of the ten Cotton States is over 650,000 square miles. (See TABLES IV. and V.) The maintenance and increase of our crop is therefore simply a question of adequate labor, not of land.

This leads us to the consideration of the present condition of those who do the work in making the crop, their present methods, and the prospective improvement which may come in the next decade.

Under the former system of slavery, the larger portion of the cotton crop was made by negro labor working on large plantations. The planters, as a class, were intelligent, and made the best use which the nature of slavery would permit them to make of their chattels; but their tools and implements of agriculture were of necessity the heaviest and rudest kind, the slaves lacking the incentive to take care of the tools which they used. The crop was made in large parcels, and was better saved in some respects than it is now. Even lists of cotton of uniform grade could then be obtained more readily than they can at the present time; but the land was scathed and worn out; the seed, which is the exhaustive element in the crop, being mostly wasted. In the Mississippi Valley and upon the bottom-lands the plantation system, after having for a time ceased to be an important factor in making the crop, is now being resumed under new and better conditions. Very able men, capable of organizing and controlling large forces of hired laborers, and who also understand the economy of fair and just treatment, are beginning to apply their powers of organizing to large areas of land, and will presently establish a reputation for the quality of their crops such as belonged to the most intelligent planters of the old times. But upon the upland section and in Texas the former slaves have scattered or have gone into other occupations; a very large proportion of the upland cotton-crop is now made upon small farms by free farmers and white laborers.

The old plantation cotton-gin and the "buzzard-wing" screw or press are disappearing. The preparation of the cotton is now conducted in public ginneries, operating for a neighborhood. For the time being, this has led to a great deterioration and want of equality in the upland crop. Different kinds are mixed in the same bale; the process of ginning is carried on more with reference to quantity than to quality; and there has been a steady depreciation, in counteracting which there will be great opportunities for future profit. On the other hand, great intelligence has begun to be applied to the selection of seed in order to produce a finer and longer staple in the healthy upland country; the seed itself is all saved; the oil is expressed and made use of, not only for many purposes in the arts, but as a substitute for lard and for olive-oil as an article of food. The residuum or cotton-seed meal has now become a recognized article of food for cattle and one of the best fertilizers which can be made use of, the seed belonging to each bale of cotton containing nearly 50 pounds of phosphate of lime and phosphate of potash, while the bale itself contains only 4 or 5 pounds.

The "all-cotton" method of farming is gradually yielding to a better system of agriculture and to a greater diversity of crops; and in the upland country cotton is becoming the surplus or money-crop of farmers who subsist themselves on the other products of their land.

The aggregate crop is vastly increased as compared to the time of slavery; the 18 crops made subsequent to the surrender of the Confederate armies have amounted to 75,541,000 bales, while the 18 crops made immediately previous to the war amounted to 53,530,000 bales, showing an excess of 22,011,000 bales for the same period of time since the war. The crop of 1859-60, the greatest before the war, was 4,861,000 bales; that of 1882-83 was 6,950,000 bales.

The whole plant has been made the subject of investigation. Many useful purposes are found for the hulls of the seed, such as packing for axle-boxes upon railway cars; possibly for the manufacture of paper; while the ashes of such hulls as are burned at the cotton-seed oil-mills are an excellent alkali. The stalk

TABLE IV.—*Acreage and Production of Cotton in the United States by Census of 1880.*

States.	Total Area sq. Miles.	Tilled Land Acres.	Acres Planted with Cotton.	Bales Produced.	Cotton Seed, Tons.	Average Pro- duct per Acre.	
						Lint.	Seed.
						lbs.	lbs.
Mississippi	46,340	4,924,630	2,106,125	963,111	457,478	219	438
Georgia.....	58,980	7,690,292	2,617,138	814,441	386,858	148	296
Texas.....	262,290	7,628,536	2,178,435	805,284	402,642	185	370
Alabama	51,540	6,134,198	2,330,086	699,654	332,336	143	286
Arkansas.....	53,045	3,431,900	1,042,976	608,256	3. 4,128	277	554
South Carolina.....	30,170	3,736,090	1,364,249	522,548	248,210	182	364
Louisiana.....	45,420	2,507,935	864,787	508,569	241,570	280	560
North Carolina.....	48,580	5,926,087	893,153	389,598	185,058	207	414
Tennessee	41,750	7,700,041	722,562	330,621	157,044	217	434
Florida	54,240	887,472	245,595	54,997	26,902	106	212
Missouri.....	68,735	13,203,756	32,116	20,318	10,158	300	600
Virginia.....	40,125	7,358,030	45,040	19,595	9,308	207	414
Indian Territory.	64,090	.....	35,000	17,000	8,075	233	466
Kentucky.....	40,000	8,367,910	2,667	1,367	650	243	486
Total.....	905,305	79,496,877	14,480,019	5,755,359	2,770,417	189	378

Note.—In addition to the foregoing, one locality in California reported 375 acres planted with cotton, which produced 205 bales and 140 tons of seed. Inquiry was not made in the rest of the State.

TABLE V.—*Acreage in Cotton, 1870–1883. Reported by the United States Agricultural Bureau.*

States.	1870–71.	1871–72.	1872–73.	1873–74.	1874–75.	1875–76.	1876–77.
North Carolina.....	451,714	388,474	450,629	513,717	457,208	621,428	609,000
South Carolina.....	601,764	523,535	570,652	627,717	571,222	955,050	945,500
Georgia.....	1,330,491	1,170,832	1,311,331	1,455,577	1,310,020	1,611,702	1,515,000
Florida.....	140,909	143,727	158,099	167,584	152,501	185,393	165,000
Alabama	1,437,272	1,250,427	1,387,972	1,499,009	1,289,148	1,732,250	1,732,250
Mississippi	1,644,512	1,397,835	1,537,618	1,706,755	1,501,944	2,016,326	1,976,000
Louisiana.....	920,700	847,044	940,218	1,034,239	827,391	1,415,730	1,260,000
Texas.....	900,937	774,806	914,269	1,097,122	1,119,064	1,483,500	1,483,500
Arkansas.....	711,734	597,857	693,512	811,409	722,154	1,133,000	1,133,000
Tennessee.....	526,184	463,042	518,605	596,395	548,683	780,000	741,000
Total in 10 Cotton States.....	8,666,217	7,557,579	8,482,905	9,509,534	8,499,335	11,934,379	11,560,250

States.	1877–78.	1878–79.	1879–80.	1880–81.	1881–82.	1882–83.	1883–84.
North Carolina.....	584,640	590,486	625,915	973,537	1,061,155	1,050,543	1,050,543
South Carolina.....	917,135	944,649	911,649	1,527,959	1,619,639	1,587,244	1,618,989
Georgia.....	1,530,150	1,560,753	1,591,958	2,878,851	2,994,005	2,844,305	2,872,748
Florida.....	166,650	166,650	161,650	257,875	263,032	260,402	257,799
Alabama.....	1,766,895	1,837,571	1,892,698	2,563,095	2,639,988	2,534,388	2,610,420
Mississippi.....	2,055,040	2,055,040	2,055,040	2,260,796	2,351,228	2,233,844	2,278,521
Louisiana.....	1,335,600	1,348,956	1,321,977	916,674	944,174	887,524	931,900
Texas.....	1,706,025	1,808,386	1,934,973	2,478,054	2,676,298	2,810,113	3,034,922
Arkansas.....	1,189,650	1,165,857	1,177,516	1,147,274	1,181,692	1,110,790	1,188,545
Tennessee.....	755,820	740,704	762,925	816,495	840,990	815,760	807,602
Total in 10 Cotton States.....	12,007,605	12,219,052	12,469,311	15,820,610	16,572,201	16,134,913	16,651,989

Note.—The number of acres planted with cotton in 1879–80, as given by the census, was 14,480,019. This amount was obtained by more careful and exhaustive inquiry than the Agricultural Bureau is able to make each year, and tends to show that the amounts given above, at least for years previous to that date, were also under-estimated. See TABLE IV.

may yet prove valuable, as it is full of fibre; and the "motes," as a portion of the refuse of the cotton-gin is technically termed (being immature seed with immature fibres attached), will soon be saved for the making of paper.

It will therefore be apparent that it remained for freedom to disclose the full value and all the uses of this wonderful plant.

(E. A.)

CHAPTER II.

COTTON-CULTURE IN THE UNITED STATES.

The parallel of 37° N. lat. somewhat roughly represents the present northern limit of the profitable cotton-culture in the United States, east of California. In

the latter State abundant experiments have proved that cotton does extremely well throughout a large extent of country to the N. of that line; and whenever a complete system of mixed agriculture shall obtain in that region there can be little doubt that cotton will be one of its standard crops. Cotton was formerly cultivated in many parts of the State of Missouri, N. of the line in question. The fact that cotton was produced to a noteworthy extent in Southern Illinois during the war of 1861–65, and has been grown there to some small extent in later years, is a significant one. South-eastern Kansas will perfect cotton-seed and fibre in ordinary years. On the Atlantic seaboard the limit of cotton-culture has been since 1865 slowly creeping northward; and now some ten counties of South-

eastern Virginia raise cotton for sale. Prof. E. W. Hilgard, however, believes that the northward limit of profitable cotton-culture in that region has already been reached. It is a noteworthy fact that Northern Manchuria, with a winter climate apparently more severe than that of New York city, is a cotton-growing region. Russian Turkestan produces cotton reputed to be of high excellence. It is therefore possible that cotton-culture may yet go somewhat farther northward in this country. It is certainly desirable that cotton-seeds from Manchuria, Turkestan, and the northern limits of cotton-culture in Japan, should be planted in our Northern States, if only for the extension of our knowledge as to what is possible in this direction.

All the States which had slave-labor up to 1865 are more or less producers of cotton, excepting only Delaware, Maryland, and West Virginia. The cotton-producing States (arranged according to the amounts of cotton produced) are as follows: Mississippi, product (by census of 1880), 228,739 tons of ginned cotton; Texas, 201,321 tons; Georgia, 193,429 tons; Alabama, 166,168 tons; Arkansas, 152,064 tons; South Carolina, 124,105 tons; Louisiana, 120,785 tons; North Carolina, 92,529 tons; Tennessee, 78,522 tons; Florida, 12,092 tons; Missouri, 5,079 tons; Virginia, 4,654 tons; Indian Territory, 4,037 tons; Kentucky, 325 tons; California, 70 tons. Total, by census of 1880, 1,384,019 tons of cotton-lint, besides 2,770,417 tons of cotton-seed. When acreage of cotton-fields alone is considered, Missouri gives the best returns in cotton. The total area of the agricultural regions of all the cotton-producing States is estimated at 710,265 square miles, and on five-sixths of the varieties of soil included in this estimate cotton has already been raised. See TABLES IV. and V. for further details of the production.

The United States census of 1880 takes no note of the small but interesting culture of cotton still going on in New Mexico and Arizona, and managed almost entirely by Pueblo Indians. This industry is of special interest as a relic of the old native civilization of the American race. Dr. Hilgard observes that the Arizona cotton is to some extent a perennial shrub. Cotton has also been grown in the valley of the Rio Virgen in Utah.

The best and fullest discussion of the soils, climate, fertilizers, and culture required by cotton in the United States is that prepared by Prof. E. W. Hilgard for the United States census of 1880, and published in 1884 as the vols. V. and VI. of the full report of that census. The facts and figures presented by Dr. Hilgard form the basis of the following remarks:

It has been clearly shown that while Mississippi easily takes the first rank as a cotton-producing State, she has not yet begun to approach the limit of her capacity in this direction. That she could easily produce as much cotton as all the States now yield is unquestionable. When the density of population is taken into the account it will be seen that Mississippi has done even better than at first sight appears. In amount of cotton raised *per capita* of the population, Mississippi and Arkansas are very far ahead of all the other States. The fertile bottom-lands of the South-west, though excellent for cotton, are in reality not so productive as the first-class uplands in their vicinity. It should not be forgotten that the great natural superiority of the cotton-lands of the Mississippi Valley over those of the Atlantic slope is at present to a great extent counterbalanced by the more careful and systematic tillage which prevails in the latter, and by the more general use of fertilizers. A fact of great significance is the present high standard of North Carolina as a cotton State, as compared with the former low average shown by the census returns. Without hesitation we may refer this gratifying improvement to improved tillage, and especially to the now very general use of fertilizers in that State.

Soils Suitable for Cotton-culture.—It has been often remarked that while the rich alluvion of the Mississippi bottoms is admirably adapted to cotton-raising, the very best results come from such uplands as the Mississippi "buckshot" soils. At the same time, given a suitable climate, and suitable fertilizers, judiciously applied, almost any soil if well cultivated will grow cotton. Not only on the Atlantic slope but in the vicinity of the Gulf, the poor pine-lands are made to produce a certain amount of cotton. The recent marked extension of the culture of cotton on these light lands is very significant. Such lands, however, can scarcely be planted with cotton so as to produce a profit, unless fertilizers are used. On the other hand, some of the heavy, "waxy," and "hog-wallow" lands are hardly arable; and although if one could work them they might be made to grow cotton, it is probable that the crop would not pay its cost. *Lime* seems essential to a cotton soil. It acts probably not so much as a direct fertilizer as an agent in rendering available the proper plant food already existing in soils. Comparatively few southern soils, even of the lightest, are markedly deficient in potash, except in the older States. Fertilizers abounding in phosphoric acid, lime phosphates, and nitrogen compounds, rather than those rich in potash salts, are therefore the ones most sought for on cotton plantations. Fortunately the "phosphate-rock" of South Carolina is abundant and cheap. In the South-west a very useful subsidiary manure is found in the "bat guano" and richly nitrogenous potassic earth of caves. Considerable use is made of this substance in some places. Far more prevalent, however, is the use of cotton-seed, or the meal or oil-cake thereof, as a fertilizer. Green manuring, by turning under cow-pease, or some other similar crop, is often practised with the best results. The cotton-stalks, or their ashes, are very generally returned to the land. Excellent marls and limestones abound in many parts of the cotton-belt, but their value is generally overlooked. The resting or fallowing of "tired" lands is also practised; but the practice is an evil one, as ordinarily managed, since it has been shown that in many cases soils lying idle are actually going to waste. An intelligent rotation of crops is a thing as yet quite unknown to many a cotton-grower; and yet upon its introduction depends the preservation of the fertility of vast areas of good cotton-land. A very important and saving factor in the problem of the restoration of worn-out cotton-land is this: that in many places it is only the thin upper layer of soil that has been exhausted. Deeper ploughing and more thorough tillage will often restore such lands to a good degree of fertility. Smaller holdings and the substitution of the wage system for the present plan of paying the laborer by a share of the crop will tend strongly to bring about cleaner and better culture.

The method of cultivation varies somewhat in different regions. Taking for a standard the well-approved system of culture that prevails in Georgia, where the best methods are very generally followed, we may give the following as an outline: The land is first laid off in beds, deep furrows being drawn $3\frac{1}{2}$ or 4 feet apart, against which the soil is bedded up by means of turn-ploughs. Fertilizers are laid in the furrows and ploughed under; or in other cases the bed is trenched by two furrows, one of which receives the fertilizer, and the other the seed. Far too little attention is usually given to the selection of the seed. Sometimes the seed is soaked in water, and then coated with lime-phosphate or other fertilizer—a process which quickens the germination of the seed. From 1 to 3 bushels of seed are applied to the acre. Planting usually is done in April or May. The young plants should show themselves in 10 days, or less. The plants are at once "barred off" by ploughing or scraping the dirt away from the row. The "chopping out" of young plants now follows, by means of which the drill or row of plants is turned into a succession of hills, say 10 inches

apart, with 2 strong plants to the hill. A "sweep" cultivator now throws back the earth to the plants. Cotton should have a continuous hoeing, first by horse-power, and later by hand; the whole ground being gone over from 3 to 5 times in the season. The cotton-bloom begins to show when the plant is 8 weeks old, and in 6 weeks more the bolls begin to open. Picking should begin at once, and should be repeated every month at least. Frost often kills the bolls by November 1st, but the picking is kept up till Christmas. The following table shows the dates of the earliest killing frosts at various points in the cotton States as reported by the United States Weather Signal Bureau for the years 1881 and 1882:

	1881.	1882.
Nashville.....	Oct. 20	Oct. 24
Knoxville.....	Oct. 26	Oct. 25
Chattanooga.....	Nov. 4	Nov. 14
Vicksburg.....	Nov. 4	Nov. 14
Charlotte, N. C.....	Nov. 4	Nov. 19
Atlanta.....	Nov. 4	Nov. 22
Little Rock.....	Nov. 13	Nov. 18
Shreveport.....	Nov. 20	Nov. 14
Denison, Texas.....	Nov. 20	Nov. 21
Wilmington, N. C.....	Nov. 24	Nov. 20
Memphis.....	Nov. 24	Nov. 13
Mobile.....	Nov. 25	Nov. 14
Montgomery.....	Nov. 26	Nov. 15
Jacksonville, Fla.....	Nov. 25	Nov. 22
Augusta.....	Nov. 26	Nov. 22
Pensacola.....	Nov. 25	Nov. 29
Indianola, Texas.....	Nov. 25	Nov. 30
New Orleans.....	Nov. 25	Dec. 8
Charleston.....	Nov. 26	None.
Galveston.....	None.	Jan. 9 '83

An "ideal cotton-fertilizer" is said to be produced by a mixture with the following ingredients, in the proportions here given: "Thirty bushels of cotton-seed, 30 bushels of stable-manure, 400 pounds acid lime-phosphate, and 200 pounds of kainit." It is recommended to manure in the drill for several years, or until the ground becomes charged with humus, after which the manure is broadcasted and plowed under. Some excellent planters have the rows run both ways, so that the plow or horse-hoe can be made to do nearly all the work of the hand-hoe. Cotton-pickers receive from 50 to 75 cents per hundred pounds. The total cost of cotton production ought not to be more than from 7 to 10 cents a pound. Rigid and most useful inspection laws have been passed in several of the States for the protection of the buyer of commercial fertilizers.

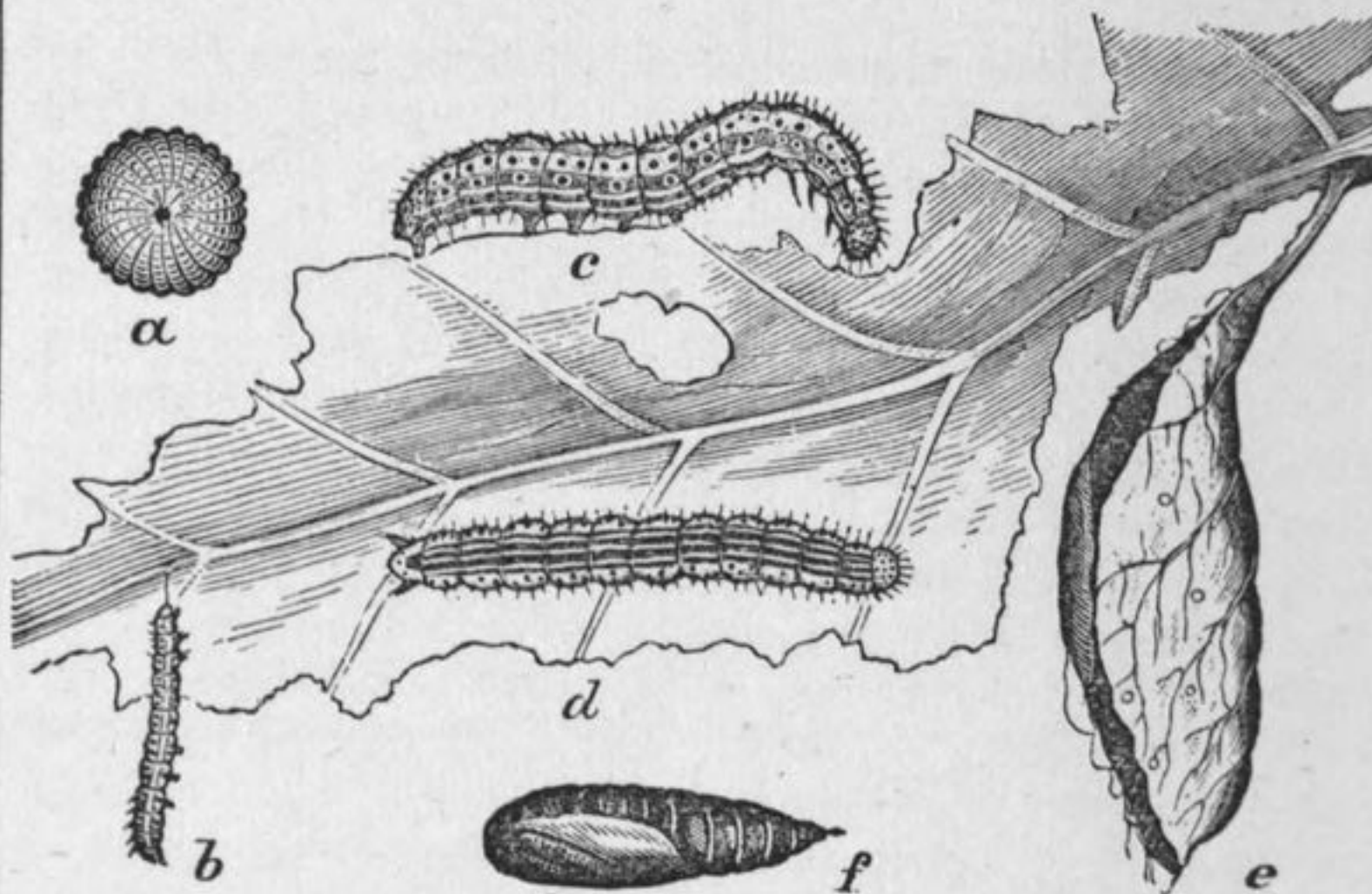
The most important *insect-enemies* of the cotton-plant are the COTTON-WORM, (see Chapter III. of this article), and the cotton-boll-worm, for which see the article AGRICULTURE, Vol. I., p. 141. The other principal enemies of the cotton are *weeds*, and chiefly the crab-grass, of several species.

Exhaustion of the Soil.—Cotton, if properly managed, is by no means one of the worst crops to exhaust soils. Supposing that all the stalks, hulls, and seeds were returned to the ground, the exhaustion produced by the shipping of lint-cotton would be a mere trifle. Four hundred pounds of the lint contain $\frac{1}{2}$ lb. of potash and $\frac{1}{2}$ lb. of phosphoric acid. Cotton-seed oil can be shipped with no appreciable waste of plant food. It appears, then, that the exhaustion of cotton-soils is at present largely due to the removal of the valuable oil-cake, which abounds in the richest elements of plant-food. The soils now exhausted are those which, in their virgin state, were among the most productive. Improvident culture, therefore, is the chief cause of the evil. Another and hitherto neglected source of waste is the washing and gulying of cotton-lands in the heavy rains. This wastage occurs chiefly in fields which are lying idle, and are supposed to be recovering strength for new crops. Dr. Hilgard, in his admirable reports on the agriculture of Mississippi, was the first to give this subject adequate attention.

CHAPTER III.

THE COTTON-WORM

The Cotton-worm (*Aletia xyliana*, Say) has been known in the United States since 1793, about which time it was probably introduced from the West Indies. The principal years of injury have been 1804, 1825, 1846, 1868, and 1873. It was first described in 1827 by Thos. Say, from specimens received from Dr. Capers, of Georgia, as *Noctua xyliana*, but it is now placed in *Aletia*, a genus never properly characterized or defined and doubtfully separable from *Anomis*. During recent years the species has been considered as identical with



Aletia xyliana: a, egg, enlarged; b, c, d, larva in different positions; e, cocoon; f, pupa.

the *Aletia argillacea* of Hübner, but a careful study of Hübner's figures and description shows marked points of difference, and the better judgment of experts retains Say's specific name, about which there is no doubt.

The damage done by this insect to the cotton crop since 1793 is enormous. The estimates in Bulletin III. of the United States Entomological Commission place the average loss in a year of ordinary abundance at about \$13,000,000. Up to the year 1878 our knowledge concerning the natural history of this species was of the most unsubstantial nature. In 1874 Mr. A. R. Grote proposed, as original, an old theory that the Cotton Worm is not a permanent denizen of the



Cotton Moth: a, with wings expanded; b, with wings closed.

United States, but that it immigrates hither every year in the spring or early summer from South America via the West Indies, and dies out again during the winter.

Recent investigation has resulted in the clearing up of most of the doubtful points in the life-history of the insect and in improved means of counteracting its injuries. The theory of annual importation from foreign lands has been disproved, and it has been conclusively shown that the insect hibernates as a moth in the more southern portions of the Cotton Belt, though in small numbers. The worms make their appearance in detached localities in March and April, and from that time on until late in the autumn they continue multiplying at the average rate of one generation a

month. Circumstances may, however, at any point during the season conspire to bring about a comparatively sudden and rapid increase. The eggs are most frequently laid on the under side of the larger leaves, and the larvæ at first feed also on the underside thereof. The pupa is formed above ground, and usually in a leaf rolled together with a slight web of silk. The moth begins flying just before sun-down and feeds on nectar and saccharine exudations of various plants, principally, however, on that of the extra-floral glands of the cotton-plant itself. It also bores into and sucks the juices of most ripe fruits. The worms are preyed upon by many birds and predaceous insects, and no less than fourteen species of hymenopterous and dipterous parasites are known to attack them.

Remedies. Among the many remedies which have been proposed, none have proved so satisfactory as Paris Green or London Purple or some other preparation of arsenic in solution, or rather in suspension, as the two first mentioned are imperfectly dissolved in water. The use of Paris Green was first proposed by Dr. Riley in 1872 and the second in 1878, and they have proved, all things considered, a great boon to the planter. Both are used in the proportion of one-half pound of the powder to forty gallons of water. Since the introduction of these poisons the energy of experimenters has been devoted principally to the devising of the most perfect and most economical spraying machines. Many have been invented.

For full details in reference to this insect and the different remedial measures and mechanical appliances that have been found useful in checking its ravages, see *Bulletin III. of the United States Entomological Commission*, published under the Interior Department, January, 1880, and the *Special Report on the Cotton Worm*, published under the Department of Agriculture, July, 1880.

The following summary of established facts is from the *New Orleans Democrat*, Sept. 21, 1880:

1. The first worms appear in small numbers, much earlier than has been hitherto, or is usually, supposed, and generally in the same spots year after year, in hibernating centres or regions where the parent moth survives the winter.

2. These first worms appear much earlier than the so-called "first crop" which attracts the attention of the planter, and they may be looked for early in May, or even during the last days of April. While young their presence is most readily detected by the pale, transparent spots they make on the leaves, which spots are a sure indication either that the worm is present or that it has been, for these early worms are frequently swept entirely off by their enemies.

3. The eggs in early summer are laid on the under side of the leaves, and very uniformly on the older leaves about the middle or lower third of the main stem, and the young worms feed there for a few days, producing the spots above described, before ascending to the more tender leaves.

4. The parent-moths, while fond of all sorts of sweet exudations and ripe fruits, obtain their chief nourishment in early summer from the glands on the under side of the leaves and on the involucre. They suck up solid particles, and may be killed by poisoning the sweets they feed on.

(C. V. R.)

CHAPTER IV.

COTTON MANUFACTURE IN THE UNITED STATES.

The great perfection attained in Cotton Manufacture, and its wonderful development within the past century, are due to the inventive skill and untiring energy of the mechanics of Great Britain and the United States. In 1793 the saw cotton-gin was invented by Eli Whitney, a citizen of Georgia, but a native of Massachusetts. The importance of this invention to the cotton manufacture cannot be

over-estimated, for it was the one thing needed to insure a sufficient supply of the raw material to meet the requirements of the increasing machinery for spinning and weaving. The result of Whitney's invention was the rapid extension of the culture of cotton in the United States, and its permanent establishment as one of the leading staples of the country. Previous to the introduction of the "Saw gin," lint cotton had been separated from its seed by the use of what were known as "roller gins." The process was almost identical with that in use in India centuries ago, and was slow and expensive. The new gin separated lint from seed in much less time, and at much less cost, than had been done by the old plan. As it also increased the quantity of lint made from "seed cotton" (or cotton as gathered from the field), it is easy to see how Whitney's invention greatly enhanced the planters' profits, and thus gave so great a stimulus to cotton-planting.

In 1775 a stock company was formed in Philadelphia for the purpose of spinning cotton by machinery, and this was probably the first attempt at cotton manufacture in the United States. In 1780 a company was organized at Worcester, Mass., for spinning and weaving cotton, and it met with a fair measure of success. The first cotton-mill in the United States, operated upon the factory system, was erected in 1787, at Beverly, Mass., by a stock company, at an outlay of about £4000. So great an interest was felt in the success of this enterprise that the legislature of Massachusetts assisted it with grants of money, amounting to £1500. In 1786 machinery for carding, roving, and spinning cotton, after Arkwright's and other English methods, had been erected for Col. Hugh Orr, at East Bridgewater, Mass., by Robert and Alexander Barr, mechanists from Scotland. Notice was given in the newspapers that the machines could be seen and examined by the public, and that the manner of working them would be explained.

In regard to the establishment of the cotton manufacture in the United States, special credit is due to Samuel Slater, a native of England, who emigrated to this country in 1789. In the following year he made with his own hands a series of Arkwright machines, and started at Pawtucket, R. I., a cotton-spinning factory. Taking the water-wheel of an old fulling-mill he used it to give power to three carding, one drawing and roving machine, and 72 spindles. As the cotton of the Southern States was then badly cleaned, his supply was drawn from the West Indies. In 1794 he made the first cotton-thread. In 1806 the firm of which he was a member founded the village of Slatersville, R. I., where they introduced in their new mill some of the improvements in machinery then used in England. Before 1800, however, many of Slater's models and patterns were used by others, and factories had been established at New Haven, Norwich, Conn., Philadelphia, New York, Boston, and other places, in about the order named. These factories were all employed in carding, roving, and spinning cotton by machinery, but the total quantity of cotton consumed by them in 1800 was only 500 bales. The weaving of cloth was done on hand-loom until 1813, when Messrs. Francis C. Lowell, Patrick T. Jackson, and Paul Moody started at Waltham, Mass., the first mill in the United States in which power-loom were used. The power-loom, invented by Dr. Cartwright, had been in use in the British mills since 1787; but, in those days, intercourse with the mother country was so restricted, and the secrets of inventors so jealously guarded, that its principles and mode of construction were unknown in America.

As early as 1790 yarns and cloth were manufactured in a mill with 84 spindles at Statesburg, S. C. In 1822 the first cotton-mill was erected in Lowell, Mass., now the largest cotton manufacturing centre in America. In 1825 there were in the United States about 800,000 spindles, which consumed during that year 100,000 bales of cotton. Until 1845 the cotton man-

See Vol. VI.
p. 450 Am.
ed. (p. 506
Edin. ed.)

ufacture was chiefly confined to the Eastern and Middle States. There were very few mills in the South; but in that section a small quantity of cotton was yearly spun by the old-fashioned spinning-jennies, and woven on hand-loom for home and plantation use. Even to the present time this primitive method of manufacture is followed in some portions of the South.

A review of the growth of cotton manufactures shows that this great industry has kept pace with the rapid progress of American development. In 1832 there were in operation in the United States 795 mills, running 1,250,000 spindles, and employing 57,500 operatives. These mills took from the crop of 1831-32 only 174,000 bales of cotton. In 1882 there were fully 12,150,000 spindles, giving employment to over 200,000 persons. Their takings from the crop of 1881-82 were 1,933,000 bales.

The following table, showing the progress of cotton

manufacture in Great Britain and in the United States, affords an interesting comparison:

	British Mills.		American Mills.	
	Spindles.	Bales Used.	Spindles.	Bales Used.
1850-51.....	21,000,000	1,667,000	3,600,000	464,000
1860-61.....	33,000,000	2,635,000	5,200,000	839,000
1871-72.....	36,000,000	3,132,000	7,500,000	1,097,000
1881-82.....	41,000,000	3,439,000	12,150,000	1,933,000
1882-83.....	42,000,000	3,734,000	12,660,000	2,456,000

It will be seen that between 1851 and 1882 British spinners increased their spindles 95 per cent., and their consumption of cotton 106 per cent.; while American spinners increased their spindles 237 per cent., and their consumption of cotton 317 per cent. The ratio of increase has been more than twice as great in the United States as in Great Britain.

The following table gives the statistics of the cotton manufacture in the several States, according to the census of 1880:

TABLE VI.—Cotton Manufacture in the United States, 1880.

States.	Mills.	Spindles.	Bales of Cotton Consumed.	Capital Invested.	Operativ's.	Paid for Wages.	Cost of Cotton.	Value of Product.
Maine.....	24	695,924	112,381	\$15,292,078	11,843	\$2,946,146	\$6,234,901	\$13,459,364
New Hampshire.....	36	944,053	157,673	19,877,084	16,637	4,284,174	8,629,603	17,848,176
Vermont.....	7	55,081	7,414	936,096	735	161,748	453,607	730,865
Massachusetts.....	175	4,236,084	574,857	72,291,601	61,939	15,857,380	31,107,154	72,035,444
Rhode Island.....	115	1,764,569	167,480	28,047,331	21,918	5,468,115	10,457,770	23,170,924
Connecticut.....	82	936,376	109,703	20,310,500	14,419	3,494,231	6,281,939	15,775,062
New York.....	36	561,658	64,614	11,399,638	9,379	1,968,001	3,981,106	8,346,842
New Jersey.....	17	232,221	21,069	3,807,750	4,273	1,156,964	1,319,422	4,568,256
Pennsylvania.....	59	425,391	83,997	10,331,985	10,024	2,464,847	4,749,428	10,912,210
Delaware.....	8	46,188	7,512	874,570	695	145,569	427,855	1,308,038
Maryland.....	19	125,706	51,537	4,600,816	4,168	765,330	2,780,715	4,682,116
Ohio.....	4	13,328	5,323	670,000	484	104,500	258,198	637,000
Indiana.....	4	33,396	11,558	1,096,300	720	162,829	679,911	1,155,030
Illinois.....	2	4,860	2,261	240,000	237	47,886	110,969	219,862
Michigan.....	1	5,100	600	20,000	515	97,680	336,984	522,980
Wisconsin.....	1	10,000	3,173	200,000	88	16,800	36,000	70,000
Minnesota.....	1	1,708	400	5,000	277	67,210	180,072	328,389
Utah.....	1	432	54	20,000	22	6,400	22,000	35,000
Total in Northern States.....	592	10,092,075	1,381,596	\$190,014,449	157,887	\$39,120,230	\$77,718,333	\$175,290,545
Virginia.....	8	44,340	11,461	1,190,100	29	2,100	3,223	7,937
North Carolina.....	49	92,385	27,642	2,855,800	1,112	169,789	601,796	1,037,412
South Carolina.....	14	82,334	33,624	2,776,100	3,270	438,603	1,125,984	2,528,996
Georgia.....	40	198,656	71,389	6,348,657	2,197	340,006	1,723,187	3,750,770
Florida.....	1	816	350	11,000	6,372	1,119,306	3,591,554	6,216,701
Alabama.....	16	49,432	14,702	1,246,500	33	5,000	16,000	25,000
Mississippi.....	8	18,568	6,411	1,122,140	1,490	225,779	729,202	1,228,020
Louisiana.....	2	6,096	1,358	195,000	716	133,214	301,226	679,094
Texas.....	2	2,648	246	50,000	108	12,572	68,018	82,776
Kentucky.....	3	9,022	4,050	360,000	71	2,466	11,280	21,600
Tennessee.....	16	35,736	10,436	1,145,600	354	63,850	188,856	418,387
Arkansas.....	2	2,015	680	75,000	998	180,172	508,305	921,679
Missouri.....	3	19,312	6,399	890,000	64	12,339	25,000	50,000
Total in Southern States.....	164	561,360	188,748	\$18,265,897	17,300	\$2,800,776	\$9,227,392	\$17,483,415
Grand Total.....	756	10,653,435	1,570,344	\$208,280,346	175,187	\$41,921,006	\$86,945,725	\$192,773,960

The figures in the table refer to regular cotton-mills, manufacturing yarns and fabrics made entirely of cotton. Besides the cotton consumed in these establishments, 95,166 bales were used in woollen-mills, hosiery-mills, and felt- and hat-factories; 40,597 bales in the manufacture of mixed fabrics, not sold as cotton goods, but composed largely of cotton; and about 15,000 bales in mattresses and upholstery work. These additions to the figures for the cotton-mills proper would make the entire cotton consumption of the country for the census year 1,721,105 bales.

From careful investigation it has been estimated by Mr. Edward Atkinson, special agent of the census for cotton manufactures, that 30,221 bales more were consumed during the commercial year ending August 31, 1880, than during the year covered by the census returns (ending June 1, 1880). This, added to the census figures, gives 1,755,773 bales as the consumption of the United States for the cotton season of 1879-80.

The 756 cotton-mills gave employment, during the census year, to 172,544 persons, of whom 59,685 were men, 15,107 boys, 84,539 women, and 13,213 girls. The working hours were 10 to 11 per day, and the

wages for the year averaged \$244, or 81 cents per day for 300 working days. The factories not classed as regular cotton-mills, but manufacturing mixed goods, containing a large proportion of cotton, gave employment to 12,928 persons; while establishments for printing, dyeing, and bleaching cotton and mixed goods, employed 12,866 operatives. Add to these the 2115 officers and clerks of cotton-mills, and the total number of persons engaged in the different branches of cotton manufacture in 1880 reaches 200,453.

In 1850 the regular cotton-mills gave employment to 94,956 persons; in 1860 to 122,028; and in 1870 to 135,369. It will be observed that, while the number of spindles increased nearly 200 per cent. between 1850 and 1880, the number of operatives increased only about 80 per cent. This is due to the greater efficiency of modern machinery and the growing tendency to concentrate work in large establishments.

Since 1880 the increase in spindles, by the erection of new mills and enlargement of old establishments, has been very considerable. It is estimated that on September 1, 1882, there were fully 11,320,000 spindles in the Northern and 830,000 in the Southern

States, making a total of 12,150,000 spindles in the entire country—an increase of 1,500,000 spindles within the past two years. During the same time the cotton spindles of Great Britain advanced from 39,750,000 to 41,000,000, and those of the continent of Europe from 20,800,000 to 21,850,000—an increase of about 3 per cent. for Great Britain and 5 per cent. for the continent, against an American increase of 14 per cent.

While the English were the first to use machinery for spinning and weaving, the Americans have made many inventions which have facilitated and cheapened the cotton manufacture. All of the American methods which possess merit have been adopted in England, and all English improvements have been introduced into America. This interchange of the inventive skill of the two countries has been constantly going on, so that at this time neither can boast of any especial advantages over the other in patented machinery.

British machinery for spinning and weaving—and, in fact, for all purposes directly connected with the cotton manufacture—is considered more perfect in its finish and details than that made in the United States, and is used in many of the best-appointed mills. American steam-engines, however, and all appliances for furnishing and regulating motive power, are regarded as superior to those of foreign make, and are in general use. As yet, the American mills manufacture, besides yarns and thread, chiefly the coarser descriptions of goods, such as shirtings, sheetings, drills, checks, print cloths, bags, etc. Some fine fabrics are, however, made by Northern mills. In Great Britain the average consumption of cotton in the year 1881–82 was about 36 lbs. per spindle, while in the United States it was about 77 lbs. This fact illustrates the relative fineness of the goods manufactured in the respective countries.

It must be said to the credit of the American manufacturers that their goods are generally free from adulteration, honestly made, and correctly branded. They stand deservedly high in the Chinese and Indian markets, where they come in competition with British goods which are often badly adulterated with sizing and other filling. American cotton manufactures are generally sold for home consumption, the export trade not yet having attained proportions of great importance. Within the past few years a prominent feature of the cotton manufacturing industry has been its rapid development in the cotton-growing States. The general recuperation of the South from the losses entailed by the war of 1861–65, and the misgovernment which followed in its wake, has been marked by earnest and energetic efforts for the establishment of cotton manufacture in this section. Many of the Southern municipal and State governments have encouraged the movement by granting exemption from taxation of capital employed in cotton manufacture. In the year ending August 31, 1878, the Southern mills took from the crop 147,000 bales of cotton; and in the season 1881–82 their takings were 287,000 bales—an increase of 95 per cent. During the same period the Northern mills increased their takings of cotton from 1,341,000 to 1,646,000 bales—a gain of about 23 per cent. Southern factories possess the advantages of proximity to the cotton-fields and a climate whose mildness insures them against those interruptions to work which, in severe winters, are often causes of inconvenience and loss to Northern mills. Other advantages over the North are cheaper land (for sites for factories and dwellings for operatives), and cheaper building material, fuel, and labor. Nearness to the cotton-fields means not only a saving in cost of transportation of the raw material, and the reduction to a minimum of the inevitable loss in weight by handling, but it means also a better selection and lower prices. Southern mills can buy their cotton direct, and save the profits and charges which the Northern mills must pay to brokers and middle-men. The loss in weight on cot-

ton, in transportation to the Northern mills, is considerable; and to this must be added the loss by the shrinkage in weight on the larger stocks of cotton which Northern mills have to carry in consequence of their greater distance from the sources of supply.

The Northern mills certainly possess great advantages in their proximity to the large cities, which serve as distributing points for their production; in the facilities afforded by the many machine and repair shops which have sprung up around them; and in the better supply of skilled labor. It may fairly be questioned, however, if their advantages equal those possessed by the mills of the South.

The cost of transportation to Northern and Western markets of the product of Southern mills, in excess of what they can sell to their own trade, is certainly much less than the freight paid by the Northern mills on all the cotton which they use. The additional first cost of machinery to Southern mills, and perhaps the somewhat greater expense for subsequent repairs, are far more than balanced by their cheaper fuel and labor, and more certain water-power. It is thought that the dividends made by Southern mills in 1881 averaged 14 per cent., while those of the Northern mills averaged scarcely 7 per cent. on the capital invested.

As the Southern States have an abundance of unfailing water-power, inexhaustible supplies of coal, iron, and lumber, and with a soil whose fertility insures abundant and cheap food, why should they not succeed in their efforts to establish cotton manufacture? Economical reasons seem to require that the cotton crop of the country be spun in the section of its growth, and the proportion of it needed for the looms of the world shipped in the shape of yarns instead of cotton. Cotton culture and cotton manufacture in this country are capable of vast extension. Since 1851 the extent of the cotton crop has been doubled, while American spinners have, within the same time, increased their consumption over 300 per cent.

(A. B. S.)

CHAPTER V.

COTTONSEED PRODUCTS.

As long ago as the middle of the last century attempts were made to utilize the seed of the cotton plant. In 1769–70 samples of oil expressed from the seed, made by the Moravians of Bethlehem, Pa., were presented to the American Philosophical Society. In 1783 the Society for the Encouragement of Arts and Commerce, London, having had its attention drawn to the value of oil seed-cake as a food for cattle, offered to West Indian planters a gold medal as a premium for oil expressed from cottonseed, and oil-cake from the seed remaining, in quantities of not less than 1 ton of oil and 5 cwt. of cake; also, a silver medal for smaller quantities. These premiums were annually renewed for six years without award. The South Carolina Agricultural Society, soon after its organization, in 1785, offered a premium medal for oils from cotton and other seeds. A patent was issued in 1819 for a preparation of food from cottonseed, and in 1820 one for a method of extracting oil from the seed. In 1833 a large manufactory of oil from cottonseed was established at Natchez, Miss., and others were building at Mobile, Ala.; Florence, Ga., and Petersburg, Va.; but the business was not then successful and their work was intermittently carried on for many years. (*Bishop's Hist. Amer. Manuf.*, ii. 81.)

It is only within the past 15 years that the seed has attained a commercial value. Previously, almost the entire crop, if utilized at all, was so utilized by restoring it to the soil as a fertilizer. Within the period named the growth of the cottonseed interest has been very rapid. At the fifth annual convention of the Cottonseed Crushers' Association, held in Chicago, June, 1883, it was stated that there were 101 mills in the United States, 85 of which were in active opera-

TABLE VII.—Cottonseed Production of 1879; with its Possible Uses and Value.

States.	Cottonseed.			Possible Products.			
	Total, in Tons.	Reserved for Seed.	Convertible.	Crude Oil. Gallons.	Oil-cake.	Cotton.	Hulls.
Alabama.....	332,336	38,446	293,890	10,286,150	110,209	3,233	143,712
Arkansas.....	304,128	17,209	286,919	10,042,165	107,594	3,156	140,303
Florida.....	26,902	4,052	22,850	799,750	8,569	251	11,174
Georgia.....	386,858	43,181	343,677	12,028,695	128,879	3,780	168,058
Indian Territory.....	8,075	412	7,663	268,205	2,873	84	3,748
Kentucky.....	650	44	606	21,210	227	7	296
Louisiana.....	241,570	14,269	227,301	7,955,535	85,238	2,500	111,150
Mississippi.....	457,478	34,720	422,758	14,796,530	158,534	4,650	206,729
Missouri.....	10,158	530	9,628	336,980	3,610	106	4,708
North Carolina.....	185,058	14,736	170,322	5,961,270	63,871	1,874	83,287
South Carolina.....	248,210	22,510	225,700	7,899,500	84,638	2,483	110,367
Tennessee.....	157,044	11,922	145,122	5,079,270	54,421	1,596	70,965
Texas.....	402,642	35,944	366,698	12,834,430	137,512	4,034	179,315
Virginia.....	9,308	743	8,565	299,775	3,212	94	4,189
Total.....	2,270,417	238,718	2,531,699	88,609,465	949,387	27,848	1,238,001

States.	Market Value of Products.					Selling Price of Seed.	Manure Value of Seed or Cake.	
	Crude Oil.	Oil-cake.	Cotton.	Hulls.				Total.
				Fuel.	Ash.			
Alabama.....	\$3,085,845	\$2,204,180	\$517,280	\$513,052	\$28,740	\$6,349,097	\$2,057,230	\$5,348,798
Arkansas.....	3,012,649	2,151,880	504,960	500,882	28,060	6,198,431	2,008,433	5,221,926
Florida.....	239,925	171,380	40,160	39,891	2,240	493,596	159,950	415,870
Georgia.....	3,608,609	2,577,580	604,800	599,967	33,610	7,424,566	2,405,739	6,254,921
Indian Territory.	80,461	57,460	13,440	13,380	750	165,491	53,641	139,467
Kentucky.....	6,363	4,540	1,120	1,056	50	13,129	4,242	11,029
Louisiana.....	2,386,661	1,704,760	400,000	396,806	22,230	4,910,457	1,591,107	4,136,878
Mississippi.....	4,438,959	3,170,680	744,000	738,023	41,350	9,133,011	2,959,306	7,694,196
Missouri.....	101,094	72,200	16,960	16,808	950	208,012	67,396	175,230
North Carolina...	1,788,381	1,277,420	299,840	297,335	16,660	3,679,636	1,192,254	3,099,860
South Carolina...	2,369,850	1,692,760	397,280	394,010	22,070	4,875,970	1,579,900	4,107,740
Tennessee.....	1,523,781	1,088,420	255,360	253,155	14,190	3,135,096	1,015,854	2,641,220
Texas.....	3,850,329	2,750,240	645,440	640,155	35,870	7,922,024	2,566,886	6,673,904
Virginia.....	89,922	64,240	15,040	14,955	840	185,007	59,955	155,883
Total.....	\$26,582,839	\$18,987,740	\$4,455,680	\$4,419,664	\$247,600	\$54,692,523	\$17,721,893	\$46,076,922

tion throughout the year; in 1884 there were 130. The united capacity of 56 of these mills is 4070 "boxes." There are now about 100 mills scattered throughout the cotton belt, but principally in the Valley of the Mississippi, which represent over \$7,000,000 of capital. Five-sixths of the manufactured products are used for home consumption.

Our annual cotton-crop exceeds 6,000,000 bales, which, after reserving the necessary seed for planting, yields about 2,500,000 tons of cottonseed. This seed, manufactured into oil, meal-cake, and other products, should yield in value not less than \$75,000,000. Compare TABLE VII., which gives the detailed estimate of the Census department, based on the crop of 1879. The amount crushed at the oil-mills is about 600,000 tons. Within the past ten years the value of the seed at the mills has doubled. The planters receive \$5 to \$10 per ton, according to their distance from the mills. The value at the mills ranges from \$12 to \$19; the difference between these values is the cost of freight, as in this business, as now carried on, the only middle-man is the carrier. The *Times-Democrat* gives the estimated receipts of seed at New Orleans for the trade year ending Sept. 1, 1882, at 959,000 tons, costing on an average \$14, ex-levee, or \$14.50 at mill-doors. It estimates the cost of manufacture by the mills of that city as follows: 100,000 tons of seed give to the planter and carrier \$1,450,000 before the mills take hold of it. This is equal to a tax of \$1 per bale on every bale of cotton received at that port in a year. The mills expend on an average \$6 per ton to manufacture this seed into oil and cake, which add \$600,000 more, making an expenditure of, say,

\$2,000,000 annually. This represents 3,500,000 gallons of crude oil, or about 3,000,000 gallons of refined oil, which, at 45 cents per gallon, has a value of \$1,350,000; 37,500 tons of cake, worth, at \$22.50 per ton, say \$844,000; and 4500 bales of lint, worth, at \$35 per bale, \$157,500—making, with the perquisites and advance prices in retail sales, about \$2,500,000, or 25 per cent. net profit. Six mills in New Orleans have a combined capital of \$1,500,000, on which is paid annually about 33½ per cent. In many places in the South the cake and the hulls pay for the seed and the expense of grinding, leaving the value of the oil a net profit. On the other hand, the planter finds it profitable to haul his seed to the mill and get in return the cake and the hulls, leaving the oil as toll to the crusher. All the products of the seed are clear gain over the old system, when its only value was as a fertilizer, and it was a custom in many places to give the seed to the ginner as toll.

A bushel of seed weighs about 45 or 46 pounds. The relative proportion of husks and kernel was found by Dr. Adriani to be, for Egyptian seed, 37.45 husks to 62.55 kernels. The same writer (*Chem. News*, x. 263) gives an analysis of this seed:

Moisture driven off at 212°.....	9.520
Gum, mucilage, etc., soluble in boiling water....	14.000
Oil extracted by boiling ether.....	20.880
Albuminous compounds.....	26.640
Woody fibre.....	25.185
Ash.....	3.775

An analysis of the seed (*Gossypium herbaceum*) by M. S. Cloes (*Bull. de la Soc. Chem.*, iii. 46) gave—

Weight of 1 hectolitre	63.00	gr.
Fatty matter in 100 parts, by weight.....	23.675	"
" " " volume, per hectolitre.....	15.931	"
Loss in water at 100° C.....	9.300	"
Ash in 100 parts.....	3.76	"
Density of oil at 15° C.....	0.9306	"
Weight of 10 grains of oil after 18 months exposure to air.....	10.397	"

The condition of the oil after exposure to air was liquid, hardly thickened.

Crude Oil.—The crushed seeds yield, on a commercial scale, 12 to 18 per cent. of crude oil, of a dark reddish-brown color, not very limpid or clear, of a specific gravity varying with the conditions of seed and manufacture, depending to a considerable extent upon the quantity of albuminous and mucilaginous matter which it holds in suspension. Dr. Adriani (*Chem. News*, xi. 5) found the specific gravity of one sample, which was an average of twenty-four casks, to be 0.93074 at 54° Fahr.; another sample, also representing a large quantity, he found to be 0.93169. He submitted a portion of the latter sample to a current of steam at 212° Fahr., and on thorough washing with boiling water, which removed the greater portion if not all of the vegetable impurities, found the specific gravity had increased to 0.9343305 at 52° Fahr. Lipowitz gives the specific gravity of crude oil as 0.9280 at 59° Fahr., and Stillwell as 0.9224 at the same temperature. The dark color of the crude oil is due to the presence of a rather dark pinkish, resino-fatty substance contained in minute cells, which are visible to the eye scattered over and through the yellowish-white mass of the seed-kernel, which substance at once oxidizes on exposure to the air.

Refined Oil.—By the processes of refining the crude oil yields 80 to 85 per cent. of a clear, limpid, light-yellow oil, without perceptible odor, and in taste resembling the finest olive-oil. Goldsmith (*Amer. Chem.*, xi. 107) gives its specific gravity at 59° Fahr. as 0.9306; Cloes (*Bull. de la Soc. Chem.*, iii. 46) gives the same; Stillwell gives for the same temperature, refined yellow, 0.9230; white winter, 0.9288; and for cottonseed salad oil, 0.9231. Refined oil solidifies at from 32° to 38° Fahr.

There is such a perfect agreement in all their properties between well-clarified cottonseed oil and the best olive oil that it is difficult even for good judges to distinguish between them. This fact has led to a large export to the Mediterranean ports, from which, mixed with more or less olive oil, it is reshipped to us and to other consumers as "pure olive-oil." The degree to which this deception has been practised was shown by the results of a duty of 14 lire per quintal imposed by the Italian Government upon all imports of cottonseed oil. The law went into operation April 22, 1881. The importations subsequent to April were made under contracts which ran to the end of the year. The average monthly imports of cottonseed oil into Italy from March 1 to Dec. 31, 1881, was 98,640 quintals; it dropped from 98,740 in Dec., 1881, to none in January, 1882, and was but 110 in February. The exports of "olive" oil for the same time were an average of 488,779 quintals per month from March 1 to Dec. 31, 1881, dropping from 677,990 in Dec., 1881, to 52,059 quintals in Jan., 1882, and 102,511 in February. In 1881 there were imported into the United States 216,788 gallons of "olive" oil, valued at \$380,425, which paid a duty of \$1 per gallon; of this it is probable that at least one-fourth was our own cottonseed oil. Prohibitory duties have been imposed in Spain as well as in Italy, and since that time the oil sent abroad has gone chiefly to Marseilles and Trieste, where it is still used for adulterating olive oil.

Aside from any consumption in manufacturing, its use for cooking purposes and as a salad for the table is noticeably increasing. As a salad oil the prefix "olive" is generally used; and hotel-proprietors, restaurant-keepers, and bakers, in deference to popular prejudice,

are careful to keep a knowledge of its use from their patrons. But its intrinsic merits are so great as, with its cheapness, to insure a large demand. At the South and West determined efforts have been made by refiners to introduce it into family use by packing it in attractive forms and widely advertising. These efforts have led the lard-dealers at the West to attribute to them the dulness of their markets in that section. At the last regular meeting of the Baltimore Grocers' Exchange the committee on cottonseed oil reported its great superiority in every respect over lard for cooking purposes. The oil is cleaner, does not become rancid in any season, is more healthy and nutritious, is entirely free from any unpleasant taste or odor, goes one-half further in cooking, and costs less in the proportion of seven to twelve. The oil can be converted by pressure into a "butter" which is largely used by the Jews, whose religion forbids the use of lard.

The standard weight of refined oil is 7½ pounds to the gallon. The barrels contain, on an average, 48 gallons.

Average Quotations for the year at New York for Prime Oil.

Kind of Oil.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.
Crude.....	44	46¾	48¾	42½	46½	39½	35½	35½	37¾
Summer yellow.	50½	54½	57½	51½	52½	47½	43½	42½	47½
Winter yellow..	58½	63	63½	54½	55¾	51¾	48½	53½	55½

The exports from the United States of the various grades of cottonseed oil, according to the Treasury reports, which are for the fiscal years ending June 30, were, in 1875, 417,387 gallons, valued at \$216,640, increasing to 6,967,796 gallons, at \$3,225,414, in 1880; in 1881 they were 3,190,836 gallons, valued at \$1,465,255; in 1882 they fell to 713,549 gallons, valued at \$330,260; and in 1883 they were 415,611 gallons, valued at \$216,779.

Fertilizer and Cattle-food.—In the cotton districts the seed in its natural state is largely used, and is very effective as a fertilizer for corn, cotton, and sugar-cane. Cottonseed meal is said to be the cheapest known source of nitrogen for compounding fertilizers. The seed is fed to a large extent to cattle. The cake which remains after the oil has been expressed is used for the same purposes—to a limited extent in the cotton districts, for there the richer seed is available; but this product of the mills is consumed in the North and West, and exported to England and Germany, both as cake and meal. Were oil-mills more generally established in large cotton-growing districts, it would be profitable for the planters to allow to the manufacturer the remaining lint, oil, and hulls, as toll, and receive the oil-cake to be returned to their fields directly, or through their cattle.

The manure from the cattle fed upon the cake or meal is very valuable. The composition and value of cottonseed cake as a plant-food, compared with linseed oil, has been given as follows (*Mass. Agricult. Report*, 1872-73, p. 167):

	Linseed Cake.		Cottonseed Cake.	
	Per cent.	Pounds in ton of Cake.	Per cent.	Pounds in ton of Cake.
Dry matter	88	1971	89.	1994
Ash	7	156.8	8	179.2
Phosphoric acid.....	4.92	110.2	7	156.8
Potash.....	1.65	37	3.12	70
Nitrogen.....	4.75	106.4	6.5	145.6
Value of manure from 1 ton.....	\$19.72.		\$27.86.	

Mr. Harris (*Mass. Agricult. Rept.*, 1875) estimates the value of manure obtained from the consumption of 1 ton of corn at \$10.75; of linseed oil cake at \$31.96; and of decorticated (*i. e.*, husks removed) cottonseed cake at \$45.26. The experiments of Mr.

Lawes, of England (*U. S. Agricult. Rept.*, 1875, p. 509), give as the comparative values of manure by the consumption of 1 ton of the food—for cottonseed cake, decorticated, £6 10s.; cottonseed cake, not decorticated, £3 18s. 6d.; and for linseed cake, £4 12s. 6d. The several values for manure given above are of course not absolute, but merely comparative.

Care has to be exercised in feeding the cotton-cake and meal to female cattle when with young, as it tends to cause miscarriage. With merino ewes, however, the effect is said to be advantageous. Another important result from feeding sheep upon cottonseed meal is, that the oil in the wool is more abundant than from any other food, and can be converted into the finest curriers' oil.

The exports of oil cake from the United States, in the year ending June 30, 1882, were 421,269,116 pounds, valued at \$6,302,828, and in fiscal year 1883 were 456,986,000 pounds, valued at \$6,061,690.

Soap.—The crude oil and the refuse from other processes are used in making soap. Dr. Adriani's experiments (*Chem. News*, xi. 94) gave 291.63 per cent. of the oil, in soft soap, containing, when made, 52.3 per cent. of water. The yield of soap with soda was 169.33 per cent. of the oil, and it contained 38.7 per cent. of water. A lead soap was also prepared by directly saponifying the oil with oxide of lead, as well as by precipitation from the potassa soap by means of a dilute solution of acetate of lead: 100 parts of potassa soap yielded 57.19 parts of dry lead soap. The crude oil alone does not make a very good soap. It is the practice of soap-makers to mix with each part two parts of other fatty substance. The saponification is carried on in the ordinary way. Where there is an excess of cottonseed oil, the soap does not readily separate from its solution by the addition of salt; the separation is facilitated at this stage by the addition of pure water. The soap thus made is decolorized by boiling over a spent lye containing the carbonate of an alkali.

(R. H. T. & F. T. T.)

COTTON RAT, a quadruped of the order *Rodentia*, family *Muridae*, and sub-family *Murinae*, belonging to the American section of that sub-family, *Sigmodontes*; the *Sigmodon hispidus*, inhabiting the Southern States and portions of Mexico to Guatemala. The size is about that of a half-grown Norway rat, and the general aspect is not very dissimilar; but there are radical differences in the dentition between any murine of the new world and any of the old, the tubercles of the molar teeth being arranged in two series in the former, in three in the latter. The dental formula of *Sigmodon* is *i.* $\frac{2}{2}$, *c.* $\frac{0}{0}$, *pm.* $\frac{0}{0}$, *m.* $\frac{2}{2}$, as usual in *Muridae*; there are certain cranial characters; the general form is stout, almost as in *Arvicolae*; profile of head convex, muzzle blunt, hairy excepting the nasal pads; ears large, orbicular, hirsute inside, nearly naked outside, with a well-developed valvular antitragus; whiskers few, soft and short, hardly reaching the ears; the tail nearly naked and scaly (somewhat as in *Mus* proper), from $\frac{2}{3}$ to $\frac{3}{4}$ as long as the head and body; forefeet small, not half as long as the hind, with naked 5-tuberculate palms; the thumb rudimentary, with an obtuse flattened nail; hind-feet very large, 5-digitate, the first and fifth sub-equal in length and very short, the naked soles 6-tuberculate, granular at bases of the toes, smooth behind; pelage long and hispid from much admixture of bristling hairs, above brownish-yellow finely pencilled with black, below grayish-white; tail indistinctly bicolor; soles black. Length of head and body 4 to 6 inches, usually about 5; tail about $3\frac{1}{2}$, but varying from $2\frac{1}{2}$ to $5\frac{1}{2}$; hind-feet $1\frac{1}{4}$; ear, $\frac{3}{8}$. There is but one species, which, however, runs into slight varieties in Mexico (*berlandieri* and *toltēcus*). It is very common in suitable places in the regions it inhabits, and sometimes so abundant as to become a serious inconvenience. It is more or less gregarious, and lives in underground burrows, preferably excavated in light sandy soil to no great distance, with several

entrances to the main chamber, in which is built a grassy nest. Under some circumstances a nest is constructed above ground in clumps of herbage or beneath heaps of brush. Generally little pathways radiate from the burrows, and along them everything is eaten away. The rice-field mouse (*Hesperomys Oryzomys palustris*) and the wood rat (*Neotoma floridana*) are near relatives of the cotton rat, and all three may be found together; the resemblance of the former to the cotton rat is very close, but there are generic differences.

(E. C.)

COUES, ELLIOTT, a distinguished American naturalist, was born at Portsmouth, N. H., Sept. 9, 1842. In 1853 his father, Samuel Elliott Coues, removed with his family to Washington, D. C., and the son was educated at Columbian College, whence he graduated in 1861, having previously spent a season in Labrador on a scientific expedition sent out by the Smithsonian Institution. In May, 1862, he became a medical cadet in the United States army, serving one year. Having obtained the degree of M. D. from the National Medical College in Feb., 1863, he became an acting assistant surgeon in the United States army, and in March, 1864, was commissioned assistant surgeon. He served in Arizona till the fall of 1865, when he returned to Washington, and was engaged in the Smithsonian Institution in elaborating the results of his operations in the West. From June, 1866, to Oct., 1872, he was on duty at Columbia, S. C., Fort Macon, N. C., and Fort McHenry, Md. He was then transferred to Dakota, and was post surgeon at Fort Randall until May, 1873, when he became surgeon and naturalist of the Northern Boundary Commission. He spent the summer in the field and the winter in Washington in work connected with his commission, until July, 1876, when he was made secretary and naturalist of the U. S. Geological Survey of the Territories, and was employed chiefly in Wyoming and Colorado. In 1877 he was elected professor of anatomy in the National Medical College, though his connection with the Geological Survey continued without interruption till 1880.

The rare opportunities for the thorough study of natural history furnished by his position in the army and on these surveys were eagerly embraced by him, so that he has collected and preserved more specimens than any other living naturalist. His collections have always been deposited in the National Museum. In 1861 he began to publish scientific articles, and has since been a diligent contributor to medical, literary, and scientific journals, both American and foreign. Among these may be noted the *London Ibis* and the *American Naturalist*, of which he has been one of the editors. His contributions relate to ornithology, mammalogy, herpetology, and comparative anatomy, and include several hundred monographs. His principal works are—*A Key to North American Birds* (1872), *Field Ornithology* (1873), *Birds of the North-west* (1874) *Fur-bearing Animals* (1877), *Monographs of North American Rodentia* (1877), *Birds of the Colorado Valley* (1878), *Ornithological Bibliography* (1878–80), *New England Bird-Life* (1881), *Check-List and Dictionary of North American Birds* (1882). His unremitting labors in his chosen field, as well as his fluency in writing, elegance of diction, and accuracy of statement, have made him prominent among the naturalists of the world. Dr. Coues has been elected a member of the National Academy of Science and of nearly every other scientific association in the United States, and is also a corresponding member of similar European associations. He still holds the professorship of anatomy in the National Medical College, Washington, D. C.

COULANGES, FUSTEL DE, a French historical essayist, was born in Paris in 1830. After graduating at the *Ecole normale supérieure* of Paris, in 1853, he spent two years in the French school at Athens and was professor of history in various lyceums till 1859. He then became a member of the faculty in the University of Strasburg, where he spent ten years. He

was recalled to Paris as superintendent of historical studies in the normal school. In 1879 he was made professor of history at the Sorbonne, where he has special charge of mediæval history. He is also a director of the normal school and a member of the council of public instruction. His most important work appeared in 1862 under the title *The Ancient City (La Cité Antique)*. It is an examination of the origin and development of the religion, laws, and institutions of Greece and Rome. He maintains that the primal religion of the classical nations was simply a worship of ancestors, and that out of the family customs and religion grew the institutions of the state. The author's total silence as to the labors of other investigators in the same field gives an unpleasant impression that his object is to produce a work of art where he should aim simply at instruction and truth. The book reached its ninth edition in 1882; it was translated into English in 1874. Another contribution to the discussion of Greek antiquities is his *Essai sur la propriété foncière à Sparte* (1880). He has issued part of a work entitled *Les Institutions politiques de la France*, which brings the history down to the seventh century, and has published various essays in the *Revue des Deux Mondes* and other periodicals.

COUNCIL BLUFFS, a city of Iowa, county-seat of Pottawattamie co., near the E. bank of the Missouri River, 4 miles E. of Omaha, Neb., and 140 miles by rail W. S. W. of Des Moines. To this point converge the following railways: a division of the Chicago and North-western, the Chicago, Rock Island, and Pacific, a branch of the Chicago, Burlington, and Quincy, another of the Chicago, Milwaukee, and St. Paul, the Kansas City, St. Joseph, and Council Bluffs, a division of the Wabash, St. Louis, and Pacific, and the St. Paul, Minneapolis, and Omaha; while to the W. the great iron bridge of the Union Pacific Railroad extends to Omaha, affording passage to street cars as well as to trains. The city is mostly built on the plain which lies between the river and the steep bluffs which give name to the town; but many houses are built in the ravines which intersect the bluffs. These bluffs were in ante-territorial times a favorite place for the Indian tribes to meet in council. The city has commodious county buildings; good public schools, including a high-school, 2 national banks, a savings-bank, newspapers, a Catholic seminary and parish-schools, a State institution for deaf mutes, an opera-house, a convenient street-railway system, and is the seat of thriving manufactures of engines, machinery, farm-implements, carriages, etc., and of large mercantile interests. Council Bluffs was visited in 1804 by Lewis and Clarke, who here met the Indians in council. In 1820 land at these bluffs was ceded to the whites by the Omaha Indians. In 1846 some Mormons here founded a town called Kanessville; and in 1853 the present city was incorporated. Population in 1870, 10,020; in 1880, 18,063.

COUNSELLOR-AT-LAW, an officer in the Supreme Court of the United States and in some of the State courts who is employed by a party in a cause to conduct the same in its trial in his behalf. He differs from an attorney in that it is his duty to draft, review, or correct special pleadings, manage the cause on the trial, and apply established principles of law to the exigencies of the case. An attorney-at-law, on the contrary, is supposed to conduct only the more mechanical parts of the cause. In New York, by a recent rule of the court of appeals, a two years' course of study is required after admission to the bar as an attorney before a person can attain the position of counsellor. See **ATTORNEY**.

(L. L., JR.)

COUNTY. In American usage a county may be defined as the principal local subdivision of a State, created by the sovereign power for political and judicial purposes. County organization is almost exclusively designed to carry out the general governmental policy of the State at large by the formation of convenient districts to

serve as bases of administration in the matters of elections, the jurisdiction of the courts, care of the poor, finance, highways, militia, education, and the like. Established without the direct consent or solicitation of the inhabitants of the locality, counties differ in this respect from municipal corporations proper, which are created mainly for the advantage and profit of the citizens and at their particular request. Although all of the States are divided into counties, or districts equivalent thereto, and these all bear a close resemblance in many of the powers with which they are vested by the State, yet the number and the importance of the governmental functions exercised by these public or quasi corporations vary greatly according to the influence upon the particular State of one or the other of two widely different systems of civil government introduced and developed in the original colonies from the time of the English settlement.

In the South, the colonies being planted chiefly in the interest of the proprietaries, and the mass of the settlers being both incapable and careless of direct participation in public affairs, the plans of government and methods of administration familiar in England were naturally imported to the new country. Accordingly, so soon as the expansion of the colony necessitated subdivision of territory to facilitate the execution of the laws and the collection of revenue throughout a widely-scattered agricultural population, the county system of England was imposed with little change by the general government. Thus in Virginia, Maryland, the Carolinas, Georgia, Delaware, and even Pennsylvania, the administration of law by means of county organization is apparent almost from the beginning, and the system thus inaugurated has been extended with certain modifications to the greater number of the subsequently established States. Under this pure county system nearly all the functions of government are exercised by county officials, elected by the county at large and acting strictly under the statute law of the State.

At the settlement of New England the nature of the country combined with the peculiar qualities of Puritan character and ecclesiastical polity to bring about a congregation of the people in closely-settled communities, and gave a preponderating influence to the town as the basis of civil government. Towns instead of counties became the instruments for the local administration of public affairs, and each individual freeman influenced government by his presence and vote at the town-meeting. Subsequently, when it was deemed expedient to conform to the method of territorial division prevailing in the other States, counties were created throughout New England, not by the extinction of the powers of the towns, but by the voluntary surrender to the county organizations of a portion of their prerogatives. Hence the counties of the New England States are mere congeries of towns, formed mainly with the view of defining more conveniently the jurisdiction of the courts and of caring for certain public property, the older municipalities still retaining the greater number of their functions in the machinery of government. In the States largely influenced by emigration from New England, such as New York, Ohio, Illinois, Indiana, Michigan, Wisconsin, and Iowa, is seen a combination of these two systems, by which, although larger powers have been conferred upon the counties, a direct influence of the towns in county affairs is carefully maintained by the appointment of boards of county officers, whose members are representatives elected by the various townships instead of by the county at large.

In the States established since the adoption of the Federal Constitution a tolerably uniform plan of creating new counties has prevailed. The fundamental or enabling act of Congress by which a portion of the national domain is converted into a Territory of the Union has usually conceded to the Territorial legislature then constructed the right, either express or implied, to parcel off the land into counties or districts. Upon admission to the Union the constitutions of most States

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have recognized the county division already made, provided (within certain limits as to area and population) for further subdivision, and have laid down certain restrictions in regard to the extent of Congressional districts, the change and establishment of county towns, etc.

The details of county organization, the powers to be exercised, the names, duties, and mode of election of the county officers, are defined by acts of the legislature, and vary somewhat in the different States.

The usual powers of a county considered as a body corporate are the right to sue and be sued, to purchase, hold, and convey real estate and other property, to make contracts in relation to the property and concerns of the county, and to administer through various officers and agents the governmental machinery of the State in relation to the election of national and State officials, the administration of justice, the levying and collection of the State and local taxes, the development and care of the highways, and the fostering of the material resources of the State (hence the frequent authority given by law to counties to subscribe for stock in railroads and other enterprises directly benefiting the community), the care and oversight of the poor and infirm, the education of the people in common schools. In many States quasi corporations distinct from the counties have been established to exercise some of the powers above enumerated, such as school districts, road districts, etc. As a consequence of the public nature of these functions, counties may take property by the right of eminent domain, and it has been held by many courts that they are not liable to pay out of the public treasury damages caused by the fault or negligence of their officers and agents. They may borrow money, and secure the repayment of the same by issuing bonds.

The names of *county officers* and the apportionment of their duties differ considerably in the several States. Generally, a board of three or more persons, variously termed *county commissioners* or *supervisors*, exercises the widest authority in the county. They construct and care for the public buildings, jails, court-houses, and other properties, audit the accounts and receive the reports of the other officers, apportion and direct the levying of taxes, arrange the election precincts and provide for the convenient holding of elections, lay out roads, provide for suitable accommodations for the sick and poor, authorize contracts and loans. In the more populous localities many of these duties are apportioned to other individuals or bodies—overseers of the poor, building commissions, boards of health, road commissioners, auditors, etc. The county clerk—sometimes called the recorder of deeds—is the custodian of public and private documents of value, and often acts as the secretary of the board of commissioners. The sheriff has the custody of all prisoners, executes the process of the courts, and acts as a peace officer in suppressing disorder or riot. The coroner acts for the sheriff in his absence, and is charged with the investigation of all cases of sudden death. The county treasurer receives and disburses the moneys of the county. The county surveyor is appointed to make both public and private surveys, and is directed to keep plats both of the county and of the towns within its area. A school superintendent or board of school directors, having the conduct of the public schools, are sometimes county officers. Assessors are frequently elected to make enumeration both of the taxable property and of the qualified voters.

Connected with the administration of justice are the county judges, having jurisdiction in courts of first instance within the county limits; probate officers, called by different names—registers of wills, surrogates, probate judges, etc.; prosecuting or district attorneys, representing the commonwealth in criminal proceedings; and clerks or prothonotaries of the courts.

The word "county" is not of uniform occurrence in designating these principal divisions of a State. In Louisiana districts exercising the functions of counties are termed parishes. This was also the case at first in Georgia,

and until quite recently the present counties of South Carolina were known as election districts. (J. R. P.)

The subdivisions of counties vary in the different States of the Union. In New England, as stated above, counties are mere aggregations of towns, and cities are in effect towns with somewhat different government, though in Connecticut some cities and boroughs are constituent parts of the towns in which they are situated. In the sparsely-settled parts of Maine there are divisions called "plantations" and "gores," while the name "township" indicates a tract of land without organization. The name "gore" is also used in Vermont. In New York counties are divided into towns, but cities are independent of the towns from which they are taken, while incorporated villages remain component parts of the towns. In fifteen States the name "township" is properly used for the principal subdivision of a county, though in some "town" is also in popular use. There is much difference as to the independence of municipal corporations. In New Jersey and Michigan cities are independent of the township; in Pennsylvania and Minnesota, cities and boroughs; in Kansas, all cities of the first and second classes—that is, all having over 2000 inhabitants; and in Wisconsin there is no uniform rule, but most cities and some villages are independent. In Ohio, Indiana, Iowa, Arkansas, North and South Carolina, cities are subject to township government, though a large city is generally made coextensive with a township. In Missouri the same rule holds, but by an exception St. Louis has an independent organization. In California the subdivisions of the county are called "judicial townships." In Illinois most of the counties are divided into townships, but twenty-three are divided into precincts. The latter mode of division is used in all the Territories except Dakota, and has been continued in some States after their admission to the Union; these are Florida, Nebraska, Nevada, Colorado, and Oregon; it is also used in one of the thirteen original States—Maryland. In Delaware the old English name "hundred" is retained for the subdivision of a county. In some of the Southern States counties are divided into districts; these are called "magisterial districts" in Virginia, West Virginia, and Kentucky, "civil districts" in Tennessee, and "militia districts" in Georgia. In Alabama and Mississippi the county subdivisions are called "beats." In Louisiana each parish is divided into police-jury wards. Texas has a more complicated system of division than any other State: each county is divided into four commissioners' precincts, then into a larger number of justices' precincts, and finally into a still larger number of election precincts. In all the Southern and Western States, except as specified above, municipal corporations are a component part of the county division in which they are situated. Cities, however, are usually made coextensive with one or more of these divisions. In Maryland the city of Baltimore is independent of Baltimore county; in Louisiana the city of New Orleans is coextensive with Orleans parish; and in California, San Francisco city and county are coextensive. Philadelphia city is coextensive since 1854 with the county of Philadelphia, embracing nearly one hundred and thirty square miles of territory, but is divided into civic, suburban, and rural districts for purposes of taxation, etc. Throughout the United States the place selected for the transaction of the public business of each county is commonly called the county-seat, sometimes the county-town.

COURLAN, a wading bird, related both to cranes and to rails, type of the family *Aramidae*, which has but a single genus, *Aramus*, of one or two species, native of the warmer parts of America. The North American Courlan, Caran, limpkin or crying-bird (*A. scolopaceus giganteus*) inhabits the marshes of Florida, the West Indies, etc. It is upwards of 2 feet long, the wing 12 or 14 inches, the tail 6 or 7, the bill and tarsus, each, about 5. The bill is about twice as long as the head, nearly straight, but contracted opposite the nostrils and with enlarged and decurved terminal portion; the nostrils are long, linear, and pervious; the toes are cleft, the hinder one elevated; the tail consists of 12 broad feathers; the wings are short and rounded. The color is chocolate-brown with a slight olive gloss, extensively and sharply streaked with white. The South American bird is very similar, but less extensively streaked, chiefly on the head and neck. In their general habits and economy the Courlans closely resemble Rails (*Rallidae*), living in large numbers in reedy marshes, threading their way with great ease and celerity through the mazes of the swaying

vegetation, upon the most uncertain footing, but their flight is usually low, slow, and apparently labored. In the breeding season the reeds resound with their loud cackling notes. The nesting is like that of rails, a shallow, bulky platform of broken-down reeds being constructed by the water's edge; the eggs are said to be 5 or 6 in number. (E. C.)

COURT.

IN this article are considered only the courts or judicial tribunals of this country, which are treated See Vol. VI. under the following heads: I. Courts of p. 458 Am. the United States. II. State Courts. ed. (p. 516 III. Courts of Admiralty. IV. Courts-Edin. ed.) Martial.

CHAPTER I.

COURTS OF THE UNITED STATES.

In glancing over the field of jurisprudence in this country, we are first struck with the fact that the system of administering justice follows the political divisions of the land; that each State has its own complete, distinct, independent system of courts, superior and inferior. Nor is it less apparent that all these systems, save that of Louisiana, of French origin, spring from a common source in the mother country. The principles of common law and equity, and, generally speaking, the methods of practice, familiar to the English courts, will be found firmly rooted in those of America, none the less because of variations in matters of form incident to altered social and political relations. The English law reports will be heard frequently on the lips of the advocate, though cited as learned expositions of recognized doctrines, not as having the binding force accorded in the courts of each State to the decisions of its own highest tribunal. Looking further, we find established in every State certain courts belonging to a distinct system, at whose head stands the Supreme Court of the land. These are the United States Circuit and District Courts, which deal for the most part with a different class of cases from the State tribunals, and appropriate to national control, and yet whose decrees often operate upon the same community and property as the latter, requiring great care to prevent, at all times, clashing of authority. Our attention will now be occupied with the Federal system, afterwards with that of the States. This system is peculiar, nay, it must be confessed, complicated and artificial; and it is only by reflecting upon the circumstances which gave birth to it and the political structure for which it is adapted that we can fairly appreciate its merits. It must be remembered that our system of government is composed of elements not in themselves harmonious: a central power clothed at first sight with sovereignty coextensive with the nation, and a collection of independent commonwealths, each with its own governor, legislature, and judiciary, and jealous of any infringement of local authority. That these antagonistic elements have been combined with so large a measure of success is due to the wise distribution of powers characteristic of the American government, which has been aptly described by Judge Cooley as "an elaborate system of checks and balances."

To obtain an idea of the organization of the Federal judiciary and the subjects within its scope, let us look at the provisions of the Constitution relating thereto, and under the authority derived from which it has been constructed:

The judicial power of the United States shall be vested in one Supreme Court, and in such inferior courts as the Congress may from time to time ordain and establish. The judges both of the Supreme and inferior Courts shall hold their offices during good behavior, and shall, at stated times, receive for their services a compensation, which shall not be diminished during their continuance in office. (Art. III., Sec. 1.)

The judicial power shall extend to all cases in law and

equity arising under the Constitution, the laws of the United States, and treaties made, or which shall be made, under their authority; to all cases affecting ambassadors, other public ministers and consuls; to all cases of admiralty and maritime jurisdiction; to controversies to which the United States shall be a party; to those between two or more States; between a State and citizens of another State; between citizens of different States; between citizens of the same State claiming lands under grants of different States, and between a State or the citizens thereof and foreign States, citizens, or subjects. In all cases affecting ambassadors, other public ministers and consuls, and those in which a State shall be a party, the Supreme Court shall have original jurisdiction. In all the other cases before mentioned, the Supreme Court shall have appellate jurisdiction, both as to law and fact, with such exceptions and under such regulations as Congress shall make.

The trial of all crimes, except in cases of impeachment, shall be by jury; and such trial shall be held in the State where the said crime shall have been committed; but when not committed within any State, the trial shall be at such place or places as Congress may by law have directed. (Art. III., Sec. 2.)

The judicial power of the United States shall not be construed to extend to any suit in law or equity commenced or prosecuted against one of the United States by citizens of another State, or by citizens or subjects of any foreign State. (11th Amendment.)

In analyzing briefly these provisions we begin with Sec. 2. The terms "cases in law and equity" and "of admiralty and maritime jurisdiction" are here used, as they are throughout the State courts, according to the jurisprudence of England. Not that there is a common law of the United States, but the Constitution adopts the common law, in the general sense of the term, so far as to make it a guide in the administration of justice. Thus an indictment cannot be sustained in the courts of the United States, unless the offence complained of has been declared a statutory crime; but jurisdiction once given by statute, the principles of the common law are involved at every step of procedure. So the distinction between law and equity is recognized; and although Congress has vested equitable and common law powers in the same tribunals, yet they are administered as distinct systems, and even where the reformed code of procedure of a State declares the distinction between law and equity abolished, substituting but one form of civil action, yet a complainant, resorting to a Federal court, must proceed at law or in equity, as the case may be. Further examination shows that the various cases comprised by the Constitution within the judicial power of the United States may be divided into three classes: (1,) those of a political character, where the controversy turns on the Constitution, or laws or treaties of the government; (2,) those cases involving the exercise of jurisdiction over certain classes of persons or bodies politic, as ambassadors, etc., the United States itself, the several States or citizens thereof, or aliens; (3,) those depending upon the subject-matter, as admiralty and maritime cases. A very moderate acquaintance with the requirements of our political system is sufficient to demonstrate the wisdom of giving the Federal courts jurisdiction in these cases. But this jurisdiction is not always exclusive. In some cases it is concurrent with that of the State courts; in others it is limited so as to exclude controversies involving comparatively small amounts; and in others the defendant has the privilege of removing the cause from the State to the national tribunal. (See *Removal of Causes*, under APPEAL, vol. i. p. 263.)

The section, providing for the trial of all crimes, except in cases of impeachment, by jury, and in the State where the crime shall have been committed, plays an important part in preventing a clashing between the State and United States courts. To enforce this provision it was enacted that the Judiciary Act of 1789, by which the organization of the Federal system of courts was commenced, directs (sec. 14) that writs of *habeas corpus* should in no case extend to prisoners in jail, except when in custody under the authority of the United

States, or committed for trial before some court of the same, or when it is necessary they should be brought into court to testify. Other exceptions need not be here enumerated. This restriction leaves to each State the exclusive administration of its own laws in all cases of imprisonment, and has always been scrupulously observed. The Judiciary Act just referred to also enacts (sec. 34) that the laws of the several States, except where the Constitution, treaties, or statutes of the United States otherwise require, are to be regarded as rules of decision in trials at common law, in the courts of the United States, in cases where they apply; and the practice, pleadings, and forms and mode of proceeding in common law causes in the circuit and district courts are required to conform, as near as may be, to those existing at the time in like causes in the courts of record of the State within which such circuit or district courts are held. (U. S. Revised Statutes, § 914.) Hence, in adjudicating upon rights and property in a State, they will follow usually the latest decisions of the highest tribunal of that State, but a change of decision by a State court in the construction of a statute will not affect rights acquired under the former decision, and the Federal courts will not follow the decision of an inferior court. Nor are the decisions of the State courts binding on questions of general commercial law, nor of the principles of equity jurisprudence. The adjudications of legal principles by the United States Courts are then, as compared with those of the States, either of paramount, equal, or inferior authority. *Paramount*, upon all subjects relating to the political organization of the general government, its laws and treaties, and commercial relations. This, of course, applies chiefly to the Supreme Court; in a much less degree to the Circuit Courts. *Equal*, upon questions of general commercial law, and other questions depending upon general principles, *i.e.*, of equal or not greatly superior weight in the courts of any State with the decisions of the supreme court of another State. *Inferior*, in cases where the United States courts administer the laws of particular States or construe their constitutions, in virtue of jurisdiction growing out of the character of the parties.

We are now ready to consider separately the courts composing the judicial system of the United States, and will do so in the following order: 1, the Supreme Court; 2, the Circuit Courts; 3, the District Courts; 4, the Territorial Courts; 5, the Supreme Court of the District of Columbia; 6, the Court of Claims; 7, the Senate of the United States as a Court of Impeachment.

1. *The Supreme Court* is established directly by the Constitution, without the intervention of Congress, and its vast importance as one of the three co-ordinate departments of the Federal government has been often displayed on important occasions and much dwelt upon by constitutional writers. It consists of a chief-justice, and 8 associate justices. The latter have precedence according to the dates of their commissions, or, where two or more have the same date, according to their ages. The court holds annually one session at the seat of government, commencing on the second Monday in October, and such special terms as it may find necessary. It adopted at an early day the practice of the Court of King's Bench as its guide, subject to such alterations as circumstances might suggest. No State legislation can be applied to the practice of this court, which is regulated only by the common law and acts of Congress. Its jurisdiction is either original or appellate, civil or criminal. It has exclusive jurisdiction of all controversies of a civil nature where a State is a party, except between a State and its citizens, or between a State and citizens of other States, or aliens, where its jurisdiction is original, but not exclusive; of suits or proceedings against ambassadors or other public ministers, or their domestics, so far as may be consistent with the law of nations; and original, but not exclusive, jurisdiction of all suits brought by ambassadors,

or other public ministers, or in which a consul or vice-consul is a party. It has power to issue writs of prohibition to the district courts, when proceeding as courts of admiralty; and writs of *mandamus*, in certain cases warranted by the usages of law; also writs of habeas corpus, *scire facias*, and all other writs necessary for the exercise of its jurisdiction, and agreeable to the usages of law. The justices have also, individually, the power to grant writs of *habeas corpus*, of *ne exeat*, and of injunction. Congress can only vest in the Supreme Court original jurisdiction in cases where the Constitution has clearly given that court original jurisdiction.

The appellate powers of the Supreme Court, which are more fully treated of under APPEAL, extend as well to the courts of last resort of the several States as to the inferior Federal tribunals. Its *criminal* jurisdiction is very limited and has been rarely exercised. It is derived from its exclusive jurisdiction of proceedings against ambassadors, etc., mentioned above. But the act of April 30, 1790, declared void any writ or process for the arrest or imprisonment of any ambassador, etc., or the servants of the same.

2. *The Circuit Courts* are the chief inferior courts established by Congress. It was originally intended that one or more of them should be held annually in each State, by one of the justices of the Supreme Court, together with the judge of the District Court for that district. But the increase in the number of States called for an enlarged system and led to the present organization: the United States is divided into nine circuits, composed respectively of the following districts: *First Circuit*, of the districts of Maine, New Hampshire, Massachusetts, and Rhode Island; *Second*, Vermont, Connecticut, and New York; *Third*, Pennsylvania, New Jersey, and Delaware; *Fourth*, Maryland, Virginia, West Virginia, North Carolina, and South Carolina; *Fifth*, Georgia, Alabama, Mississippi, Florida, Louisiana, and Texas; *Sixth*, Ohio, Michigan, Kentucky, and Tennessee; *Seventh*, Illinois, Indiana, and Wisconsin; *Eighth*, Nebraska, Minnesota, Iowa, Missouri, Kansas, Arkansas, and Colorado; *Ninth*, California, Oregon, and Nevada. Circuit Courts are now established as follows: one for the three districts of Alabama; one for the eastern district of Arkansas; one for the eastern district of Mississippi; and one for each district in the other States. (Revised Statutes, § 608.)

The Circuit Court is now composed of one of the justices of the Supreme Court, who is required to attend at least one term every two years; a circuit judge who must reside in his own circuit, and having the same powers therein as the circuit justice, and the district judge of the district where the circuit is holden. But Circuit Courts may be held by the circuit justice, or the circuit judge, or the district judge, or any two of them, and Circuit Courts may be held at the same time in the different districts of the same circuit.

The judges of the Supreme Court have no distinct commission as Circuit Court judges, but as long ago as 1803 their authority to so act was held established by long acquiescence. The ministerial officer of the Circuit Courts, corresponding with the sheriff of a County Court, and whose duty it is to execute the process of the court, is called the United States Marshal. A class of officers known as United States Commissioners also play an important part in the administration of the business of the Circuit and District Courts. They are appointed by the Circuit Court, from among members of the bar, as many as may be necessary in the different parts of the district, and are authorized to take preliminary examinations of persons charged with offences against the United States laws, and commit them for trial; also of persons claimed for extradition; to hold to bail to keep the peace, and for good behavior; to discharge indigent convicts imprisoned for non-payment of fines to the United States, and to perform various other duties.

The Jurisdiction of the Circuit Court is either civil (at law or in equity) or criminal, and original or appellate. The original jurisdiction has been much enlarged by the act of 3d of March, 1875, which seems also by inference to have extended the concurrent jurisdiction of the State courts to many cases under the laws of the United States, which were formerly subject only to Federal jurisdiction. It provides that the Circuit Courts shall have original cognizance, concurrent with the courts of the several States, of all suits of a civil nature at common law or in equity, when the matter in dispute exceeds, exclusive of costs, \$500 in value, and arising under the Constitution or laws of the United States, or treaties made under their authority, or in which the United States are plaintiffs or petitioners, or in which there shall be a controversy between citizens of different States or between citizens of the same State claiming lands under grants of different States, or between citizens of a State and foreign States, citizens or subjects, and a corporation is a citizen of the State which created it; and shall have *exclusive* cognizance of all crimes and offences cognizable under the authority of the United States, except as otherwise provided, and *concurrent* jurisdiction with the District Courts of the crimes and offences cognizable therein. But no person shall be arrested in one district for trial in another in any civil action before a Circuit or District Court. And no civil suit, except under certain specified circumstances, shall be brought by either of said courts against any person by original process in any other district than that whereof he is an inhabitant, or in which he shall be at the time of serving such process. The Circuit Court has also jurisdiction in cases arising under the revenue laws, and of a variety of other matters, which need not here be further set forth. The appellate jurisdiction of the Circuit Courts is limited to affirming, modifying, or reversing the judgments, decrees, and orders of the District Courts. (See APPEAL.)

3. *District Court*.—We have already referred to the division of the States into districts. Most of the States have but one district, but many have two, and Alabama, New York, Tennessee, and Texas, three each, known respectively, according to their situation, as the northern, southern, middle, etc., districts. They now number in all sixty. Congress has provided for the appointment of a judge for each district, with some exceptions where one judge presides over all the districts of a State. Each judge must reside within his own district. The District Court has the largest original jurisdiction of any of the Federal Courts, standing in a similar relation to the Circuit and Supreme Court as do the County Courts of a State to its Supreme Court. It is the court of admiralty and bankruptcy, but since the repeal of the bankruptcy laws, Sept. 1, 1878, that part of its jurisdiction is unimportant. Of course also the office of Register in Bankruptcy was thereby abolished except so far as to allow of the settlement of proceedings begun before the repeal went into effect. One or more registers whose duties were to assist the District Court in the administration of bankrupt estates were appointed for each Congressional district by the district judge.

The further jurisdiction of the District Court is as follows: Crimes cognizable by the United States not capital; piracy, when no Circuit Court is held in that district; penalties and forfeitures under the United States laws; suits at common law by the United States or their officers; suits in equity to enforce liens on land for internal revenue taxes; forfeitures or damages under laws relative to debts due by or to the United States; all actions under the postal laws; exclusive jurisdiction of seizures on land and waters not within admiralty jurisdiction; of all prizes, except where the Circuit Court has jurisdiction; all suits for the condemnation of property, taken as prize, which has been in any way used for the promotion of insur-

rection; all suits upon assignments of debentures for drawbacks of duties; suits growing out of the infringement of the civil rights laws; suits at law or in equity for infringements of rights secured by the Constitution or laws of the United States; certain suits to recover possession of an office where the sole question touching the title thereto arises out of the denial of the right of a citizen to vote on account of race, color, or previous condition of servitude; certain proceedings by *quo warranto*, for the removal of any person from office, except a member of Congress or of a State Legislature; suits by or against national banks; by aliens for torts contrary to the law of nations, or to a treaty of the United States; suits against consuls and vice-consuls, except for certain offences.

4. *Territorial Courts*.—The Constitution vests in Congress the right to dispose of and make all needful rules and regulations concerning the territory of the United States. The courts of the Territories, therefore, derive all their powers from acts of Congress, and recognize no distinction between Federal and State jurisdictions. A substantially uniform judicial system has been established in all the Territories, consisting of a Supreme Court, District, and Probate Courts, and Justices of the Peace. In Arizona the system of courts, except the Supreme Court, was provided by the legislative council of the Territory, but is like that of the other Territories. The Supreme Court is composed of a chief-justice and two associate justices, appointed for four years, and holding an annual term at the capital of the Territory. Each of these justices holds a District Court in one of the three districts into which every Territory is divided, at a time and place prescribed by law, and they are also authorized to hold court within their respective districts, in the counties wherein courts have been established to hear causes in which the United States are not a party. The Supreme and District Courts possess original and appellate, common law, and chancery, jurisdiction. The original powers of the Supreme Court extend to the issuance of all writs necessary to the exercise of its appellate jurisdiction. As a court of appeal, it reviews the final judgments of the District Courts. The latter have the same original jurisdiction over all cases arising under the Constitution and laws of the United States as the Circuit and District Courts of the United States. Their jurisdiction extends to all actions at law where the demand exceeds \$100 in value (but in Montana this limit is \$50; in Utah, \$300; and in New Mexico there is no such limit); also to all suits in equity, and to the more important criminal cases. Appeals lie to them from the Probate and Justices' Courts. The Probate Courts perform the usual functions of such courts in the several States, but in some of the Territories, as in Idaho and Montana, they have a concurrent jurisdiction, in certain criminal matters, with the Justices' Courts, and a general civil jurisdiction where the amount involved does not exceed \$500. The Justices' Courts have a limited civil and criminal jurisdiction, resembling the same tribunals in the States, and are open at all times. Upon the change of a Territory into a State, Congress may provide for the transfer of all pending causes to the United States Courts, with authority to dispose of them finally. In all the Territories but Washington (where the limit is \$2000), an appeal will lie from the Supreme Court to the Supreme Court of the United States, where the value in dispute exceeds \$1000. A marshal and district attorney are appointed for each Territory, for a term of four years.

5. *The Supreme Court of the District of Columbia* was established by act of Congress of 3d March, 1863, absorbing the functions of the Circuit, District, and Criminal Courts of the district theretofore existing. It consists of a chief-justice and five associates, appointed by the President. Its jurisdiction is general in law and equity, original only in cases involving over \$50, including patent, copyright, bankruptcy, and di-

voiced cases, appeals from the decisions of the Commissioner of Patents refusing the issue of a patent, and appeals from the Police Court and from justices of the peace, who have chiefly a civil jurisdiction. The organization of the court comprises a District Court of the United States, a Circuit Court for the trial of actions at law, and special terms respectively as a court of equity, or for probate or criminal business. Any one of the justices may hold a District, Circuit, or Criminal Court. Owing to its situation at the seat of government this court is clothed with certain important powers peculiar to itself, especially that of issuing a writ of *mandamus* to any of the heads of the executive department. Actions can only be brought against inhabitants of the district or persons found therein.

6. *The Court of Claims* is one of the inferior courts constituted by Congress with jurisdiction of contracts between the government and the citizens. Before its establishment, claims could only be brought to the consideration of the government by presenting them in Congress, and it was established, according to Chief-Justice Chase, "in 1855 for the triple purpose of relieving Congress, of protecting the government by regular investigation, and of benefiting the claimants by affording them a certain mode of examining and adjudicating upon their claims." Its powers were at first very limited, as it could only report to Congress a bill authorizing payment of claims favorably passed upon, but they have been much enlarged and modified by various subsequent enactments, and its judgments, unless appealed from, are payable directly from the treasury. The Court of Claims consisted originally of three judges; now of a chief-justice and four associates, appointed by the President. Three make a quorum, but three must concur in any decision. One session is held each year, commencing at the opening of Congress, the first Monday of December. Its jurisdiction extends throughout the United States, and is confined to strictly legal claims, founded on breach of contract, as it has no jurisdiction in equity, nor of demands grounded in tort, and can only render judgment for a money demand. More in detail, its jurisdiction embraces: all claims founded upon any law of Congress, or upon any contract, express or implied, with the government of the United States, and all claims referred to it by Congress; all set-offs, claims for damages, or other demands whatsoever, on the part of the United States against any person making claim against the government in said court; all claims under the act to provide for the collection of property abandoned in the insurrectionary districts during the civil war; but the jurisdiction of the Court of Claims does not extend to claims against the United States growing out of the destruction or appropriation of any property by the army or navy engaged in suppressing the rebellion. An appeal lies from the Court of Claims to the Supreme Court of the United States.

7. *The Senate of the United States as a Court of Impeachment.*—This august tribunal is only convened on extraordinary occasions, and as it can scarcely be said strictly to belong to our judicial system will require very brief notice. The Constitution gives the Senate the sole power of trying impeachments of the President, Vice-President, and all civil officers of the United States, for treason, bribery, or other high crimes and misdemeanors, leaving it in each case to the Senate, sitting as a court, to define these terms. When organized to try an impeachment, the members are on oath or affirmation. If the President is on trial, the chief-justice shall preside; in all other cases, a quorum of senators is sufficient. Two-thirds of the members present are necessary to conviction. Judgment does not extend further than to removal from office, and disqualification to hold and enjoy any office of honor, trust, or profit under the United States; but the party convicted is nevertheless liable and subject to indictment according to law. The power of impeachment has been very rarely exercised. The chief

instances are the trials of Judges Chase, in 1804, Peck, in 1831, and Humphreys in 1862, and the unsuccessful impeachment of President Johnson in 1866.

CHAPTER II.

STATE COURTS.

Although the forensic systems of the several States, excepting those of Louisiana and Texas, which are partly derived from the civil law, have a common English origin, yet there are considerable diversities in matters of detail, as well in the methods of legal procedure as in the constitution of, and the titles assigned to, the courts. We shall first present an outline embracing the points generally common to all, and then call attention somewhat more minutely to the prominent features peculiar to each.

At the head of the tribunals of each State is a court of last resort, usually called the Supreme Court, but in some cases the Court of Appeals, always of appellate, sometimes also of limited original jurisdiction, which reviews the decisions of the circuit and county courts of the State, and possesses large powers in the issuing of remedial writs, such as *writs of error*, *supersedeas*, *certiorari*, *prohibition*, *habeas corpus*, and *quo warranto*. It is composed of a chief-justice and several associates, two, four, or six, as the case may be, and usually holds its terms at regular intervals, in rotation at the principal centres of the State, but sometimes permanently at one place. Its members receive a larger salary than those of the inferior courts, and hold office for a longer term, in some cases during good behavior. The judges of the Supreme Court separately hold Circuit Courts, in many of the States, at the county-seats or in certain districts, at stated times, exercising a general civil and criminal jurisdiction, often concurrent with the county and probate courts, with power to hold jury trials and entertain appeals from justices of the peace. Courts of Chancery have a distinct existence in but a few States, their peculiar equity jurisdiction being commonly vested in certain of the common law courts. The independent system of each county comprises one or more courts of first instance, known as the Court of Common Pleas, County Court, or Circuit Court for the county (just mentioned), which have a general civil jurisdiction, in some cases also criminal, and are courts of appeal from the justices' courts; a court for the management of the estates of deceased persons, the care of children and lunatics, and of general probate jurisdiction, entitled the Probate, or Orphans', Court; criminal courts for the trial of crimes and misdemeanors, known variously as the Criminal Court, Quarter Sessions, Oyer and Terminer, Police Court, or Oyer and Terminer and General Jail Delivery; and Justices' Courts, presided over by Justices of the Peace, Magistrates, or Aldermen, clothed with authority to try suits of limited amount, usually \$100, and to commit persons for trial for offences of all kinds. In some of the larger cities, additional local courts have been established, known as city, corporation, or superior courts, generally having a concurrent jurisdiction with the circuit, county, or criminal courts, or justices of the peace.

Attached to the courts of each county are certain important officials: Recorder or Register of Deeds, in whose office are recorded deeds, mortgages, and other instruments; Clerk of the County Court, whose duty it is to affix the seal of the court to all writs, processes and exemplifications, to sign judgments, and generally manage the business of the court office, and take charge of the records of the court. In some States he performs also the duties of a Recorder of Deeds. In Pennsylvania his title is Prothonotary. In many counties each court has in addition a clerk of its own. There are also clerks of corresponding functions for the court of probate, the criminal court, and the supreme court. The District or Prosecuting Attorney (in each county) conducts all criminal prosecutions on

behalf of the Commonwealth; Register of Wills, in whose office wills are proved and registered, except where these duties are discharged by the Probate Court. Certain other officers who control a variety of important matters, such as Overseers of the Poor and County Commissioners, have no connection with the administration of justice, and do not require mention here. The machinery for enforcing the process of the courts essentially conforms throughout the land to the original English type, and the sheriff and coroner continue to play the roles so familiar to the people in Shakespeare's day. Allusion has been made to the peculiar origin of much of the jurisprudence of Louisiana and Texas. Notwithstanding that fact, those States may fairly be included in the foregoing sketch. The laws of Louisiana affecting public and personal rights, and criminal and commercial matters, have been assimilated to those of the other States, but in relation to real property, the common law or English equity system has never been adopted there. In Texas the forms of pleading and practice derived from the civil law, introduced by the Spanish settlers, obtain, but modified by the common law. In both States the peculiarities are rather internal, affecting the law itself, than apparent in the outward organization of the courts.

A consideration of the jurisprudence of the country would be very imperfect without some reference to the adoption of codes, under which the legal procedure of most of the States and Territories is now conducted. (See CODE.)

The following is a brief statement of the titles and jurisdiction of the courts in the several States.

Supreme Court.—This title is given to the court of last resort in nearly all the States. In Connecticut it is called the Supreme Court of Errors; in Delaware and New Jersey, the Court of Errors and Appeals; in Maine and Massachusetts, the Supreme Judicial Court; in Maryland and New York, the Court of Appeals, but in the latter State there is also a Supreme Court, only inferior to the Court of Appeals, and composed, to meet the vast requirements of the State, of thirty-four members, apportioned among eight districts, four to each district, except those of New York city and Brooklyn, which have five each. In Texas the Supreme Court has appellate jurisdiction only in civil cases from the District Courts, and the Court of Appeal hears appeals in all criminal cases, and in civil cases from the county courts. What most nearly corresponds to a court of last resort is The Commissioners of Appeals, created in 1879, to which cases are referred by consent of parties. In Virginia and West Virginia the highest tribunal is the Supreme Court of Appeal.

Chancery Court.—This is found now only in Alabama, Arkansas (Pulaski co. only), Delaware, where it consists of a Chancellor; in six counties of Kentucky, Mississippi (the State is divided into twelve districts, each with a Chancellor); New Jersey, and Tennessee; formerly also in New York and South Carolina. An appeal lies in most of these States from Chancery to the court of last resort. It must not be forgotten that the principles of Chancery have been adopted in all the States (except in Louisiana as to real estate), though their application has been much modified. In many of the States Chancery powers are exercised by the common law judges, but according to the practice of Chancery. Of this class are Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, Pennsylvania, Virginia, West Virginia, North Carolina, Georgia, Illinois, Texas, Florida, Michigan, Iowa, Arkansas, and Oregon. In the States not included in either of these groups, the distinction between actions at law and suits in equity has been abolished, as before referred to in speaking of the State codes; but yet it has been found necessary to provide for certain equitable remedies, such as injunction and specific performance, and other methods borrowed

from Chancery are employed under the forms known to the common law or established by statute.

The singular mingling of law and equity in the practice of Pennsylvania calls for special notice. Equity is part of the common law of that State. The want of a court with chancery powers early led to the courts administering equity through common law forms. Thus the action of assumpsit was made to supply the place of a bill in equity, and its sufficiency as a remedy has almost entirely withdrawn parol contracts from chancery jurisdiction. A *cestui que trust* has been permitted to maintain ejectment in his own name for property of which he was entitled to the possession. The owner of a lost bond could not at law maintain an action thereupon, because he could not make *profert* of it. But in Pennsylvania he was allowed to make his declaration, merely stating his reasons for not producing the bond. So every kind of equitable right is subject to the lien of a judgment, and may be completely sold under an execution; examples need not be multiplied. This unique development in jurisprudence does not interfere with the administration of equity through the regular chancery forms, which, we have already seen, exist now in Pennsylvania. (See CHANCERY.)

Circuit Courts.—These are held in Alabama, Arkansas, Colorado, Florida, Illinois, Indiana, Iowa, Kentucky, Louisiana, Maryland, Michigan, Mississippi, Missouri, New Jersey, New York, Oregon, Tennessee, Virginia, West Virginia, and Wisconsin. California, Maine, and Pennsylvania have no such courts nor anything quite corresponding thereto, but in the other States their place is supplied by circuits of the Superior or District Courts, or Court of Appeals.

Probate Courts.—Courts of general probate jurisdiction, *i. e.*, for taking proof of wills, issuing letters testamentary, of administration and of guardianship, etc., are known by this title in Alabama, Arkansas, Connecticut, Illinois (in counties of over 70,000 population), Kansas, Maine, Massachusetts, Michigan, Minnesota, Mississippi, New Hampshire, North Carolina, Ohio, Rhode Island, South Carolina, Tennessee, and Vermont. In the following States it is the Orphans' Court: Delaware, Maryland, New Jersey, and Pennsylvania. In Georgia it is designated the Court of Ordinary, and in some of the larger counties of New York, as New York and Kings, the Surrogate's Court. In the other States the powers of the Probate Court are delegated, usually to the Civil Courts of each county, but sometimes to the Circuit Courts or the Court of Chancery.

Courts of Common Pleas exist in some counties of Connecticut, the city and county of New York, in Kentucky, Pennsylvania, Rhode Island, and South Carolina, but equivalent functions are performed in all other States by the County, City, Circuit, or District Courts.

City or Municipal Courts.—The jurisdiction of these courts, as the name implies, is purely local and is often both civil and criminal. They are established in the chief cities of Connecticut, in some cities of Maine, in the cities of Boston, New York, Baltimore, St. Louis, New Orleans, Montgomery, and Mobile, Ala., and in cities of over 6000 inhabitants in Indiana. The Marine Court of the city of New York, originally established to determine controversies involving seamen arriving at that port, but now of more general, though purely local, jurisdiction, is one of the oldest examples of this class. The Supreme Bench of Baltimore is a peculiarly constituted tribunal, composed of the Superior, the Common Pleas, the Circuit, the Criminal, and the City Courts of Baltimore, with power to make all needful rules and regulations for the conduct of business in each of the courts of that city.

Justices' Courts are found in every State but Virginia, where, for every city of 5,000 inhabitants or upwards, they have a *hustings'* or corporation judge. In some places Justices' Courts have been superseded by Police Courts.

(A. L.)

CHAPTER III.

COURTS OF ADMIRALTY.

Courts of Admiralty had been established in all the provinces of British North America before the Revolutionary war. In some cases these courts were created by charter, in others they were established by acts of the provincial legislature, but usually Admiralty jurisdiction was conferred, directly or indirectly, by royal commissions, which were of four kinds: (1.) A commission to the Governor, as such; (2.) A general commission to the Governor and other principal officers of the colony, issued under the act of Parliament for the suppression of piracy; (3.) A commission to the Governor as Vice-Admiral of the colony; (4.) A commission to the judges of the Vice-Admiralty Court. The first two issued from the office of the Secretary of State; the others from the High Court of Admiralty of England.

By his commission, the Governor of the Colony, or other officer, was authorized to create Courts of Admiralty which should hear maritime causes submitted to them, subject to an appeal to the High Court of Admiralty of England. In most cases several colonies were united under the jurisdiction of one Court of Vice-Admiralty. The commissions gave to the courts very considerable powers, and enabled them to take cognizance of all maritime matters, crimes, torts, and contracts, to a greater extent than was permitted to the Admiralty Courts in England. These latter courts, as is well known, had been deprived of a great part of their original jurisdiction through the jealousy and encroachments of the Superior Courts of common law. The Vice-Admiralty Courts of the colonies, however, being created by royal commission, were not bound by decision of the Common Law Courts, nor even by acts of Parliament unless specially mentioned in them. Their powers were given by the document creating them. The fact that the judges of these Courts of Vice-Admiralty were appointed, directly or indirectly, by the Crown, and that their proceedings were without a jury, and in derogation of the common law, tended to make them unpopular with the colonists. Then, too, the large jurisdiction which had been conferred upon these courts, not so much in causes of strict admiralty cognizance as in those for the enforcement of taxes and duties for revenue, increased that unpopularity, and was the occasion of many complaints and petitions to the crown.

At the time of the Revolution, each colony having become a State, and having assumed the rights and powers of sovereignty, most of the States availed themselves of the right to establish Courts of Admiralty. In some States, such as Massachusetts and New York, the court was retained as it had theretofore been constituted, new commissions being granted to the judges. In others, such as Pennsylvania and New Jersey, a new Court of Admiralty was established, and its jurisdiction, in general, set forth. It is to be observed, however, that in none of the States was there any very material change in the subject-matters which were to come within the cognizance of these courts. They were to be, as their predecessors had been, international courts for the trial of all maritime causes, civil and criminal, including, however, the right to condemn prizes of war, a right which did not belong to English Admiralty Courts, as such, but was usually conferred by special commission, issued at the beginning of a war. The jurisdiction and proceedings of these courts were to be in accordance with the laws and principles governing Courts of Admiralty everywhere in the civilized world, but having been established under the constitution, or by the legislature, of the States respectively, their powers and duties were not absolutely identical.

The Articles of Confederation of the States, which were adopted in Congress Nov. 15, 1777, were finally ratified by all of the States Jan. 30, 1781. Among the

rights which were surrendered by the States were those of engaging in war and granting letters of marque and reprisal, and to the United States was given the sole right of "establishing rules for deciding, in all cases, what captures on land or water shall be legal, and in what manner prizes, taken by land or naval forces in the service of the United States, shall be divided and appropriated, . . . and of appointing courts for the trial of piracies and felonies committed on the high seas, and establishing courts for receiving and establishing finally appeals in all cases of captures." Subject to these provisions, however, the State courts of admiralty still continued to have jurisdiction, and at the time of the adoption of the Constitution of the United States in 1787 they were still in existence.

The Constitution of the United States provides (Art. I., Sec. 8) that "The Congress shall have power to levy and collect Taxes, Duties, Imposts, and Excises . . . to regulate Commerce with foreign Nations and among the several States . . . to constitute Tribunals inferior to the Supreme Court, . . . to define and punish Piracies and Felonies committed on the High Seas, and Offences against the Law of Nations, . . . to declare War, grant Letters of Marque and Reprisal, and Make Rules concerning Captures on Land and Water, . . . to provide and maintain a Navy." It also provides (Art. III., Sec. 2) that "The judicial power [of the United States] shall extend . . . to all cases of admiralty and maritime Jurisdiction." Thus the jurisdiction of the States over admiralty and maritime matters and revenue from foreign commerce was surrendered by them to the United States.

The act of Congress of 1789 (commonly called the Judiciary Act) divided the Union into districts, in each of which was established a court to which, among other powers, it was granted to have "exclusive original cognizance of all civil cases of admiralty and maritime jurisdiction, including all seizures under the laws of impost, navigation, or trade of the United States, where the seizures are made on waters navigable from the sea by vessels of ten or more tons burthen, within their respective Districts as well as upon the High Seas, saving to suitors in all cases the right of a Common Law remedy, where the Common Law is competent to give it; and also exclusive original cognizance of all seizures on land, or other waters than as aforesaid, made, and of all suits for penalties and forfeitures incurred under the laws of the United States."

For many years after the adoption of the Constitution, the tendency of the courts, and especially of the Supreme Court, was to hold the jurisdiction in admiralty within the narrow bounds to which it had been restricted in England. In process of time this was seen to be an erroneous view as well of the direct provisions of law as of the necessities of our new and growing country. It came to be understood that there was neither law nor reason in restricting the admiralty jurisdiction to causes arising upon waters "within the ebb and flow of the tide, and below the first bridges." Such a construction (which might be proper enough in a country like England, where the sea, and waters very near it, were the only waters in fact navigable) was utterly inappropriate to a continent abounding in great lakes and rivers, where there is no tide, but over which is carried on a commerce vast in importance and daily increasing. In the year 1845, therefore, an act of Congress was passed purporting to enlarge or declare the jurisdiction of the admiralty, so as to include not only seas and bays, but lakes, rivers, and canals. At about the same time the current of judicial decisions gradually changed, and though the jurisdiction of the United States admiralty courts is still far behind that of all the continental nations of Europe, it is, in many respects, more extensive than that of England.

This jurisdiction is either as to *Instance Causes*, or *Prize Causes*. Instance causes are those relating to crimes, torts (including breaches of the Revenue

Laws), and contracts. The right of admiralty courts to take cognizance of the first two depends upon locality alone. That is to say, a cause is one of admiralty cognizance as to crimes and torts, when the crime was committed or the wrong done on any waters which are, in fact, navigable, and upon any form of craft of whatever size, shape, or means of propulsion, provided it may fairly be called a vessel. This is so unless by the act of Congress defining the tort or crime some other rule is established.

Certain writers on admiralty law, as well in America as in England, refuse to consider crimes as instance causes, or indeed to include them in causes of admiralty cognizance: but undoubtedly the only logical reason for conferring upon the courts of the United States jurisdiction over a collision between vessels, or an assault on the high seas, for example, is because these are matters appropriate to admiralty courts, as well in their criminal as in their civil aspect, and whether the suit be brought by indictment at the complaint of the United States, or for damages, at the complaint of the individual injured, can make no difference.

By act of August 18, 1856, and its supplements, guano islands, discovered by a citizen of the United States, are placed within admiralty jurisdiction, to the same extent as if they were vessels belonging to one of our citizens. The District Courts have jurisdiction over all cases of seizure made under the laws of impost, navigation, or trade; and wherever such causes are appropriate to the admiralty jurisdiction, the court sits as a court of admiralty.

In regard to contracts, admiralty jurisdiction depends upon the subject-matter, and it is exercised over all contracts relating to "the navigation, business, or commerce of the sea," lakes, or other navigable waters. The chief of these are charter parties and contracts of affreightment, bottomry bonds, towage, pilotage, wharfage (where the vessel is foreign), demurrage, marine insurance, jettison, average, salvage, seamen's wages, judgments of foreign admiralty courts, controversies between part owners of a vessel as to her employment, and delivery of possession of vessels to those entitled to them, surveys of vessels, contracts with passengers for their transportation, claims of material men and those who furnish supplies to vessels foreign to the State where the work was done or supplies furnished. The latter classes of claimants are also allowed to proceed in admiralty against vessels belonging to their own State, whenever that State has given the right by its municipal laws. The decision of the Supreme Court giving the right to claimants in such cases to proceed in admiralty (*The Lottawana*, 21 *Wallace*, 201) has been much criticised, but still remains the law. The decision is based upon the principle that although the States have no power to grant to their own courts, or to those of the United States, admiralty jurisdiction, yet they may establish rules by means of which their citizens shall obtain their dues from defaulting vessels; and where such cases are proper subjects of admiralty cognizance, the Federal Courts will enforce the right by the appropriate admiralty remedy, which the State court could not apply. But admiralty jurisdiction is not entertained over contracts merely leading to maritime contracts, nor such as are to be performed on land, as, for example, a contract to enter into a charter party or to build a ship; nor can accounts between part owners of vessels be settled in admiralty, nor can a mortgage upon a vessel be foreclosed. It must be admitted that the law is still somewhat unsettled in several respects. Some of the District Courts entertain jurisdiction of causes which others will not recognize, such as claims for wharfage of domestic vessels, claims by stevedores for loading and unloading vessels, and those of watchmen for taking charge of them; but, of late years, there is much less disagreement between the courts, upon such subjects, than there was formerly.

By several acts of Congress, jurisdiction is also con-

ferred upon the District Courts to carry into effect decrees and awards of the consuls of foreign nations in causes of dispute between their citizens, and to aid such consuls in their proceedings, civilly and criminally. Such causes, or some of them, may, perhaps, be considered a branch of admiralty jurisdiction.

Under several acts of Congress, and in pursuance of treaties with some of the civilized nations of Asia and Africa, and also in all uncivilized countries, consuls of the United States have power to hold courts for the determination of disputes and trial of offences, where citizens of the United States are concerned. This jurisdiction extends, in a limited degree, to admiralty causes, both civil and criminal. An appeal is usually allowed to the United States minister to the country where the consul resides; and in case of China and Japan, an appeal, in all matters involving more than \$2500, is allowed to the Circuit Court of the United States for the District of California.

Courts of Admiralty, beside their instance jurisdiction, have also cognizance of the seizure of vessels in time of war, their condemnation as prize of war, and the distribution of the proceeds.

The mode of proceeding in Admiralty Courts of the United States is in accord with the practice under the civil law. All cases are heard upon written allegations and answers, by the District Judge, who decides the case without the intervention of a jury. He may, and frequently does, call to his assistance, as assessors, persons of nautical skill and knowledge; but he is not bound by their opinion. In the act of Feb. 26, 1845, it is provided that "in causes of admiralty or maritime jurisdiction, relating to any matter of contract or tort arising upon or concerning any vessel of twenty tons burthen or upward, enrolled and licensed for the coasting trade, and at the time employed in the business of commerce and navigation between places in different States and Territories upon the lakes and navigable waters connecting the lakes, the trial of issues of fact shall be by a jury when either party requires it." And the act of Feb. 16, 1875, gives to the Circuit Court, on appeal in admiralty, the right to call a jury as to questions of fact, if both parties desire it. These provisions somewhat mar the symmetry of the system of admiralty procedure, but have never influenced the practice to any considerable extent.

In criminal cases in admiralty, whether in the Circuit or the District Court, trial is had before a jury, and according to the course of the common law. This is in accordance with the provisions of the sixth amendment to the Constitution of the United States. In such cases it is usual to have a preliminary hearing before a United States Commissioner, an officer appointed by the court, who sits as a committing magistrate. If a *prima facie* case is made out, the offender is committed, or enters bail, to await the action of a grand-jury.

By act of June 11, 1864, in certain criminal cases not capital or otherwise infamous, the district attorney, with consent of the accused, is authorized to submit the case to the district judge, to be tried summarily. In such cases there is no indictment. The case is heard and decided, and the punishment, if any, inflicted by the judge alone. (H. G. W.)

CHAPTER IV.

COURTS-MARTIAL.

Courts-Martial in the army of the United States, in their procedure, bear a strong analogy to like tribunals in the British service. There is one marked distinction, however, between the military courts of the two nations. In the British service their composition and jurisdiction depend largely on the royal prerogative recognized by Parliament in the mutiny act, and the sovereign prescribes the articles of war. In the American service, however, the constitution and juris-

See Vol. VI.
p. 459 Am.
ed. (p. 517
Edin. ed.).

diction of military courts are expressly provided for by law in the "articles of war" enacted by Congress under the authority given by the Constitution "to raise and support armies" and "to make rules for the government and regulation of the land and naval forces." (See ARTICLES OF WAR, Vol. I., p. 333.) Such courts, therefore, in the army of the United States, although courts of special and limited jurisdiction, are, nevertheless, judicial tribunals, whose judgments, in cases within their competency, are just as binding as those of any court of record of civil or criminal jurisdiction.

By the Articles of War of the United States two kinds of courts-martial are provided, viz.:—General courts-martial, for the trial of any crime mentioned in such articles, and regimental, garrison, or field-officers' courts-martial, for the trial of minor military offences, where the punishment does not exceed the forfeiture of one month's pay or imprisonment at hard labor for a longer period than one month. These minor military tribunals are also inhibited from trying commissioned officers.

General courts-martial may in time of peace be appointed by the President of the United States or Secretary of War, or by a general officer commanding the army of the United States, a separate army thereof, or a separate military geographical department. When, however, any such general officer is the accuser or prosecutor of any officer under his command, the court must be appointed by the President, who thereafter acts on the proceedings of the completed trial. In time of war the commander of a division or of a separate brigade is competent to appoint a general court-martial, unless he is the accuser or prosecutor of any person under his command, when the next higher commander has to appoint the court.

General courts-martial must consist exclusively of commissioned officers of the army, unless where officers of the marine corps are detached for service with the army by order of the President, in which case the latter also are eligible as members. Each general court-martial is required to have thirteen members as a maximum, unless that number cannot be convened without manifest injury to the service, in which case a less number may be appointed. There must, however, be at least five members and an officer detailed to act as judge-advocate; and the decision of the officer appointing the court announced in the order therefor that a greater number cannot be convened without manifest injury to the service is conclusive. The officiating judge-advocate prosecutes in the name of the United States.

When the accused officer or prisoner is called before such a court, he is entitled to hear read the order appointing the court, and has the statutory right of challenge as to each member present, each challenge to be determined before a new challenge can be received. The member challenged is obliged to withdraw while the remaining members decide upon the relevancy and validity of the challenge. Should members be thus excused from sitting, and the number present be thus reduced below five, the court cannot proceed further until additional members shall have been added by the appointing power. When the right of challenge has been exhausted, the court is then duly sworn according to law by the judge-advocate, and the judge-advocate is duly sworn in like manner by the president of the court, who is the senior member present. These oaths must all be administered in the presence of the person on trial, who is entitled to have the assistance of counsel for his defence and to be informed of the nature of the accusation against him, to be confronted with the witnesses for the prosecution, and to have compulsory process for obtaining witnesses in his favor.

No indictment or presentment of a grand-jury for a capital or otherwise infamous crime is required in a case cognizable by a general court-martial, as such cases, when arising in the land or naval forces, or in

the militia when in actual service in time of war or public danger, are excepted by the fifth amendment of the Constitution of the United States. A military charge with its subordinate specification, subscribed by a commissioned officer, stands in the place of a formal indictment. When arraigned, the accused may make any plea such as is recognized in the Circuit Courts of the United States in criminal cases.

The proceedings thereafter are conducted in almost identically the same manner as in such courts of record. As the court-martial is the judge both of the law and the fact, when the testimony is all in and arguments heard, the court is cleared and closed for deliberation on its findings and sentence, as the members are required in their statutory oath to swear that they will not divulge the sentence of the court until it shall be published by the proper authority, neither will they disclose or discover the vote or opinion of any particular member unless required to give evidence thereof as a witness, by a court of justice, in due course of law. The proceedings, findings, and sentence, or acquittal, having been authenticated by the president and officiating judge-advocate, are at once forwarded to the officer who appointed the court, or to his successor for the time being, who must approve the whole proceedings or the sentence cannot be carried into execution. All the proceedings in detail of military courts are required to be reduced to writing and duly authenticated. When, however, a duly sworn stenographer is employed, the proceedings may first be taken in shorthand, such as the *viva voce* examination of witnesses, and subsequently written out. The findings and sentence being determined upon in closed session, none but members and the judge-advocate are authorized to be present.

All persons in the military service of the United States, and all retainers to the camp and persons serving with the armies of the United States in the field though not enlisted soldiers, are amenable to trial by general court-martial for offences specified or included in the articles of war. Three classes of offences come under the cognizance of such tribunal, viz.: (1.) Purely military offences, made such by law in consequence of the nature of the military service, such as desertion, absence without leave, mutiny, disobedience of orders, sleeping on post, conduct unbecoming an officer and a gentleman, etc. (2.) Crimes, whether felonies or misdemeanors, which any civilian may commit in the particular State, district, or Territory, when such crime is prejudicial to good order and military discipline, and committed by a person amenable to trial by general court-martial. (3.) Neglects and disorders to the prejudice of good order and military discipline, which include necessarily serious violations of army regulations, which the President is, by law, authorized to promulgate, or violation of standing post, company, troop, or battery regulations.

Under the first category certain military crimes may, according to the nature and degree thereof, be punished by sentence of death. In time of *peace* desertion cannot now be thus punished. Under the second category only crimes not capital can be taken cognizance of by a military tribunal. In time of war, insurrection, or rebellion, however, exclusive jurisdiction is given in cases of larceny, robbery, burglary, arson, mayhem, manslaughter, murder, and certain other felonies, when committed by persons in the military service of the United States.

The usual punishments by such courts are, according to the character of the crime and the limitation by law, death, cashierment or dismissal, or suspension from rank in cases of officers, dishonorable discharge, forfeiture of pay and allowances, imprisonment with or without hard labor, and dismissal in certain cases of officers with disqualification to hold any office or employment in the service of the United States. No sentence of a general court-martial can be carried into execution against a general officer until it shall have

been confirmed by the President, and in time of peace no sentence of dismissal against any commissioned officer will be effective without like confirmation. In time of peace the death sentence cannot be inflicted without his confirmation; but, in time of war, sentences of dismissals of commissioned officers other than general officers, and sentences of death in cases of persons convicted of being either spies, mutineers, deserters, or murderers, or of certain other crimes, may be carried into execution by the commanding general in the field.

The power to pardon or mitigate any offence of which a person is convicted by general court-martial rests by law in the officer appointing the court, unless in a case where confirmation by the President, of the sentence, is necessary. The President, as constitutional commander-in-chief, and invested with the pardoning power, may exercise his prerogative in his discretion.

Military persons sentenced by general courts-martial to dishonorable discharge and imprisonment at hard labor for a definite period become convicts, for the time being; and if the offence is one which a civilian might commit, and which is ordinarily punishable by imprisonment in a State prison or penitentiary, the military convict may be sent there. Otherwise, if he is convicted of a purely military offence, his sentence to hard labor will be executed at some military post, or at the military prison established by Congress at Fort Leavenworth, Kansas.

Regimental and garrison courts-martial are each required to consist of three commissioned officers, and another detailed as judge-advocate. This is the maximum and minimum number. The former court may be appointed by any regimental or corps commander in that portion of the regiment or corps under his immediate command. The latter court may be appointed by any officer commanding a garrison, fort, or other place where the troops consist of different corps. These appointing officers act on the proceedings of such courts, and may pardon or mitigate any punishment which such courts may adjudge.

In time of war a field officer may be detailed in any regiment to act as a field officer's court for the trial of such enlisted men of his regiment as otherwise might be sent before a regimental or garrison court. His jurisdiction is no greater, and his proceedings in any case, before the sentence can become effective, are required to be approved by the brigade commander, or, in case there is no brigade commander, by the post commander.

All proceedings of general courts-martial, when acted upon by the proper reviewing or confirming officer, are sent to the Bureau of Military Justice in the War Department for revision and record. In like manner all proceedings of other courts-martial are sent to the office of the Judge-Advocate of the Military Geographical Department within which such court was instituted.

Courts of inquiry may be appointed by the President at his pleasure, or by any commanding officer, on demand of the party whose conduct is to be inquired into, to examine into the nature of any transaction of, or accusation or imputation against, any officer or soldier. Such tribunals are required to consist of one or more officers not exceeding three, and a recorder to reduce the proceedings and evidence to writing. The court and recorder each take a particular oath, and the party accused may cross-examine opposing witnesses and examine his own. Such courts cannot give an opinion on the merits of the case inquired into, unless specially ordered to do so. Courts of inquiry may be preliminary to a general court-martial, but they do not have any power to try and determine any case and duly administer justice.

Both courts-martial and courts of inquiry have power to issue process to compel the attendance of witnesses. Minor statutory regulations have been

enacted as to the time of day when courts-martial may sit, and as to limitations on the time within which an offender must be brought to trial.

In the naval service of the United States courts-martial for the administration of the naval articles of war are entirely the subject of statutory regulation, and consist of general courts-martial constituted the same as in the army, and summary courts-martial of very nearly the same jurisdiction and same number of members as in a garrison court in the army, with a recorder to such inferior court instead of a judge-advocate.

Retiring boards in the army, for the purpose of determining upon the incapacity of any officer for active field service, may be appointed by the Secretary of War, under the direction of the President, and must consist of not less than five, nor more than nine officers, two-fifths of whom must be detailed from officers of the medical department. These courts are duly sworn, and are invested by law with all the powers of a court-martial or court of inquiry necessary for their purpose. Their proceedings are for the information and action of the President.

Military commissions, composed of officers of the army of the United States, are recognized by acts of Congress as tribunals sanctioned by the laws of nations in the time and theatre of belligerent contests.

To the American army is due the credit of enunciating in the clearest terms the laws of war and punishments for violations thereof, and in formulating a summary procedure under such laws, which, while reserving to the particular belligerent the same power of punishment as before, has yet given the accused an opportunity, in a regular way, of proving his innocence of the charges against him, and has thus ameliorated the exercise of arbitrary power originally vested in the commander in the field in such cases. The most notable instance of American procedure under a charge of a violation of the laws of war is to be found in the action of Gen. Washington, as commander-in-chief, in assembling a board of 14 general officers of the army, together with the judge-advocate-general, on Sept. 29, 1780, to consider and determine on the case of Maj. John André, adjutant-general of the British army in North America, who was charged with being a spy. During the war of the Revolution, tribunals were frequently constituted in the American army to try offenders under such laws. In the British service, however, at that time, Gen. Sir William Howe when commanding at New York, and Lieut.-Gen. Earl Cornwallis when commanding in North and South Carolina, executed alleged offenders under such laws in several instances, by direct orders without either prior judicial or quasi-judicial investigation by an army court or board, or opportunity to the accused to be heard in their own defence.

During the war with Mexico Maj.-Gen. Winfield Scott, who commanded the armies of the United States then operating in that republic, promulgated a code of procedure for the punishment of offences against the laws of war, by the instrumentality of military commissions, which became the basis of the American system and fully answered the purposes. This code was first promulgated by him in general orders No. 20, from army headquarters, Tampico, Feb. 19, 1847, and repeated with amendments at Vera Cruz, and finally reissued with additions from his headquarters in the National Palace, city of Mexico, as general orders No. 287, Sept. 19, 1847.

During the war of the Rebellion in the United States, President Lincoln approved and caused to be published in general orders No. 100, April 24, 1863, from the War Department, adjutant-general's office, "for the information of all concerned," elaborate instructions for the government of the armies of the United States in the field, as to the laws of war (*martial law*), and the mode of punishing offenders thereunder.

Martial law it is thus to be finally noticed is some-

thing very different from military law, the first being that branch of the laws of nations applicable to belligerent operations on land and adopted *ex necessitate rei* for the protection of the army in the field and of unoffending inhabitants, and punishments for violations thereof are inflicted by sentences of military commissions duly appointed and sworn and proceeding much as do courts-martial. Military law on the other hand consists of the statutes enacted by Congress for the government of the army of the United States at all times, and is a code found in the revised statutes, known as the "Rules and Articles of War," by which punishments are only inflicted by sentence of courts-martial under express statutes. Martial law therefore derives its authority from the laws of nations, while military law is merely the local code by which each State governs its own forces.

(A. B. G.)

COURTNEY, LEONARD HENRY, an English economist, was born at Penzance, July 6, 1832. After preliminary education in that town he went to St. John's college, Cambridge, of which he was elected a fellow after his graduation in 1855. He was called to the bar at Lincoln's Inn in 1858, and in 1872 was made professor of political economy at University College, London. In 1875 he went to India, and in 1876 he was elected to Parliament from Liskeard, which position he continues to hold. He has been a regular writer for the *Times*, and has contributed to various reviews, devoting himself chiefly to economical and financial topics.

COUZA, ALEXANDER JOHN (1820-1873), first prince of Roumania, was born at Huseh, in Moldavia, March 20, 1820. He belonged to a noble family and was educated at Paris. Returning to Moldavia in 1839 he was employed in the administration of justice, but having taken part in the revolutionary movements of 1848, he was banished by Prince Michael Stourza. When Prince Gregory Ghika succeeded to power in 1850, Couza was permitted to return and became prefect of the district of Galatz. After the Crimean war he represented that city in the legislative assembly and also attained the rank of colonel in the army. In the provisional government of Moldavia in 1858 he was minister of war, and organized the movement for the political union of the Danubian principalities. For the accomplishment of this project he was first elected Prince of Moldavia in January, 1859, and then prince of Wallachia in February. After long delay he obtained from the Sultan official recognition of his double election, and on Dec. 23, 1861, he proclaimed the union of the principalities under the traditional name of Roumania. The representatives of the whole region were summoned to Bucharest, but when they manifested opposition to the innovations required to carry out the treaty of Paris, the prince dissolved the assembly, March 14, 1863. In May, 1864, he arbitrarily decreed a new Constitution, embodying the desired changes, and in the following August he freed the peasantry from the rents which had long been exacted by the nobles. But his radical measures and the expensiveness of his administration excited great discontent, which culminated in a conspiracy, by which he was compelled to abdicate his power Feb. 23, 1866. He then removed to Austria, and after residing for a time near Vienna went to Italy and finally to Germany. He died at Heidelberg, May 15, 1873.

COVINGTON, a city of Kentucky, in Kenton co., on the Ohio, at the mouth of the river Licking, opposite Cincinnati. Together with Newport and several minor Kentucky towns (Ludlow, Central Covington, West Covington, Bellevue, Dayton), it may be regarded as forming a suburb of Cincinnati. It is the N. terminus of the Kentucky Central Railroad. A noble suspension bridge connects it with Cincinnati, and another bridge crosses the Licking, connecting the town with Newport. The principal buildings are the custom-house and post-office, a court-house, a jail,

good public-school buildings, a theatre, and an opera-house. Other institutions are St. Elizabeth's Hospital, a children's home, a widows' and orphans' home, an infirmary, a foundling asylum, a Benedictine Priory, a boys' Catholic academy and cathedral school, St. Walburga's Benedictine nunnery, 3 Catholic academies for girls, 15 churches (8 Catholic), among which is a cathedral, the city being the see of a Roman Catholic bishop. There are 4 national banks and 1 private bank, with an aggregate capital of \$2,200,000. Covington is the seat of very active manufactures; there are several rolling- and rail-mills, wire-works, furniture-factories, stove- and iron-foundries, and many tobacco-factories; also stock-yards, breweries, distilleries, brick-yards, an ice-factory, refrigerating and other warehouses, flour-mills, steamboat yards, car-works, spoke-manufactories, and the like. The city stands on high ground. The water-supply dates from 1871, and is by the Holly system. Covington was founded in 1812, and became a city in 1834. Population in 1870, 24,505; in 1880, 29,720.

COW-BIRD, a conirostral oscine passerine bird, of the family *Icteridae*, sub-family *Agelaiinae*, and genus *Molothrus*, of which there are several species, all of North, Central, and South America. Their nearest relatives are the Bobolink (*Dolichonyx oryzivorus*) and Marsh Blackbird (*Agelaius phoeniceus*). The name "cow-bird" or "cowpen bird" connotes their fondness for gathering where cattle and horses are kept; they may be seen in flocks rambling over the ground about the very feet of the quadrupeds, or even perching upon their backs. There is little to distinguish the cow-birds as a genus from other blackbirds, either in structure, outward form, or general economy; but in one respect they are remarkably unlike any other birds of America, and resemble the parasitic cuckoos of the old world. The *Molothri* live in polygamy, which is rarely practised by passerine birds, and moreover in sexual communism beyond that, for instance, of domestic poultry, for each cock has his own seraglio, whereas the cow-birds mingle in indiscriminate flocks the year round, have no domestic relations whatever, and construct no nests, depositing their eggs by stealth in the nests of other birds, and abandoning their offspring to be hatched and reared by foster-parents. Such eccentricity is the more remarkable in a group of birds all the other members of which display the usual conjugal fidelity and parental devotion, while some of them (the orioles) construct most elaborately woven nests; and there is nothing in the conformation of the cow-bird to account for its peculiar habits. The best known species is *M. ater*, which inhabits the whole of the United States and southern portions of British America. It is particularly numerous in the West, where thousands gather about the isolated ranches and stock-corral, or follow in the wake of cattle-trains; and where cow-birds' eggs are the rule rather than the exception in the nests of the prairie birds which build upon the ground. This species is 7½ to 8 inches long, the wing 4 or more, the tail about 3. The bill is strictly conical, like that of a fringilline bird; the feet are stout, adapted to terrestrial habits, and when on the ground the birds walk by moving the feet alternately, instead of hopping with both together like a sparrow. The male is iridescent black, with metallic lustre, with the head and neck purplish-brown. The female is considerably smaller (wing 3¼, tail 2¼, etc.), lustreless dark grayish-brown, paler below; the young males are similar to the female, but with black shaft lines on most of the plumage. The bill and feet are black in both sexes. The female cow-bird when about to lay deserts the flock, and furtively seeks in shrubbery and herbage for the nest of some other bird, which is occupied by stealth when the owner is away. The unwelcome token of her intrusion left behind, she rejoins her companions. The list of birds ascertained to be victimized in this way is a long and increasing one, comprising most of the small land-birds of the regions

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the cow-bird inhabits, especially finches and warblers of numerous species, vireos, and flycatchers. The victims are usually (not always) smaller than their persecutor; the cow-bird's egg, therefore, being so much larger than those with which it is deposited, receives the most warmth from the foster-parent's body, so that the rightful eggs may fail to hatch at all, or, if they do, the demands of the sturdy and voracious young cow-bird are such that the parent's own progeny are neglected and often perish. Eggs have been found in the nests of such large birds as the kingbird, and towhee bunting. The alien egg is said (but is not definitely ascertained) to hatch sooner than that of most birds; this would obviously be an advantage, and tend to prevent the other eggs from hatching at all, the parent being required at once to cease incubating and attend to the wants of its spurious progeny. There is usually but one cow-bird's egg in a nest, and it has been supposed that the female lays but one. This is unlikely, however, the probability being that she lays at least four or five, in as many different receptacles. Two, three, even five cow-bird's eggs have been found in one nest, most probably deposited successively by different females. When the intrusion is effected before the owners have laid their own eggs, or begun to incubate them, they usually abandon their nest, preferring the labor of building another to the odious task of incubating the alien egg. Later on, however, they usually face the disagreeable duty resolutely, rather than abandon their own eggs; and then become faithful and devoted foster-parents. Not seldom, however, they resort to an ingenious device, evincing almost human reflection and foresight, by building a second-story to their nest, thus leaving the hateful egg to addle in the cold basement; and in at least one instance—that of a summer-warbler—a three-story nest has been constructed, with a cow-bird egg enclosed in each of the two lower compartments.

A smaller variety of the cow-bird (*M. ater obscurus*) inhabits the S. W. border of the United States. In portions of Texas and Mexico there is a much larger and perfectly distinct species, the brazen cow-bird (*M. æneus*), entirely of the most lustrous and varied iridescence. Others inhabit South America. As far as known, their habits are substantially the same, so far at least as their polygamy and parasitism are concerned. (E. C.)

COWLEY, HENRY RICHARD CHARLES WELLESLEY, EARL, a British diplomatist, was born in London, June 17, 1804. His father, the first Baron Cowley, was a brother of the great Duke of Wellington. The son received his education at Eton; went to Austria as a diplomatic attaché in 1824; to the Hague in 1829; to Stuttgart in 1832, and to Constantinople in 1838. Having succeeded to the barony in 1847, he was sent out as minister to Switzerland. In 1851 he became envoy to the Germanic Confederation. He was sent by Lord Derby as ambassador to France, Dec. 6, 1852, and by his personal influence with Napoleon III. did much to shape the course of public events. In the Congress of Paris, Feb. 25, 1856, England was represented by Lords Cowley and Clarendon. As a reward for his diplomatic services, the former was in 1857 created Earl Cowley and Viscount Dangan. He resigned his post as ambassador in 1867.

COWPENS, a village of Spartanburg co., S. C., about 5 miles S. of the North Carolina line, and on the Atlanta and Charlotte Railroad, 10 miles from Spartanburg. Here a battle was fought Jan. 17, 1781, in which the Americans under Brig.-Gen. Daniel Morgan defeated the British under Col. Tarleton. The latter had been sent by Lord Cornwallis to drive Morgan out of the north-western part of the State, where he seemed likely to regain a foothold. Morgan, well informed of his opponent's movements, retired till he reached a field of open woods, about two miles from the "cowpens," where the few settlers of the

district gathered and marked their cattle from time to time. Here he awaited his pursuer, making all his arrangements with the greatest care. About 300 volunteers from the Carolinas and Georgia under Col. Pickens held the approaches to the field, while 60 sharpshooters were thrown out on each flank as skirmishers. A hundred yards back, the main body, numbering about 400, occupied the highest part of the field, the Maryland light infantry, under Lieut.-Col. J. Eager Howard, forming the centre, and Virginia riflemen each wing. Lieut.-Col. William A. Washington's regiment of dragoons was in reserve behind a second ridge. Tarleton's troops, numbering 1100 men and having two field-pieces, came in sight about 8 A. M. Jan. 17. As soon as they were formed in line, they rushed gallantly forward, and, in spite of the heavy fire, drove in Pickens's militia, who, however, according to Morgan's plan, fell back on the left of the main body. At the second line the British encountered such resistance that Tarleton ordered up his reserves and then fell heavily on the American right flank. To meet this attack, Col. Howard ordered the Marylanders to change front, but through a misunderstanding the whole line fell back in good order to the ridge behind which the cavalry had been posted. There suddenly facing about by Morgan's order they delivered an effective volley of musketry into Tarleton's men, who were pressing on in pursuit. The British veterans recoiled before this unexpected fire, which was followed by a bayonet charge. Before they could recover, Washington, who with the aid of Pickens's militia had already broken the British right, dashed upon the rear of their left and completed the rout. The American loss was only 12 killed and 60 wounded; while the British lost 300 killed and wounded and nearly 600 prisoners. Two field-pieces which had been captured from the British at Saratoga and retaken at Camden again came into the possession of the Americans. Morgan destroyed the captured baggage-wagons, and with his foot soldiers and prisoners crossed the Broad River on the day of the battle. Although the victory was hailed with the utmost enthusiasm, but little could be done to take advantage of it. Morgan retreated leisurely through North Carolina before the superior force of Cornwallis, and three weeks later was compelled by rheumatism to retire from active service.

COX, SIR GEORGE WILLIAM, an English clergyman and historian, was born in 1827. He was educated at Rugby and at Trinity College, Oxford, whence he graduated with the highest honors in 1849, and received the degree of M. A. in 1859. He was ordained in 1850, and was for a year curate of Salcombe Regis, Devon, and from 1854 to 1857 curate of St. Paul's, Exeter. In 1860 he became assistant master in Cheltenham College, but remained there only a year. On the death of his uncle, Sir Edmund Cox, in Aug., 1877, he succeeded to the baronetcy, being the fifteenth in succession from Sir Richard Cox, chancellor of Ireland. In 1880 he was appointed vicar of Bekebourne, and is now rector of Scrayingham. In 1850 he began his career as an author by publishing a volume of *Poems, Legendary and Historical*, which was followed in 1853 by a *Life of St. Boniface*. But in 1861 he struck out a new path, in which he at once achieved success by publishing his *Tales from Greek Mythology*. In this little work he set forth in a manner most attractive to the young the stories which have come down from the Greek poets, while in the preface he gave the result of the most recent researches into their real origin and interpretation. The success of this attempt led to the preparation of similar books—*The Great Persian War* (1861), *Tales of the Gods and Heroes* (1862), *Tales of Thebes and Argos* (1863); and these were all collected into one under the title *Tales of Ancient Greece* (1868). To these he added a little school-book called *A Manual of Mythology* (1867). He has since devoted himself chiefly to historical work, and besides contributing to the *Edin-*

burgh Review has published *Latin and Teutonic Christendom* (1870), *The Mythology of the Aryan Nations* (1870), *A History of Greece* (1874), *The Crusades* (1874), *A General History of Greece* (1876), *A School History of Greece* (1877). Of his larger history of Greece only two volumes have appeared. He has contributed to the ninth edition of the *Encyclopædia Britannica* articles on "Alexander the Great," "The Crusades," etc. He was associated with W. T. Brande in editing the *Dictionary of Science, Literature, and Art* (3 vols., 1865-67; 2d ed., 3 vols., 1875). In 1881 he published a *History of the British Rule in India*. In all of his works he has manifested a truly liberal spirit, as well as faithfulness in the record of facts. His style is animated and perspicuous. In theological views he belongs to the school of Dean Milman and Dean Stanley.

COX, JACOB DOLSON, an American general and statesman, was born in Montreal, Canada, Oct. 27, 1828. His youth was spent in New York city; he attended Oberlin College, Ohio, for three years, and was admitted to the bar in 1852. He then practised his profession at Warren, Ohio, and was elected to the State Senate in 1859. On the outbreak of the civil war he was placed in command of a camp of instruction of State militia, and soon after (May 15, 1861) was made brigadier-general of volunteers. Marching into West Virginia he drove the Confederate Gen. Wise out, and, except for a short time, had command of that department until August, 1862, when he was placed under Gen. Pope in the Army of Virginia. In October he returned to the district of the Kanawha; after the death of Gen. Reno he commanded the Ninth Army Corps, and fought at Antietam. He afterwards commanded the Twenty-third Army Corps, and served in the campaign against Atlanta in 1864. For his services in Georgia and Tennessee he was made major-general Dec. 7, 1864. At the close of the war his command formed part of Gen. Sherman's army. In 1866 he was elected governor of Ohio and served two years. In March, 1869, he was appointed Secretary of the Interior by President Grant, but retired from office in October, 1870. He has published *Atlanta* (1882), and *The Second Battle of Bull Run* (1882.)

COX, SAMUEL, D. D., an English Baptist minister and theologian, was born in London, April 19, 1826. At the age of fourteen he was apprenticed to the London Dock Company, but on the expiry of his term he resigned his post and entered the Baptist college at Stepney. Though the condition of the college at that time was not favorable, he acquired a good knowledge of mathematics and Hebrew, pursuing the latter study under Prof. Nenner. In 1851 he became pastor of the Baptist church in St. Paul's Square, Southsea, and after a successful ministry of four years passed over to Ryde, where his congregation was chiefly composed of Independents. During the four years spent in Ryde a change in his theological views took place, which was afterwards manifested in his best-known work, *Salvator Mundi* (1856). In this he maintains that the final restoration of the whole human family to the obedience and grace of God is the true teaching of the New Testament. The publication of this belief brought on him much trouble, and the alienation of former friends rendered him for some years almost hopeless. An accident which occurred in 1856 has largely shaped his subsequent course. In treating him for an ailment of the throat a surgeon let fall a drop or two of caustic on the vocal chords. For more than a year he wholly lost the power of public speech, and, though his voice has since improved, it has never regained its original clearness. For two years he suffered from penury, but at last obtained employment in writing for the London newspapers and magazines. He was still anxious to return to the work of the ministry, but was unable to find a place till in 1863 he received a call from the General Baptist church, Mansfield Road, Nottingham. His preaching, chiefly expository, has attracted a sympathizing congregation. Owing to a nervous disease, he now preaches but one

sermon a week. His main work is literary, and his expositions of the Scriptures have passed through several editions. The most valuable is his *Commentary on Job*, which has been pronounced by Hebrew scholars the best popular exposition of that sublime poem yet given to the English public. Among his other works are—*The Private Letters of St. Paul and St. John* (1867), *The Quest of the Chief Good* (1868), *The Resurrection* (1869), *An Expositor's Note-book* (1872), *Biblical Expositions* (1874), *The Pilgrim Psalms* (1874), *A Day with Christ* (1876), *The Book of Ruth* (1877), and the *Genesis of Evil* (1880). He is also editor of *The Expositor*, a magazine intended to give the latest results of biblical investigation by the best scholars of Great Britain. In 1873, Rev. Mr. Cox was elected president of the General Baptist Association, and his address was published in the *British Quarterly*. In 1882 he received the degree of D. D. from the University of St. Andrews.

COX, SAMUEL HANSON, D. D., LL. D. (1793-1881), an eminent and eloquent Presbyterian divine, was born at Rahway, N. J., Aug. 25, 1793, of a family most of whose members belonged to the Society of Friends. He was educated at the Friends' school at Westtown, Pa., and in 1811 began to study law at Newark, N. J. About this time he became a convert, and in 1813 was baptized in the Presbyterian communion. He then studied theology, was licensed to preach Oct. 10, 1816, and ordained pastor at Mendham, N. J., in the following July. At the close of 1820 he was transferred to New York City, where his congregation was largely composed of leading merchants. He took a foremost part in founding the University of the City of New York in 1831, and as professor of moral philosophy delivered a memorable course of lectures. During the cholera season of 1832 he remained at his post until stricken down by the disease. In the following year, his health being impaired, he went to Europe, and made an eloquent address in London at the anniversary of the British and Foreign Bible Society, which greatly extended his fame. Dr. Cox while abroad had earnestly defended his country against calumniators, but returned deeply impressed with the necessity of action in regard to slavery. Soon after he preached a celebrated sermon, which, though moderate in tone, drew upon him the odium then attached to the name of abolitionist, and in consequence his house and church were sacked by a mob, July 10, 1834. In the following autumn he was chosen professor of pastoral theology in the seminary at Auburn, N. Y., and remained there three years. At the division of the Presbyterian denomination he was a prominent champion of the New School, though in regard to order and discipline he was strongly conservative. In 1837 he became pastor of the First Presbyterian Church at Brooklyn, where for several years he maintained a position of great eminence, and for a considerable part of the time he was professor of ecclesiastical history in Union Theological Seminary at New York. He actively encouraged temperance and other benevolent and reformatory movements of his time. In 1846 he was chosen moderator of the General Assembly of the Presbyterian Church (N. S.), and was a delegate to the Evangelical Alliance in London. In April, 1854, on account of failing health, yet against the remonstrances of his congregation, he resigned his charge and retired to Owego, N. Y., but for several years continued to preach occasional sermons and deliver lectures in New York. He died at Bronxville, Westchester co., N. Y., Oct. 2, 1881. He married, in 1817, Abia Hyde, a lady of great refinement and daughter of Rev. Aaron Cleveland of Connecticut, somewhat noted as a poet in his time (1744-1815). His second wife was Anna, daughter of George Bacon of Hartford, Conn. He received the honorary degree of A. M. from Princeton College in 1818, and that of D. D. from Williams College in 1825, but in a public letter declined to accept what, in characteristic style, he called "the semilunar fardels." Nevertheless, he

was henceforth known as Dr. Cox, and in 1855 he received the additional degree of LL.D. from Marietta College, Ohio. He was a man of high character, of great boldness in expressing his convictions, and of remarkable power and magnetism as an orator. His style was peculiar, and he did not hesitate to introduce strange Latin derivatives, and even phrases, into popular addresses. Besides sermons and pamphlets he published *Quakerism not Christianity*, 1833, and *Interviews, Memorable and Useful, from Memory reproduced*, 1853. He left large collections of unedited manuscripts, which in the judgment of his friends are more valuable than anything he ever published, since they contain that "base of supplies" which made him, as Rev. Dr. R. S. Storrs remarked, "the readiest, the fullest, and most eloquent man of his time."

COX, SAMUEL SULLIVAN, an American statesman, was born at Zanesville, Ohio, Sept. 30, 1824. He studied at Ohio University, Athens; and graduated at Brown University in 1846. He became a lawyer, politician, and editor in Columbus, Ohio, and in 1855 was appointed secretary of the United States legation in Peru. He was a democratic member of Congress from the Columbus district, Ohio, 1857-65, and having removed in 1865 to the city of New York was again elected to Congress in 1868. He has been several times re-elected. He is author of *The Buckeye Abroad* (1852); *Eight Years in Congress* (1865); *A Search for Winter Sunbeams* (1870); and *Why We Laugh* (1876.) Though a lover of humor and having a keen sense of the ridiculous, he has been diligent in the public service, and is an earnest and effective speaker. He was chairman of the committee on the census of 1880, a member of the committee on commerce, and one of the leaders of his party in the House.

COXE, ARTHUR CLEVELAND, D. D., an American bishop of the Protestant Episcopal Church, was born at Mendham, N. J., May 10, 1818. He is a son of Rev. Dr. Samuel Hanson Coxe. He was graduated at the University of the City of New York in 1838. While an undergraduate he composed several poems, and in 1837 published a sacred drama entitled *Advent, a Mystery*; also in the following year *Athwold, a Romance*, and *Saint Jonathan, the Lay of the Scald*, a humorous poem which was never completed. While a student at the General Theological Seminary, New York, he sent forth two more volumes of poetry, one of which, *Christian Ballads*, consisting of poems chiefly suggested by the seasons and services of the Church, has given him a wide reputation and enduring fame. The *Ballads* have passed through several editions in England as well as in America. Mr. Coxe was ordained deacon in 1841, and in August of that year became rector of St. Anne's Church, Morrisania, N. Y., and in 1842 of St. John's Church, Hartford, Conn. He next published *Saul, a Mystery, Hallowe'en, and Other Poems*, and *Sermons on Doctrine and Duty*. Having visited Europe, he gave to the world his *Impressions of England; or, Sketches of English Scenery and Society*, 1853. In 1855 he became rector of Grace Church, Baltimore, where he published his *Apology for the Common English Bible*. During the agitation of the Civil War he was a firm supporter of the Union. In 1863 he became rector of Calvary Church, New York, and two years later was consecrated bishop of Western New York. In 1869, when Pope Pius IX. had invited all Christian bishops to attend the Vatican Council, Bishop Coxe sent a reply which was translated into most European languages. He has been a frequent contributor to the *Church Review*, the *Independent*, and other periodicals, has published pastorals on theological subjects and on moral reforms, and translated from the French and German several controversial works. He is the author of a volume in the French language (published in Paris in 1875), *L'Épiscopat de l'Occident*, and of several smaller treatises published by the "Anglo-Continental Society," of which he was one of the founders.

His *Apollis*, *Criterion*, and other theological works have been republished in England. In 1872 he visited Hayti, and spent several weeks organizing a diocese.

COXE, JOHN REDMAN (1773-1864), an American physician, was born at Trenton, N. J., in 1773. He studied medicine under Dr. Benjamin Rush, of Philadelphia, and in London, Paris, and Edinburgh. He settled in Philadelphia in 1796, and was port-physician in 1798 during the yellow fever epidemic. He was the first to introduce vaccination in that city. For many years he was a physician of the Pennsylvania Hospital and of the Philadelphia Dispensary. In 1809 he was appointed professor of chemistry in the University of Pennsylvania, and in 1818 was transferred to the chair of materia medica, which he retained till 1835. He edited the *Philadelphia Medical Museum* from 1805-11, and began the translation from the French of the *Emporium of Arts and Science* (1812), which was continued by Dr. Thomas Cooper. His own works comprise treatises on *Inflammation* (1794); *Vaccination* (1800); *Combustion* (1811); *American Dispensary* (1827); *Refutation of Harvey's Claim to the Discovery of the Circulation of the Blood* (1834); *Epitome of Hippocrates and Galen* (1846). He also published *Recognition of Friends in Another World* (1845); and *Female Biography*. Dr. Coxe never had a sick day in his life, and died without any appreciable disease at Philadelphia, March 22, 1864.

COXE, TENCH (1755-1824), an American political economist, was born in Philadelphia, May 22, 1755. He was educated in the Philadelphia College, and became in 1776 a partner in a leading mercantile house. In 1786 he was sent as a commissioner to the Federal Convention at Annapolis, and in 1788 he was elected a member of the Continental Congress. He was appointed Assistant Secretary of the Treasury in 1790, when the duties of the office were peculiarly important—since Alexander Hamilton was then laying the foundation of the financial system of the United States. He was Commissioner of the Revenue from May, 1792, to March, 1797. He advocated the election of Jefferson to the Presidency, but devoted his attention chiefly to the encouragement of American manufactures. He was one of the founders of the Pennsylvania Society for the Encouragement of Arts and Domestic Manufactures, instituted in 1787. Among his numerous works are: *An Inquiry into the Principles of a Commercial System for the United States* (1787); *A View of the United States* (1794); *Thoughts on Naval Power and the Encouragement of Commerce and Manufactures* (1806); *On the Navigation Act* (1809); and a *Statement of the Arts and Manufactures of the United States for 1810* (1814). He died July 17, 1824.

COYPU, COUIA, or RACOONDA, a South American quadruped, *Myopotamus Coypu*, belonging to the hystricine series of simpidicent *Rodentia*, family *Octodontidae*, sub-family *Echinomyinae*. The animal is aquatic in habits, and somewhat resembles a beaver, but has a cylindric-tapering tail about two-thirds as long as the head and trunk, like that of an otter—a circumstance which appears to have led to some confusion, the valuable fur of the Coypu being known in commerce as *nutria*, which is the same word as *lutra*, an otter. It is one of the largest of living rodents, surpassing a beaver in dimensions, and only itself exceeded in size by the Capybara (*Hydrochoerus capybara*). The form is stout; the muzzle blunt; the ears small; the hind-feet enlarged, with four full-webbed digits and a fifth free digit. The incisor teeth are very large and powerful, plane and ungrooved; there is, as usual in hystricine rodents, one premolar above and below, giving with the three molars 16 back teeth. The enamel-folds are curved and deep, those of the upper teeth making one internal and two external loops, those of the lower teeth three internal and one external. The general color of the fur is brown above, brownish yellow below, usually white about the muzzle. The Coypu lives on the banks of rivers and lakes,

sometimes the seashore, from about 15° N. to 23° S. lat., inhabiting burrows in the ground, and subsisting chiefly upon vegetable food, especially the roots of aquatic plants. It swims freely in the water, often transporting its young upon its back in that element. The female has four pairs of teats, situated high up on the side of the body, behind the shoulder and in front of the hip; four or five young are produced at a birth. The chief exportation of nutria fur is from Buenos Ayres. (E. C.)

CRAIK, DINAH MARIA (MULOCK), an English novelist, was born at Stoke-upon-Trent, Staffordshire, in 1826. Her father, an Irishman of a literary turn and somewhat eccentric, wrote a book called *Atheism Answered*, and is mentioned in Moore's *Life of Byron*. Miss Mulock's first novel, *The Ogilvies*, appeared anonymously in 1849; it was quickly followed by *Olive* (1850), *The Head of the Family* (1851), and *Agatha's Husband* (1852). Though these met with some favor, it was not till the publication of *John Halifax, Gentleman* (1857), that the author, who still remained anonymous, achieved a decided success. She had modified the sentimentalism and too feminine tone of her former works and improved in the presentation of character. Though she has since written many stories, she has never surpassed this effort, and still is best known as the "author of *John Halifax*." Her subsequent novels are *A Life for a Life* (1859), *Mistress and Maid* (1863), *Christian's Mistake* (1865), *A Noble Life* (1866), *Two Marriages* (1867), *The Woman's Kingdom* (1869), *A Brave Lady* (1870), *Hannah* (1871), *My Mother and I* (1874), *The Laurel Bush* (1876), *Young Mrs. Jardine* (1879). She is an eminently domestic writer, describing the common joys and sorrows, trials and vicissitudes, of Scotch and English families of the present day. Her delight is to set forth a happy home as woman's kingdom. She fails in appreciating strong masculine traits and in making her characters individual and lifelike. Besides her novels, she has published a number of short stories and children's books, as well as some volumes of essays. Among these are—*A Woman's Thoughts about Women* (1858), *Sermons out of Church* (1875), *His Little Mother* (1881), *Plain Speaking* (1882). From time to time she has contributed to various magazines poems of tender sentiment and domestic interest, and some of these were collected into a volume in 1860. A later collection, including these and many more, has been published under the title *Thirty Years, being Poems Old and New* (1881), and *Children's Poetry* (1881). She also compiled and arranged a volume of music entitled *Songs of our Youth* (1875), and has translated some books from the French. A little book on *Fair France* (1871) gives a sketch of a visit to that country. In 1864 a literary pension of £60 was granted to Miss Mulock by the British Government, and in 1865 she was married to Mr. George Lillie Craik.

CRAIK, GEORGLIANA M., an English novelist, born in London, April, 1831, the youngest daughter of the well-known author, George Lillie Craik (1799–1866). After her father's removal to Belfast in 1850 she began to contribute to the periodicals short stories, and in 1857 appeared her first novel, *Riverston*. In 1867, after her father's death, she returned to London. Among her novels are *Lost and Won*; *Winifred's Wooing*; *Faith Unwin's Ordeal*; *Leslie Tyrrel*; *Mildred*; *Hero Trevelyan*; *Esther Hill's Secret*; *Without Kith or Kin*; *Theresa*; *Only a Butterfly*; *Sylvia's Choice*; *Anne Warwick*; *Hard to Bear*; and *Dorcas*. Among her books for children are *My First Journal*; *Playroom Stories*; *Cousin Trix*; *The Cousin from India*; *Miss Moore*; and *Janet Mason's Troubles*.

CRAKE. I. Properly a European bird, found also as a straggler to America, of the family *Rallidae*, and genus *Crex*; the land-rail or corn-crake, *C. pratensis*, about 10 inches long, varied above with yellowish and blackish-brown, of less aquatic habits than those of rails generally.

II. From their general similarity, any of the short billed species of rails, of the genus *Porzana* and its allies, receive also the name of *Crake*. The bill is shorter or not longer than the head, straight and comparatively stout; other characters are much as in the rails at large (*Rallus*). There are numerous species, of most parts of the world, mostly of small size, under that of the corn-crake. The North American Sora (*Porzana carolina*), yellow-breasted rail (*P. noveboracensis*), and little black rail (*P. jamaicensis*) are good examples. The names *crex*, *crake*, like *creak*, *crackle*, are onomatopœtic, expressing the cry of the birds: as indeed is *rail*, Fr. *rasle* or *râle*, Lat. *rallus*. See RAIL. (E. C.)

CRANBROOK, GATHORNE HARDY, VISCOUNT, a British Conservative statesman, was born at Bradford, Yorkshire, Oct. 1, 1815. He was educated at Shrewsbury and at Oriel College, Oxford, where he graduated B. A. in 1836. In 1838 he married, and in 1840 he was called to the bar at the Inner Temple. In 1856 he entered Parliament for Leominster, and in 1858 he became Under-Secretary for the Home Department. After representing Leominster for nine years, in 1865 he was elected to Parliament both by this constituency and by the University of Oxford. He then chose to represent the latter. In 1866 he was sworn of the Privy Council and made president of the Poor-law Board, and in the next year was Home-Secretary. During the Parliamentary struggle which resulted in the disestablishment of the Irish Church, he was a conspicuous defender of that institution. In 1874, under Lord Beaconsfield, he was appointed Secretary of State for War, and in 1878 he received the burdensome portfolio of Secretary of State for India. In the same year he was raised to the peerage. As a commoner he was a firm friend and supporter of Beaconsfield, and was distinguished for business capacity, earnestness of purpose, and decision of character.

CRANE, a large long-legged wading bird, of several distinct genera of the family *Gruideæ*, and order *Alectorides*. Owing to their stature and general superficial resemblance, the cranes have been wrongly referred to the order *Herodiones*; but they have really little in common with the herons, storks, ibises, etc., their ordinal relationships being with the courlans, rails, and gallinules. The cranes are all large birds, with very long legs and neck, some of them standing the highest of any carinate birds. There are three very distinct genera. One of these is represented by the elegant African crowned crane (*Balearica pavonina*), in which the head is adorned with an upright tuft of feathers of peculiar texture, resembling a small wisp or clothes-brush. The graceful and gentle "demoiselle" or "paradise" cranes (*Anthropoides virgo*, *A. paradisea*) are related forms of Africa, India, and Southern Europe. Most of the species, however, to the number of about twelve, fall in the single genus *grus*. In this the head has no kind of crest, but is in part naked and colored; the general plumage is compact, either snowy white set off with black, or ashy; some of the inner wing-feathers are enlarged, arched, and then pendant; the bill is as long as the head or longer, straight, stout, compressed throughout, contracted in the middle, opposite the nostrils, which are large and completely pervious; the tibiae are extensively denuded above the suffrage; the tarsi are scutellate in front; the toes short, the anterior ones webbed at base, the hinder one elevated. In most if not all the species of this genus the breast-bone is hollowed out to receive foldings of the wind-pipe, which may make several coils in the bone before passing to the lungs. In the whooping crane, for example, in which this peculiarity is carried to an extreme, the entire windpipe is about four feet long, and over half of it is coiled away in the sternum. Cranes inhabit both marshy places and high and dry plains;

they are extremely wary and vigilant, and when feeding in flocks, as is their custom, usually have one or more sentinels on the watch for danger. A broken-winged crane is a dangerous antagonist, owing to the force and rapidity with which spear-like thrusts of the bill may be given. Extensive migrations are performed by most of the species with great regularity, flying in bands like wild geese, high overhead. The voice is loud, raucous, and resonant to the highest degree, consisting of harsh rattling cries frequently repeated. The eggs are generally two in number, of an elliptical rather than ovoid shape, of drab or olivaceous ground-colors, heavily marked with darker colors. The young are usually rusty or reddish colored at first. The two best-known species are the white and gray crane of Europe, *Grus leucogeranus* and *G. cinerea*. The North American species are three in number. 1. The white or whooping crane, *G. Americana*, one of the largest and handsomest of the genus, is, when adult, pure white with black primaries, primary coverts and bastard wings; the head extensively naked, carmine-red, with scattered black bristles. The length from end of bill to end of tail is upwards of 4 feet; the standing height is much more, the tarsus alone being nearly a foot long; the wing is 2 feet long, the extent of the wings some 7 or 8 feet. This magnificent bird appears to have been formerly distributed over most of the United States, the earlier writers reporting it from the Atlantic coast and various interior points; it is now, however, chiefly confined to the Mississippi Valley and westward, from Dakota to Texas. 2. The brown or sand-hill crane, *Grus pratensis*, was long supposed to be the young of the preceding, but is now generally conceded to be distinct. The head is less extensively denuded, with an entirely different outline of the feathers; the plumage is ashy or plumbeous-gray, never whitening, with the primaries and border of the wing black; the size is decidedly less than that of *G. Americana*, and the coiling of the wind-pipe in the breast-bone is much less extensive. It has inhabited temperate North America at large, but, like the whooping, is nearly or quite exiled now from the more densely populated portions of the United States. 3. The *Grus fraterculus*, of Cassin, supposed to be the true *G. Canadensis* of Linnæus, is a still smaller species of brown or sand-hill Crane, now usually admitted to be distinct from *G. pratensis*, but perhaps not fully established as a species. It inhabits portions of British America and Mexico, with the intervening part of the United States west of the Mississippi. (E. C.)

CRAPE MYRTLE, the common name of a highly ornamental shrub very popular in the southern portion of the United States, into which it has been introduced from the East Indies. It belongs to the natural order *Lythraceæ*. It has six sepals and six long-clawed rosy petals, which are beautifully craped or fringed, from whence its common name. It is the *Lagerstromia Indica* of botany. One species, *L. reginæ*, is the jarool, a famous timber-tree of Burmah. Our cultivated kind grows about 10 or 15 feet high, making sometimes a trunk 12 or more inches in circumference, in the States south of the Potomac. North of this it is killed to the ground in the winter, if not wholly destroyed. (T. M.)

CRAWFORD, WILLIAM HARRIS (1772-1834), an American statesman, was born in Nelson co., Va., Feb. 24, 1772. When he was about 7 years of age his father removed with his family to South Carolina, and in 1783 crossed the Savannah and settled in Columbia co., Ga. After his father's death in 1788, Crawford, then only 16 years of age, began to teach school, and after reaching manhood he attended Rev. Dr. Waddell's academy for two years. He then commenced the study of law, still supporting himself by school-teaching, and in 1798 was admitted to the bar. The legislature of Georgia in 1800 appointed Crawford and Horatio Marbury to revise the laws of the State. Within two years the work was accomplished satisfactorily and the first *Digest* published. Being elected to

the legislature in 1802, Crawford became a leader of the Republican party, adopting heartily the principles of Jefferson, and adhering to them tenaciously throughout life. After serving four years in the legislature, he was chosen to the United States Senate. During the canvass for this position he fought two duels, in the first of which he killed his opponent, and in the other he himself was severely wounded. His ardent friendship for Jefferson did not prevent him from objecting to the embargo bill when first proposed, but after it had gone into operation he voted against its repeal. In the same way he was opposed to the declaration of war against England in 1812, but finally consented to it as demanded by his party. Gallatin, then made secretary of the treasury, strongly urged the necessity of a national bank, and found in Crawford an effectual supporter of the measure. Being still inclined to peace, Crawford in 1813 declined a seat in President Madison's cabinet as secretary of war, and was appointed minister to France. During his residence abroad he became an intimate friend of Marquis Lafayette, who afterwards appointed him agent of his property in America. Being recalled at his own request in 1815, Crawford, while yet on his return voyage, was made secretary of war, but a year later he was transferred to the treasury department by President Madison. In this position he remained through both terms of Monroe's administration, and towards its close was generally regarded as the legitimate successor of the Virginian dynasty which had long ruled the councils of the nation. But he was opposed by Calhoun, then rising into prominence, and by those who wished the Federal government to assist the States in making internal improvements. His official integrity was impeached, but without success. He is more justly charged with resorting to intrigue to secure the object of his ambition. According to previous custom a caucus of the members of Congress belonging to the Republican party was called, which, however, was attended only by his friends, about one-third of the whole number, while the others refused to participate in it or be governed by its decision. Though Crawford was thus the regular nominee, the party was disintegrated and the ensuing campaign became a personal contest in which Crawford, Gen. Jackson, John Quincy Adams, and Henry Clay, all belonging to the Republican party, were the candidates. Gen. Jackson received the highest number of electoral votes but did not have a majority, and the election devolved on the House of Representatives, voting by States. Crawford had been incapacitated by paralysis, yet his name was presented and he received the votes of four States. John Quincy Adams, who had been secretary of state throughout Monroe's administration, was able to attract the other opponents of Jackson and obtained the presidency by the votes of 13 States. Crawford's health afterwards improved to some extent, but his political career was closed. Returning to his home in Georgia, he lived for a time in retirement. In May, 1827, he was appointed judge of the northern circuit of Georgia, and served as such the remainder of his life. Though he was infirm and partially disabled, his sight and speech being both affected, his mind remained clear and he discharged his duties to the satisfaction of his fellow-citizens. He died near Elberton, Ga., Sept. 15, 1834.

CRAWFORDSVILLE, a city of Indiana, the county-seat of Montgomery co., is on Sugar Creek, 44 miles west of Indianapolis. It is at the intersection of the Louisville, New Albany, and Chicago Railroad with the Indiana, Bloomington, and Western Railroad, and on the Logansport branch of the Indianapolis and Terre Haute Railroad. It has 3 hotels, 3 banks (2 national), 2 daily and 5 weekly newspapers, 10 churches, and graded schools. The industrial works comprise 2 foundries, a woollen-factory, coffin-factory, barbed-wire-factory, 3 flour-mills, 3 planing-mills. It was settled about 1820, and in 1834 Wabash College, a Presbyterian institution of some prominence, was established

here. The city has well-paved streets lined with maple trees. Population, 5251.

CREASY, SIR EDWARD SHEPHERD (1812-1878), an English jurist and historian, born at Bexley, in Kent, Sept. 12, 1812. He was a king's scholar on the foundation at Eton; proceeded in 1831 to King's College, Cambridge, and became a fellow of his college in 1834. He was called to the bar at Lincoln's Inn, in 1837; was afterwards a deputy assistant judge for the Middlesex sessions. He was professor of history in University College, London, 1849-58. He was appointed chief-justice of Ceylon in 1860, and received the honor of knighthood. In 1869 he returned to England on account of ill health, and in 1875 was appointed professor of jurisprudence and Roman law in the Inns of Court. He died in London, Jan. 27, 1878. He was a sound and able lawyer, and acquired a high repute as an author. Among his writings are, *An Account of the Foundation of Eton College; Sub Rege Sacerdos; Text-Book of the Constitution; Memoirs of Eminent Etonians* (1850); *The Invasions of England*; the extremely popular *Fifteen Decisive Battles of the World* (1851), which has been through many editions; *Rise and Progress of the English Constitution* (1834); *History of the Ottoman Turks*; *History of England* (vol. i. 1869, vol. ii. 1870, incomplete); *The Old Love and the New*, a novel (1870); a work on the *Imperial and Colonial Constitutions of the British Empire* (1872); *First Platform of International Law* (1876).

CREEDMOOR, a small post-village of Queen's co., N. Y., having a station of the Central R. R. of Long Island, 12 miles east of New York City. On account of its topography it has long rifle-ranges, and is well suited for target-practice. The National Rifle Association meets here, and local clubs are constantly practising here. Great matches occur not only between local associations, but American and English teams meet to contest for the palm. It corresponds to Wimbledon in England. (H. C.)

CREEK INDIANS, more correctly called Muskogees or Muskoki, the principal tribe of the so-called Appalachian or Chahta-Muskoki stock. They formerly lived in Georgia, Florida, and Alabama, and were of many minor tribes. The name Creeks is said to have been given on account of the numerous water-courses which intersect their old habitat. Among the minor Creek peoples were the Alabamas, Coosas, Hitchitees, Appalachees, Cowetas, Cussetas, Coosadas, or Coushattas, and others. The Seminoles and Mikosukies of Florida were Creek offshoots. Various local tribes, not clearly Appalachian, were at one time or another absorbed in the Creek nation. From their wide territorial range, the Creeks in colonial times had little tribal unity. The French of Mobile, the Spaniards of Florida, and the English colonists all sought the Creek alliance, and together they succeeded in keeping the tribe from developing any solidarity or community of action. Yet there is mention of Coweta "emperors" who seem to have had a sort of suzerainty over the whole Muscogee name. The Creeks were never strongly hostile to the English. In the Revolutionary war and in that of 1812-15 they were very active friends of the English. In the latter war they took a very important part, and it required the most vigorous operations on the part of the United States forces, led by Gens. Jackson, Coffee, Claiborne, and others, to put down the Creeks. The Indians made a stout resistance, but were everywhere completely overpowered. Long before this many Alabamas and Coushattas, with some other Muskogees, had removed to Texas and Louisiana, where a remnant of their descendants still exists. In 1825 a large part of their land, including most of what they retained in Georgia, was ceded. Renewed hostilities with the Alabama Creeks led to their forcible and almost complete expatriation. After the removal of the Creeks to the Indian Territory they did not prosper for a long time. They for some years refused civilization, schools, and Christianity, and

rapidly declined in numbers; and even now they do not number over two-thirds as many as when they first were removed. During the war of 1861-65 the tribe divided, and several severe battles were fought; but the Confederate party gained the advantage and drove the Unionists out of the country. The latter took refuge in Kansas, but afterwards returned to Indian Territory. Since the war the Creeks have prospered. Their freedmen have been adopted as Creek Indians, and their long controversy with the Seminoles has been settled. This controversy arose partly by the mistake of United States agents who placed some of the Seminoles on Creek land, and partly from the Indian obstinacy and suspicion, which would permit no regular survey of the ground. There are in the Creek nation two factions, the Chicote party and the Sands party, but there are at present no real grounds for party difference. The tribe has a governor or head chief, and a second chief. The legislature sits at Okmulkee, and consists of a house of kings and a house of warriors. There are one supreme and five district courts. The school system is well sustained. The present Creek country is bounded N. by the lands of the Osages and the Cherokees, E. by that of the Cherokees, S. by the country of the Choctaws, and W. by that of the Seminoles, Sacs, Foxes, and Pawnees. Its area is 3,215,495 acres. The Arkansas river flows through it. They have also large tracts of unoccupied lands farther west. The Creek country is of varied character, well wooded and fertile, three-fifths of the land being arable. Cattle-raising is a leading industry. Pecan-nuts are extensively produced, but the main crops are corn, wheat, and some cotton. The Creeks have two languages, the Muskoki and Hitchitee, the latter said to be nearer to the Choctaw than to the true Creek tongue. The Seminoles use the Muskoki. The Alabamas and Coushattas have, or once had, dialects akin to the true Muskoki, and it is stated that the former once had a separate language for their women's use. Minor bands of Creek race are living in Polk co., Texas, and in Louisiana. (C. W. G.)

Creeper, a name very loosely and indiscriminately applied to numberless small tenuirostral birds of more or less scansorial habits, chiefly of the order *Passeres*, but of several different families. I. For the creepers properly so-called, see *Certhiidae*. II. The European wall-creeper, *Tichodroma muraria*, typifies a special section of the family *Certhiidae*. III. The black- and white-creeper of N. America, *Mniotilta varia*, is one of the *Sylviolidæ* or wood-warblers. IV. The honey-creeper of the West Indies and other warm parts of America constitute the family *Dacnidae*, related to the *Sylviolidæ*, but having extremely acute, decurved bills and other peculiarities; the species are numerous, chiefly of the genera *Dacnis* and *Certhiola*. The latter is specially characteristic of the West India Islands; one of the species (*C. bahamensis*) also occurs in Florida. V. The tree-creeper (*Dendrocolapidae*) are a large and varied family, of numerous genera and species, peculiar to South America. VI. Others, too numerous to mention, having the least possible affinity, were by the earlier ornithologists classed in the genus *Certhia*, and called creeper, or its equivalent in other languages. The name has thus no precision in meaning, and very little classificatory significance, in ornithology. (E. C.)

CREES, or KNISTENEAUX, a tribe of American Indians, of the Algonkin family, who occupy a very extensive district in Northern Canada, extending from Hudson's Bay to the Rocky Mountains, and in a north and south direction from Lake Winnipeg to Lake Athabasca. By the valley of the Red River they extend to the borders of the United States. Here they come into contact with the Sioux (Dakotas) and Blackfeet, with whom they long waged war.

The tribe is divided into several bands, in accordance with their localities and modes of life, as the Plain Crees, the Strongwood Crees, and the Swampy Crees

of Lake Winnipeg, the latter named being the lowest in character and condition. The Crees are a well-built and athletic race, and their women are more attractive in appearance than Indian women generally. They are friendly and hospitable in character, though some writers speak of them as arrant thieves.

Like the Indian tribes of the Southern plains the Crees formerly trusted for subsistence to the buffalo, which visited their region in immense droves. But the almost complete extinction of this animal has deprived them of their principal food, and forced them to turn to smaller game, which they formerly disdained. Agents have been appointed by the government to teach them the art of agriculture, to which some of them begin to display an inclination. The authorities of the British possessions have dealt with their Indian tribes in a very different method from the United States, and have respected their territorial claims. The Indians, in return, have surrendered all their lands but certain reservations, retaining the privilege of hunting on all unoccupied lands. The Crees have been considerably reduced in numbers in recent years, especially by small-pox, and are now estimated at something over 6000 souls.

See Vol. VI. p. 500 Am. ed. (p. 565 Edin. ed.)

CREMATION. Since 1876 the practice of cremation has made notable progress, and the movement has attained what for a long time to come must be regarded as its final stage, in which the legality of this method of disposing of the dead is admitted; and the stimulating effect of opposition or novelty being no longer felt, the extent of its practice (nowhere general) is determined by local conditions and personal preferences.

In 1878 the Cremation Society of England purchased an acre of land in a secluded part of the parish of Woking, in Surrey, with a view of erecting a crematory there after the system of Prof. Gorini. The receiver is a flat-bottomed chamber, open at each end, one end communicating with the upper part of the furnace, the other with the lower part of the chimney. The furnace, which discharges its heat into the receiver, is sufficiently spacious to produce the necessary heat by means of wood-fuel only, and the chimney is of sufficient sectional area to remove the products of combustion from the receiver as well as the furnace, and high enough to permit the draught to keep above the gases pervading the receiver, and prevent any dispersion of heat or smoke through the apertures around the receiver or cremation-chamber. A grating is placed near the base of the chimney, on which a fire of coke is kindled; thus the products of animal combustion which issue, still highly heated, from the receiver, are subjected to a higher temperature in passing through the burning coke, and such organic matter as may have resisted or escaped the first combustion is destroyed by the second and mixes harmlessly with the atmosphere. Experiments having shown that cremation was possible by this system without offence to any sense, the council of the society waited upon the Home Secretary (March 20, 1879), but were informed that, as the registration of deaths in England had always been associated with burial, cremation must first be approved by Parliament. Lack of funds compelled the society to intermit its labors for some time. In 1879 Dr. Fraser, bishop of Manchester, at the Social Science Congress, declared that cremation was "a subject which would have to be seriously considered before long, as cemeteries were becoming not only a difficulty, an expense, and an inconvenience, but an actual danger." An address, numerous signed, was brought before the British Medical Association in 1880, urging the government not to oppose the practice of cremation, and commending it to the public until some better process for rapidly resolving the body into its component elements should be devised. In 1882 the question of cremation was brought before the High Court of Justice in the case of *Williams vs. Williams*, where

Eliza Williams sued her brother, executor or Henry Crookenden, for £321, expenses incurred in carrying out the testator's expressed desire that his remains should be cremated. By a codicil to his will the testator directed that his body should be handed to her to be burned in accordance with instructions contained in a letter, and that his executors should pay her the expenses incurred. The body was buried, but Miss Williams obtained a license for its exhumation, alleging her desire to remove it to another cemetery. She then removed it to Italy, where the cremation took place. Mr. Justice Kay dismissed the action with costs, ruling that there could be no property in the dead body of a human being; that a man could not dispose by will of his remains; that the executors were *primâ facie* responsible for the proper interment of the dead body, and after death had a right to its custody and possession; and that the license for removal had been obtained illegally. The opinion was also expressed that cremation in England was not legal according to the law of the country. Upon this decision the comment is made that it would be tried severely in the case of a testator favoring earth-burial whose executors were cremationists. It may be noted, also, that the Roman Catholic Church lent the act of Miss Williams its sanction by blessing the urn containing the testator's ashes at the second burial.

On the 8th and 9th of Oct., 1882, the bodies of the wife of Capt. Hanham and of his mother, Lady Hanham, wife of the late Sir James Hanham, Bart., of Dean's Court, Dorset, were cremated there. These ladies died in 1876 and 1877 respectively, and their bodies were burned in the encasing coffins of wood and lead. Though the apparatus was most simple, the coffins being placed on iron plates and fire-brick above the furnace, a chimney 22 ft. high furnishing the draught, the process was successful in every respect. The time occupied was two hours. It may be added that it is recorded that in 1769, in obedience to the directions given in her will, the body of a Mrs. Pratt, of George Street, Hanover Square, was "burned to ashes in the new burying-ground adjoining Tyburn Turnpike;" and that about 1844 the sanction of the authorities of the city of London was obtained for the cremation, within the city of London gas-works, of the dead of Bridewell Hospital. An arrangement was also concluded for the incineration of the bodies of dead prisoners and of the offal of the markets; but the project was opposed, and the permission lapsed through non-usage.

Upon the Continent of Europe cremation has advanced much more rapidly. The Hygienic Congress which met at Geneva in 1882 approved the practice, especially in the case of serious epidemics. Italy still leads in the movement. In July, 1882, there were in that kingdom twenty-two organized cremation societies, with about five thousand subscribing members, and five "propagating commissions." Two crematories were in practical operation at Milan, and three others at Lodi, Cremona, and Varese, while a sixth was in process of construction at Rome. The total number of bodies cremated up to that date was 219. The Gorini furnace is most favored, being adapted to any kind of light and inexpensive fuel, and the cost of cremation ranges from eight francs to twenty or twenty-five. No opposition has been offered to the practice by the Catholic or Protestant clergy, and it is likely to grow in popularity on account of its economy and greater decency as compared with inhumation in the Italian cities. Garibaldi left an autograph letter expressing a wish that his remains should be burned on the island of Caprera, being wrapped in his red shirt and laid on an iron couch upon a pyre of aromatic woods. As open-air burning is illegal, his wishes were not carried out, and the repugnance he expressed during his lifetime to being "roasted in an oven like a fowl" has confirmed his friends in their reluctance to employ scientific apparatus. Germany ranks next to Italy in

the number of cremations performed and the attention paid to the general subject. Up to the fall of 1882 85 bodies had been burned at Gotha, where a crematory was erected in December, 1878, at a total cost of \$22,000, of which sum the apparatus proper represented one-fourth. According to the report of Consul Wharton; the charge for cremation is \$37.50. The bodies are placed in zinc boxes and rolled upon trucks into the "oven," where air heated to 1400° Fahr. is employed. Nine hours of preliminary preparation are necessary, and two hours elapse ere the ashes are collected, the average weight of the residuum being four pounds in the case of a woman, and six in that of a man. The ashes are delivered from the furnace, which is an economical modification of the regenerative system of Dr. Siemens, of London; they are perfectly white, and no odor is perceptible. Bodies have been sent to Gotha from different parts of Germany, from Russia, from England, and even from America. The Catholic clergy have refused to sanction the process, but no objection is offered by Protestants or Hebrews. Cremation is not yet legalized in Dresden, though several bodies have been burned there. The Berlin Cremation Society sends the remains of its members to Gotha, charging a small monthly fee, like a "funeral club." The movement has made much progress among the intelligent and well-to-do, and the cost of the process as yet prevents it from becoming popular. In the event of pestilence or war, however, it is likely that resort will be had to cremation, some such apparatus being employed as the Küborn, which receives twelve bodies at once, and can dispose of more than 200 in twenty-four hours.

Elsewhere upon the Continent the cremation movement is in a yet earlier stage. France has a society under the presidency of M. Kœchlin-Schwartz, with some 400 members, among them several very eminent men. The government, however, has refused to sanction cremation, though in the eighth year of the Republic the prefect of the Seine issued a permit to the wife of Pierre François Lachèze, the *chargé d'affaires* at Venice, allowing the incineration of the remains of their son. This permit, of which she did not avail herself, was granted upon the ground that the last rites paid to the dead constituted a religious act, the method of performing which could not be prescribed by the authorities without violating the principle of freedom of opinion. A bill to sanction cremation is soon to be introduced in the French Chambers, and it is not likely that it will fail to pass, especially in view of the crowded condition of the Parisian cemeteries, whose inadequacy to the needs of the population would be made shockingly conspicuous by any epidemic of moderate severity. In March, 1882, the municipal council of Paris, by a vote of 58 to 5, declared in favor of optional cremation and the employment of furnaces to dispose of the débris of the dissecting-rooms. Cremation has been legalized in at least some cantons of Switzerland, which possesses several vigorous societies, notably that of Zurich. Though in Austria the government has treated the representations of the advocates of incineration with official neglect, the sanitary authorities of Buda Pesth have declared in favor of legalizing cremation. In Denmark, Copenhagen possesses a large and powerful society, which expects, by undertaking to cremate bodies at a cost of \$2, or even less, to popularize the practice, funerals being excessively expensive. The Dutch Cremation Society is large and thoroughly organized, and possesses ample funds, but its efforts to obtain a modification of the burial laws of Holland have as yet proved unavailing. The subject of cremation has also been discussed in Belgium, where there is an influential society with its headquarters at Brussels. In Japan, according to Miss Isabella Bird's *Unbeaten Tracks in Japan*, the practice of burning the dead has grown in favor most rapidly since the removal of the prohibition pronounced by the government out of deference to European preju-

dices, so that about 9000 bodies are cremated annually. The coffins are placed upon stone trestles above piled fagots, tall chimneys furnishing a powerful draught and carrying off all offensive odor. The cost of cremation is about \$1. Simpler processes upon a much larger scale were adopted in 1882 to dispose of the remains of those who had perished in the epidemic of cholera.

Interest in the cause of cremation in America dates from the republication in New York, in January, 1874, of Sir Henry Thompson's paper. A cremation society was then planned in New York, but it was never fully organized and did no practical work. The movement, however, was taken up and carried on by Dr. F. Julius LeMoyne of Washington, Pa., who constructed at his own expense the first, and so far the only, furnace for cremation built in the United States. The furnace was of brick and firebrick, 10 feet long, 6 feet wide, and 6 feet high, enclosing a semi-cylindrical retort of fire-clay, the lid of which is accessible from the outside at the door of the furnace. Into this retort, after it has been properly heated from below, the body is thrust, the required degree of heat being obtained by means of a fan-blast, and the gases formed during the process of burning being carried off by a chimney. The first cremation conducted at this furnace took place Dec. 6, 1876, when the body of Joseph Henry Louis Charles, Baron de Palm, was burned in accordance with the provisions of his will. The body, which had been embalmed just after death, in May, 1876, when the performance of the funeral-rites by the New York Theosophical Society attracted no little attention, and was thus in a condition particularly favorable for incineration, was wrapped in a sheet saturated with alum, and the process of cremation was practically completed in two hours. The direct cost of the process was \$7.04, forty bushels of coke being employed as fuel. Up to the present time some forty bodies have been cremated in the LeMoyne furnace, the most notable incinerations being those of Mrs. Benn Pitman, Feb. 15, 1878; of Dr. LeMoyne, Oct. 16, 1879; and of Dr. S. D. Gross, May, 1884. Soon after Dr. LeMoyne's death it was reported that the crematory was to be dismantled, but the report proved untrue, his trustees resolving, though he had left no directions in the matter nor any fund for keeping up the furnace, to maintain it for the accommodation of believers in "fire-burial." No body is received unless it is shown that death has occurred recently and from natural causes, references and certificates to this effect being demanded. Notice is required in advance, as the heating of the furnace occupies twenty-four hours. The process of cremation takes about two hours, but from twenty to twenty-four hours must be allowed to elapse ere the retort is sufficiently cool to permit of the removal of the ashes. These weigh from five to seven pounds. The body is removed from the coffin before cremation, a sheet placed beneath it facilitating the operation. The fee charged is \$45, which includes all the expenses from the time the corpse is received at the railroad station until the ashes, in a sealed metal receptacle, are delivered to the friends. The cases thus far recorded are too few in number to warrant the student of the subject in generalizing, but it may be said that of the persons desiring to be cremated several were American-born and several women; indeed this method of disposing of the dead seems to commend itself particularly to the feminine mind as obviating the loathsomeness of decomposition. In respect of religious belief generalization would be as unsafe, but the list includes impartially members of different Protestant sects, Free-thinkers, a Swedenborgian, and a Liberal Hebrew. Besides the cremations at Washington, there should be enumerated two or three incinerations of Americans dying in Germany, who desired their ashes to be sent home, and the case of Mr. C. F. Funch, a prominent shipping-merchant of New York, who, disliking the publicity attaching to

the process in the United States, ordered in his will that his remains should be taken to Milan and burned, and the ashes subsequently interred at Copenhagen. In 1884 the trustees of the Le Moyne crematory resolved to confine its use to residents of Washington county, Pa., in which it is situated.

The New York Cremation Society (Rev. J. D. Beugless, Brooklyn Navy-yard, president), which was incorporated in March, 1881, and now contains about 150 members, may be called the only effective organization of its kind in the country, though from time to time the movement has provoked the formation of associations in other cities—notably in St. Louis and Indianapolis. Its members were instrumental in the formation of the United States Cremation Company, with the object of erecting in the vicinity of New York a crematory and columbarium of the most approved modern pattern. The contract for this building and apparatus was given out by the New York Society in 1884.

It may be added that a number of portable crematories, upon the system devised by M. Louis Creteur, of Brussels, were included in the outfit for the construction of the Panama Canal. At least this announcement was made in 1880, but the project seems to have been abandoned, as in 1882 the principal medical director of M. de Lesseps's company was found recommending the erection of permanent crematory furnaces along the line of the canal. A crematory has been erected in connection with the University of Pennsylvania at Philadelphia, where the bodies from the dissecting-room are burned: provision has been made for a similar furnace in the newest of the London hospitals.

In his pamphlet on cremation Dr. Le Moyne mentions two instances of incineration in America during the last century. The body of Henry Laurens, for some time president of the Continental Congress, was burned soon after his death at Charleston, S. C., Dec. 8, 1792, and that of Henry Berry (or Barry), of Marion county, in the same State, July 18, 1786. The pyre in the open air, such as that upon which Shelley's body was burned, was resorted to in these cases. In July, 1877, the remains of Dr. Charles F. Winslow were burned at Salt Lake City, in a furnace built for the occasion, and removed as soon as the incineration was complete. The body, wrapped in a shroud, was laid upon an iron tray and pushed into the furnace, the process of cremation occupying two hours and a half. In November of the same year Julius Kircher, of New York, employed one of the furnaces of his factory in the cremation of the remains of his son, an infant, one week old. The body, weighing 7 pounds, was reduced to 2½ ounces of white ashes. These instances, with the cremations at Washington, Pa., already mentioned, make up the list of the recorded American incinerations.

There has been a considerable increase of interest in the subject throughout the country, and it is probable that the presence of a severe epidemic would be the occasion of introducing the practice where it is now unknown. The opposition on sentimental grounds is less pronounced, while hygienic arguments in its favor have been more widely accepted.

The recent literature of cremation is comparatively scanty. Excellent bibliographical lists will be found in the *Transactions* of the Cremation Society of England (London, Smith, Elder, & Co.); Dr. Edward J. Birmingham's book, *The Disposal of the Dead* (New York, Birmingham & Co., 1881); and Mr. J. E. Williams' *Cremation* (Pittsburg, 1883), should be mentioned among American publications; and the papers which Mr. John Storer Cobb, Dr. Charles A. Siegfried, U. S. N., Dr. Charles W. Purdy, of Chicago, and several other earnest students of the subject, have contributed to periodical literature, and the *Transactions* of medical and scientific societies merit collection and preservation in a more permanent form. Dr. Purdy in particular has dealt with the economical aspects of cremation in a novel and effective manner.

(G. T. L.)

CRESSON SPRINGS, a health-resort in Cambria co., Pa., is on the Pennsylvania Railroad, 15 miles S. W. of Altoona, and at the junction of the Ebensburg and Cresson branch railroad. It is on the crest of the Alleghanies, 2200 feet above tide. The hotel accommodations are large and good. The three principal medicinal springs are called respectively the "iron," the "alum," and the "magnesia spring;" but all are ferruginous, the second strongly, and the third slightly so. The water of the alum spring is recommended as a tonic, and that of the magnesia spring as an aperient; while the iron spring is useful in certain diseased conditions of the kidneys and the mucous surfaces generally. A fourth spring is exceptionally pure, and is employed in nephritic and rheumatic cases, as well as for chronic diseases of malarial origin.

CRESTLINE, an incorporated village of Crawford co., Ohio, is at the intersection of the Pittsburg, Fort Wayne, and Chicago Railroad with the Cleveland, Columbus, Cincinnati, and Indianapolis Railroad, 60 miles west of Columbus. It has 6 hotels, 2 banks, 2 weekly newspapers, 7 churches, and 2 schools with good buildings. Its business and most important industries are connected with the railroads, which have large shops here. There are also two flour-mills, a saw-mill, and manufactures of furniture, wagons, carriages, etc. Crestline was settled in 1852, and incorporated in 1858. Its property is valued at \$1,000,000; its public debt is \$55,000. It has a park and good water-works. Population, 2848.

CRESTON, a city of Iowa, in Union county, is on the Chicago, Burlington, and Quincy Railroad, 190 miles W. of Burlington. From this place a branch road runs south to St. Joseph and Kansas City, and another north to Sioux City. The roundhouse and machine-shops of this road are also here, and extensive stock-yards. The city is lighted with gas, has a telephone exchange, water-works, and a fire department. It has 3 banks, 1 daily and 3 weekly newspapers, 6 churches, and good schools. It has also 2 flour-mills, 3 grain-elevators, and other industries. It was laid out in 1869 and incorporated in 1871. Population, 5081.

CRIMINAL LAW. Crime is an act committed or omitted, in violation of public law, either See Vol. VI. p. 520 Am. ed. (p. 587 Edin. ed.) forbidding or commanding it, and criminal law is that special form of procedure which has exclusive jurisdiction over such offences. Criminal law provides for the trial of persons charged with criminal offences, defines crimes, and prescribes the punishment to be inflicted on conviction. It inflicts punishment upon the body of the guilty, whilst civil law punishes the offender by the means of damages commensurate with the injury done.

The criminal codes both grade and classify crimes. The grades are felony and misdemeanor. Felony consists of treason, murder, arson, burglary, robbery, rape, sodomy, mayhem, and larceny. Misdemeanor comprises all offences, lower than felonies, which may be subjects of indictment. Misdemeanor is divided into two classes, *mala in se* and *mala prohibita*. *Mala in se* ("evils in themselves") are such as mischievously affect the person or property of another, or openly outrage decency, disturb the public order, are injurious to public morals, or are a breach of official duty, when done corruptly. *Mala prohibita* ("evils forbidden") are of two sorts. The first consists in the commission or omission of any act enjoined or forbidden by statute, though by such statute such omissions or commissions are not made the subject of indictment; secondly, those which consist of the omission or commission of any act which by itself is made specially indictable.

Proceedings under the criminal law are commenced by indictment, or a written accusation of one or more persons of a crime or misdemeanor presented to and preferred upon oath or affirmation by a grand-jury legally convoked. To render an indictment valid there are certain essentials and requisites, viz., the indict-

ment must be presented to some court having jurisdiction of the offence. It must be found by the grand-jury of the proper county. It must be found a true bill, and signed by the foreman of the grand-jury. It must be framed with sufficient certainty—that is, it must contain a certain description of the crime or misdemeanor of which the defendant is charged, and a statement of the facts by which it is constituted, so as to identify the accusation; it must be in the English language, and be certain as to the name of the defendant charged with the crime, for a misnomer is fatal to the indictment. So jealous is the law of the liberty of a citizen that unless the above requisites are strictly complied with, no man can be put in jeopardy of his life or liberty.

Criminal law has peculiar and exclusive jurisdiction over the following offences: (1) Offences against religion, as blasphemy and disturbing public worship. (2) Offences against the State, as treason and misprision of treason, counterfeiting or impairing the current coin. (3) Against public justice, bribery, perjury, prison-breaking, rescue, barratry, maintenance, champerty, extortion, suppressing evidence, neglect or misconduct of officers, obstructing legal process, and embracery. (4) Against public peace and trade, as challenges to fight a duel, riots, affrays, and libels. (5) Against chastity, decency, and morality, as sodomy, adultery, incest, bigamy, fornication, drunkenness, and violating the grave. (6) Against public police and economy, as common nuisances, idleness, vagrancy, and beggary. (7) Against public policy, as gambling and illegal lotteries. (8) Against the private property of individuals, as burglary, arson, robbery, forgery, larceny, receiving stolen goods, knowing them to have been stolen, and malicious mischief. (9) Against individuals, as homicide, mayhem, rape, poisoning with intent to murder, abortion, assault and battery, kidnapping, false imprisonment, abduction, and conspiracy. The penalties attached to the conviction of any person or persons are regulated and prescribed by the various statutes of the several States, and are generally in the nature of fine or imprisonment, or both, infliction of which is usually left to the discretion of the court.

The power of pardoning a criminal, in most of the States, is vested in the executive or governor, at whose discretion a person may be released from his sentence and restored to liberty and citizenship; in other States the power is vested in the Criminal Court; but in Pennsylvania the power is vested by the Constitution of 1874 in a Board of Pardons, composed of the Lieutenant-Governor, Secretary of the Commonwealth, and Attorney-General and Secretary of Internal Affairs, upon whose favorable recommendation in writing alone can the Governor issue a pardon, as is also the custom or law in the State of Massachusetts. In the several States the doctrine of the English common law is incorporated in the statute laws, as to the classification of the crime and its effects, but the punishment has been made a matter of special statutory enactment. (F. H.)

CRISIS, COMMERCIAL. Commercial crises are serious troubles in a system of exchange based on credit. During periods or in countries where credit is not employed, commercial crises are unknown; they have become frequent and serious in the present century, and have occurred most often in England, the United States, and in the north-west of the European continent; that is to say, in those lands where credit has to a great extent taken the place of metallic money.

Crises are sometimes acute, as those of 1847 and 1857, but not prolonged; sometimes they are persistent, as in 1873–1879. If we may compare these diseases in currency to those of the body, we might say that the first are of an inflammatory character, while the second resemble an anæmia. There are three sorts of crises: 1. Commercial and monetary crises. 2. Industrial crises. 3. Stock-exchange crises or *Krachs*. Although possessing many common fea-

tures, they differ sufficiently to bear being separately studied.

I. COMMERCIAL AND MONETARY CRISES.—*Their Character.*—Since the regular recurrence of crises it has been remarked that there are three periods in their development: the period of preparation, the period of expansion or “inflation,” and that of contraction or revulsion. During the period of preparation industry is active, commerce healthy, and the production of wealth abundant and regular. New capital is formed from savings. This is employed in the cultivation of fresh soil, in opening up new territory or mines, in furnishing industry with more highly perfected machinery, or establishing further means of communication between towns or countries by railways and steamboats, or, again, in building houses in towns or villages. Economic progress is thus calmly and evenly accomplished; nevertheless, in those lands where science, rendering work productive, rapidly multiplies wealth, the latter does not at once find remunerative employment. It accumulates in banks as deposits, or is offered on the money-market seeking good investments. The supply of capital is in excess of the demand, and the rate of discount falls. When money is to be obtained cheaply, a great many enterprises become possible which were not so previously. If by paying an annual interest of 2 or 3 per cent. the use of a capital of \$100 may be obtained, any investment bringing in 4 or 5 per cent. is a temptation to enterprising characters. Capital calls forth the spirit of enterprise, and the latter moves with greater or less activity, at times even becoming feverish. The period of expansion then commences. There is generally one sort of enterprise which is looked upon as the most advantageous and which absorbs public attention; for example, the colonization of the Mississippi, as in the time of Law, in France; the mines and exports of goods to the then recently liberated Spanish colonies, as in England in 1820–1825; or the railway mania, commencing in England and America in 1843–1847, and again in 1857.

The public is persuaded that these undertakings will bring in immense profits, and the shares representing them are sought for. These shares, of course, rise in the market, and those possessing them make money. As the rise continues, it is concluded that it suffices to purchase to obtain part of the profits. All spare capital is invested in the enterprise which enjoys such general favor. The more abundant the capital, the greater the rise. Who would not buy to-day with the assurance that he can sell to-morrow with profit? Why not thus enrich one's self without trouble, calculation, or risk? The circle of buyers increases ceaselessly; sometimes, as in the days of Law, it embraces all classes of the population. In such a case speculation becomes an absolute infatuation. The shares rise to fancy prices. But the result produced does not stop there. Those who have realized profits place their gains elsewhere; they invest in other values which, in their turn, rise in the market. Others prefer at once to enjoy their newly acquired wealth. They order fine furniture, elegant clothing, and commence spending lavishly. Goods in general, being more sought after, rise in price. Tradesmen and importers make money, and, in their turn, spend more freely. Fresh enterprises being started on all sides, products of all kinds are needed to advance them; machinery, vessels, wagons, rails, tools, all rise in price, and the manufacturers realize large profits. In order to execute the orders which pour in from all sides, more workmen must be employed; this demand for extra hands raises the rate of wages. Workmen, better paid, spend more, and colonial produce, groceries, and manufactured goods rise also in price, and those who manufacture or sell them make money and consequently spend more lavishly. In short, a general inflation in prices, a general growth in profit takes place; economic activity becomes overstrained. The employment of credit favors to a considerable degree this expansion and over-ex-

citement. More is bought and at higher prices. Exchanges being more numerous and the articles exchanged of greater value, there must be more means for effecting them.

When metallic money is very plentiful, a similar effect is produced; but since in this case the edifice is founded on a solid basis, that is to say, on real merchandise, there is no danger of its falling. The use of credit is, on the contrary, most dangerous, for it is based on a very fickle sentiment, *confidence*. Speculators who purchase shares, tradesmen buying goods, manufacturers purchasing raw materials or increasing their factories, operate not only with the cash they have at their disposal but with capital borrowed from banks. Further still, they buy, promising to pay, and they count on the profits they will make on the sale of their purchases to be able to do this. They obtain credit because they are trusted, and it may be that they are in point of fact generally solvent. Only by this promise they involve capital which cannot be, properly speaking, employed as a means of purchase, houses, lands, factories, which represent a value superior to the engagements they have entered upon, but which could not be immediately realized upon on the bills falling due. So long as confidence lasts and promises can be renewed, the accelerated economic movement continues. Nevertheless there is great want of proportion between the engagements undertaken and the means at hand to meet them.

The rise in the value of the principal shares cannot last indefinitely. There comes a moment when the public begin to reflect and men ask themselves, "Is what I am buying worth the price I pay for it?" This reflection is the key-note of a series of difficulties and disasters. Often an unfortunate event, a bad harvest, for instance, is the signal for the return movement; sometimes a simple change in the ordinary aspect of commercial affairs suffices. So long as the rise is believed in, without any limit being fixed, the intrinsic value of the shares does not signify; no one reflects on it; all are persuaded they will sell with profit. But as soon as a doubt arises and hesitation becomes manifest, every one seeks shelter. The number of sellers exceeds the buyers and the shares begin to fall. Some few efforts are made to stop them at the onset, but they are ineffectual, confidence is lacking, and soon the shareholders insist on realizing at any price. The fall then becomes more rapid than was the rise. Sometimes it is even a sudden collapse. No one will buy because there is no foreseeing how low the value may fall. I purchase to-day, and find to-morrow that what I bought is worth less than the price I gave for it. Nevertheless, those who have entered upon engagements must fulfil them, and they sell for the price they can obtain. Then commence bankruptcies. These begin with those houses the most deeply involved in speculation, or where the state of affairs was previously more or less compromised. But soon more stable firms are threatened or even forced to suspend their payments, because their creditors are unable to pay them. The commercial world of the present day forms a huge chain; if one of the links be snapped or broken the entire chain feels something of the shock.

Credit was the means of exchange and payment employed by all, but, in these moments of crisis, distrust is spread abroad and rightly so, for there is no knowing who will hold out against the tempest. The bounds of credit become far more limited and it is even refused entirely.

Before the crisis promises were in excess of the available means of payment. The latter are now wholly inadequate, a portion having altogether ceased to exist. Bank deposits are withdrawn, bills of exchange refused, and thus not only are money and bank-notes hoarded to meet the urgent necessities of the time being, but many credit instruments serving as circulating mediums are not renewed. It is easy to conceive what must be the result of such an accumu-

lation of circumstances. Every one wishes to sell, no one to buy; every one to borrow, no one to lend. The means for effecting exchanges ought to be increased. They are diminishing, and even metallic money is withheld from circulation. The demand for capital is pressing, even violent; men will have money at any cost: they *must* have it to fulfil their engagements and escape failure. Regulating banks, for the protection of their reserve, suddenly raise the rate of discount from 4 or 5 to 9 or 10 per cent.; 20 or 30, and sometimes, on specially dark days, 40 or 50 per cent. is asked by private bankers. The panic now reaches its height. Failures and suspensions of business may be counted by hundreds and thousands. Economic life is at a standstill because exchange, the principal wheel of the whole machinery, is stopped.

This sharp period of the crisis is not of long duration. By-and-by the panic ceases. Capital, attracted by the extreme cheapness of all securities and of goods in general, reappears on the market. Buyers also offer, and thus, little by little, prices rise. Demands for advances lessen and banks are thus enabled to lower their rate of discount. At the end of a few months, economic life has resumed its normal aspect. But industry, which has been severely attacked, suffers longer. Workmen have been discharged and the wages of those kept in employment reduced. The majority of trades suffer indirectly; there comes a reaction. It takes some time for this depressed state of affairs to right itself. This is the period of recovery. Two or three years of peaceful calm and prosperity follow, during which time the elements of a fresh crisis accumulate.

Periodicity of Crises.—The almost regular return of crises at an interval of about ten years has led to their recurrence being attributed to a sort of law similar to that which governs cosmic phenomena. A well-known English economist, Stanley Jevons, endeavored to associate the advent of crises with that of the spots which have been remarked on the sun. Mr. Jevons pretends that the crises are induced by bad harvests, and that bad harvests are caused by certain periodical modifications of the solar photosphere. All the physical phenomena observed on our planet depend in so great a degree on the action of the sun, that economic events might also be subject to the same influence; only crises are not always due to bad harvests. The link to connect them with the spots visible on the sun is therefore wanting.

The periodicity of crises is very simply explained by the series of facts we have already analyzed. It takes several years of prosperity for the elements of a crisis to be formed. Then the period of expansion occupies also two or three years. Add a similar time for the period of embarrassment and recovery and we reach a total of ten or eleven years, the space which has elapsed between the crises which have taken place during the last century. The following are the dates of the commercial crises really worthy of the name: 1763, 1783, 1793, and 1797, 1825, 1837-1838, 1847, 1857, 1864-1866.

It is well to remark that these dates refer to crises that have occurred in England. Other countries, as for instance the United States and France, were seriously affected by only one, that of 1857. It would be rather singular if the spots on the sun affected England alone!

Men are disposed to find in events those *corsi* and *ricorsi* of which Vico speaks; this flux and reflux which is, according to ancient philosophers, the rhythmical law of the universe; but the decennial cycle of crises is far from being an acknowledged fact. Economic disturbances are of frequent occurrence, and it is only by making some among them stand out in bold relief that the decennial period can be fixed upon. According to some authors there were crises in all the following years: 1793, 1795, 1797, 1810, 1811, 1816, 1825, 1832, 1837, 1839, 1840, in the spring of 1847

and the autumns of 1857, 1864, and 1866. In his celebrated speech on the Currency bill, Sir Robert Peel mentions three great monetary crises as having taken place, viz.: one in 1825, another in 1832, and a third in 1837-39. Mr. Tooke, on the other hand, entirely ignores those of 1832 and 1839, and even as regards the years 1836 and 1837 he maintains that the money-market difficulties at that time were not sufficiently serious to be designated as "commercial crises." The notion of a periodical, or I may say fatal, return of crises is contradicted by an attentive study of these phenomena, for they are brought about each time by wholly different and purely accidental circumstances. Only as Mr. Cliffe Leslie observes in some letters to the *Economist* (19th and 20th November, 1864) if this idea were to take root in the business world it might be productive of most unfortunate results and thus realize the predictions of the cycle theorists; for a belief in a decennial crisis would tend to produce one at the appointed time as a result of the false alarm, or would induce one at another moment from over-confidence in the non-existence of danger.

Theory and Causes of Crises.—Mr. Macleod, in his *Dictionary of Political Economy*, under "Commercial Crises," explains their causes as follows:

"*First.* A long-continued very low rate of interest. Persons in such times who have nothing but the interest of small capitals to live on are so strained in their means that they look out for more profitable investments. At such times wild speculators are sure to abound to take advantage of the credulous. One scheme breeds another, and a speculative fever seizes upon the public like a mania. Multitudes of schemes are set afloat for no other purpose than gambling in the shares. Numbers of persons then rush to buy the shares merely for the sake of selling them again, knowing full well that a crash must come, but hoping to make a lucky hit during the fever. Then, at last, either when calls come, supposing them ever to get to that stage, or when the circle of dupes is found to be exhausted, prices begin to waver and every one rushes to sell, and of course things fall as rapidly as they rose, and then comes the crash.

"*Secondly.* When some new, large market is opened at home or abroad, in which extraordinary gains are realized by the first adventurers, numbers then rush in and over-production takes place, and the herd of adventurers is ruined.

"*Thirdly.* A great and general failure of some great crop necessary for subsistence. The enormously increased price deranges the demand for other things; the sudden rise of price tempts great speculation, sure to be followed by enormous disasters.

"*Fourthly.* A great derangement of the ordinary course of trade from some great general cause, such as the sudden commencement or the sudden termination of a war. The sudden cessation of demand for some articles deranges the calculations of the producers of them, and the sudden demand for large quantities of others raises their price suddenly, and gives rise to immense speculations in them, which are sure to be overdone and end in general ruin.

"Each of these causes separately, if on a sufficient scale, may produce a commercial crisis; but, as several of them may happen together, it will, of course, be proportionably intensified."

In my opinion, Mr. Macleod enumerates the principal reasons for crises, but does not indicate how they are prepared. I consider that, for a true commercial and monetary crisis to break out, the three following causes are necessary:

1. The general use of credit as a means of exchange.
2. The existence of an excessive number of long-term engagements.
3. A contraction of the metallic basis of credit through the absorption of money in interior channels of circulation, or its being exported to foreign lands under the influence of an opposite balance.

The first two causes prepare the elements of the crisis, the last one determines it. Let us examine the three causes more closely.

First. In western countries, and especially in England and the United States, exchanges are effected in far more cases (90 per cent.) by the employment of credit than by the use of metallic money. Doubtless, in retail sales and purchases—which are by no means unimportant, though but little account is taken of them—metallic money is usually employed; but at the same time it is certain that nine-tenths of the important business transactions are treated on the credit system, bills of exchange, cheques, bank deposit, letters of credit, promises, etc. All these credit instruments are, in point of fact, promises or orders to pay certain stipulated sums in cash. If depositors were to withdraw their deposits from the banks, or if the holders of notes wished to convert these into coin, it would be at once seen that it would be a matter of impossibility to fulfil the engagements entered upon. Banks circulating bank-notes could no more pay them than could ordinary banks the deposits confided to them.

The immense edifice of credit rests on a metallic basis, and this basis is reduced to a minimum by banks, to whose interest it is to allow no capital to lie idle, and also by individuals who prefer paper-money to silver or even gold. Strictly speaking, we might say that the whole commercial world is in a constant condition of latent bankruptcy; for the means of payment at its disposal are wholly insufficient to meet the number of engagements contracted. Bagehot, Newmarch, and nearly all economists who have studied the fluctuations of the universal money market, are of opinion that cash is too much economized, for any noteworthy disturbance in the equilibrium of international exchanges suffices to induce an embarrassment which may degenerate into a crisis if it fall on a market overcharged and far other than steady. This danger has increased since the calling in of silver has led civilized people to contend for the only metal which now enjoys international circulation—viz.: gold. The disturbances and anxieties which agitated the money markets of the European continent, after the exceptional exports of gold to America in 1880-81, are sufficient proof of this instability.

Secondly. The second cause of the preparation of crises is the existence of a great many long-term engagements. It is quite certain that if all purchases of values or of goods were paid for in cash, or, at all events, if the means of payment were always available, heavy losses would not so often entail crises; but, as we have already seen when studying the characteristics of crises, during the period of expansion shares for many undertakings are issued and subscribed for, ready-money payments not being exacted; for, as a rule, only a portion of the capital is considered requisite when an enterprise is started. Shares and goods are purchased at high prices, and for credit, in the hope of realizing a profit later on their sale. When these term purchases become feverish, and the general infatuation induces an immoderate rise in values, the elements of a crisis may be said to exist on the market. This bursts forth on the production of the third cause.

Thirdly. The third cause is any event, either favorable or the reverse, which induces an important change in the market and leads to an absorption of cash either through the ordinary channels of circulation or through being exported abroad. The two crises of 1763 and 1783 were each time the result of the conclusion of peace. That of 1825 was induced by an excess of foreign investment; that of 1847 by the necessity to purchase corn abroad; that of 1857, which commenced in the United States, by the necessity to pay exceptional importations; those of 1864 and 1866 by the purchases of cotton in the Indies, instead of, as previously, in the United States. Large sums in silver were then, of course, obliged to be sent to the East. As Newmarch says, monetary pressure is sufficient to determine

a crisis when the elements of it already exist, because a rise in the rate of discount takes place. This rise produces a double effect—one direct, the other indirect: direct, in that it diminishes the margin of profits for silver; indirect, in that it shakes confidence. Thus the rapid expansion movement which prepares crises, the rise in prices and the excess of employment of means of credit is founded entirely on the confidence in an ulterior rise. Shake this confidence and the advance movement comes to a stand-still; the period of revulsion commences, the reflow becomes more marked; and then, if the market has been overstrained, a panic ensues and catastrophes multiply. The history of crises which we will briefly sketch is proof sufficient of the truth of these observations. Each of these disturbances was determined by the export or absorption of cash.

Monetary Contraction Crises.—These crises are quite different from those we have just analyzed. They have been less carefully studied, for, their action being almost imperceptible, they do not attract public attention, and are, indeed, denied by the majority of economists. The following is a diagnostic of this sort of crisis. When, for a local or general cause, the instrument of circulation is reduced or does not increase in proportion to the requirements of exchange, a slow but continuous fall in prices ensues. Debtors and all who are engaged in trade and industry lose through this fall in prices, and these repeated losses stop the impetus of business and paralyze economic movement. This sort of crisis has been nowhere better described than in the report addressed to the Senate of the United States, March 2, 1877, by the Monetary Commission of 1876. I think it useful to give some few extracts here:

Effects of a Shrinking Volume of Money on Productive Industry.—The worst effect, however, economically considered, of falling prices, is not upon existing property nor upon debtors, evil as it is, but upon laborers whom it deprives of employment and consigns to poverty, and upon society, which it deprives of that vast sum of wealth which resides potentially in the vigorous arms of the idle workman. A shrinking volume of money transfers existing property unjustly, and causes a concentration and diminution of wealth. It also impairs the value of existing property by eliminating from it that important element of value conferred upon it by the skill, energy, and care of the debtors from whom it is wrested. But it does not destroy any existing property, while it does absolutely annihilate all the values producible by the labor which it condemns to idleness. The estimate is not an extravagant one that there are now in the United States 3,000,000 persons willing to work, but who are idle because they cannot obtain employment.

"Money capital, labor, and other forms of capital are the warp and woof of the economical system. Labor, co-operating with the forces of nature, is the source of all wealth, and, to reach the highest degree of effectiveness, it must be classified through the aid of capital and supported by capital during the process of production and be measured and paid in money, each unit of which is a sight-draft on all other forms of property, bearing a value in proportion to the number of such drafts. In order that any country may reach the maximum of material prosperity, certain conditions are indispensable. All its labor, assisted by the most approved machinery and appliances, must be employed, and the fruits of industry must be justly distributed. These conditions are utterly impossible when the money-stock is shrinking and the money-value of property and services is declining. Howsoever great the natural resources of a country may be, however genial its climate, fertile its soil, ingenious, enterprising, and industrious its inhabitants, or free its institutions, if the volume of money is shrinking and prices are falling, its merchants will be overwhelmed with bankruptcy, its industries will be paralyzed, and destitution and distress will prevail.

"Other forms of capital must be constantly converted into money in order to pay wages and to meet other demands incident to industrial enterprises. When the stock of money is shrinking and prices are falling, this conversion can only be made at rates continually growing more unfavorable, while at the same time the products of the labor for whose wages sacrifices have been made are also undergoing a shrinkage of money-value. Thus loss and sacrifice are encountered at every turn, and the owners of other capital than money shrink from the friction of exchange, withdraw from productive enterprises, and only exchange as much of their property for money as will suffice to meet the necessary expenditures of living, which are reduced to the most economical level, as it is principal, and not income, which is being consumed. Little more labor will be employed under these circumstances than is sufficient to support the owners of capital on this parsimonious basis; and, as a consequence, the labor market will be overstocked, and the competition between laborers will reduce wages to a starvation level. But during this period, when property is being sacrificed to meet current necessities, and laborers are being remitted to idleness and destitution, money fattens on the general disaster. Under an unjust money-system, under a system which, through law or accident, fails to regulate the quantity of money so as to preserve the equilibrium between money and the other factors of production, the conflict between money and labor and other forms of capital becomes destructive and ruinous. It is in the shadow of a shrinking volume of money that disorders, social and political, gender and fester; that communism organizes; that riots threaten and destroy; that labor starves; that capitalists conspire and workmen combine; and that the revenues of governments are dissipated in the employment of laborers, or in the maintenance of increased standing armies to overawe them. The peaceful conflict which under a just money-system is continually waged between money-capital and labor, and which tends only to secure the rights of each, and is essential to the progress of society, is changed under a shrinking volume of money to an unrelenting war, threatening the destruction of both.

"The very same reasons which make capitalists refuse to exchange money, whose command over property is increasing, for property, whose command over money is decreasing, also make them refuse to exchange it for labor for the production of property. In a commercial sense, industrial enterprises are never undertaken nor carried on, except with the hope and expectation of gain. This expectation, unless under exceptional conditions, falling markets destroy. While capitalists, for these reasons, cannot afford to invest money in productive enterprises, still less can anybody afford to borrow money for such investments at any rate of interest, however low, and but little money is being now borrowed, except for purely speculative ventures, or to supply personal and family wants, or to renew old obligations. Money withdrawn from circulation and hoarded in consequence of falling prices, although neither paying wages, nor serving to exchange the fruits of industry, nor performing any of the true functions of money, is nevertheless not unproductive. It may not be earning interest, but it is enriching its owner through an increase of its own value, and that, too, without risk, and at the expense of society. If this were not the case, and if money were, while idle, losing a little in value instead of gaining, or if it simply held its own, it would be constantly diminished to the extent of the necessary expenditures of its owners, who, under such conditions, would be impelled by every instinct of thrift to seek for revenue through its employment in productive enterprises. The peculiar effect of a contraction in the volume of money is to give profit to the owners of unemployed money, through the appreciation of its purchasing power, by the mere lapse of time. It is falling prices that robs labor of employment and precipitates a conflict between it and money

capital, and it is the appreciating effect which a shrinkage in the volume of money has on the value of money that renders the contest an unequal one, and gives to money capital the decisive advantage over labor and over other forms of capital invested in industrial enterprises. Idle machinery and industrial appliances of all kinds, instead of being productive of profit, are a source of loss. They constantly deteriorate through rust and waste. They cannot escape the assessor and tax-gatherer, as the bulk of money does, and must pay extra insurance when idle. Labor, unlike money, cannot be hoarded. The day's labor unperformed is so much capital lost forever to the laborer and to society. It being his only capital, his only means of existence, the laborer cannot wait on better times for better wages. Absolute necessity forces him to dispose of it on any terms which the owners of money may dictate. These are the conditions which surround the laborer throughout the commercial world to-day. The labor of the past is enslaving the labor of the present. At least that portion of the labor of the past which has been crystallized into money is enabled through a shrinkage of its volume and while lying idle in the hands of its owners to increase its command over present labor and over all forms of property, and to transform vast numbers of honest and industrious workmen into tramps and beggars. These laborers must make their wants conform to their diminished earnings. They must content themselves with such things as are absolutely essential to their existence. Consumption is therefore constantly shrinking toward such limits as urgent necessities require. Production, which must be confined to the limits indicated by consumption, is constantly tending toward its minimum, whereas its appliances, built up under more favorable conditions, are sufficient to supply the maximum of consumption. Thus idle labor, idle money, idle machinery, and idle capital stand facing each other, and the stagnation spreads wider and wider."

Industrial Crises.—These are always produced by an excess of production in the industry which the crisis affects. The price of an object is raised from excess of demand. At once all available capital and enterprising people turn in this direction. Numerous new factories and works are opened for the manufacture of the product so sought after, and the result of this excessive production is a glut in the market. A crisis breaks out. The less important factories succumb, and finally the balance is re-established. These crises are particular to one or another branch of trade. But when they attack an important branch as, for instance, metallurgy, the reaction may affect others and lead to a general disturbance.

Stock Exchange Crises or Krachs.—The German word *krach* (crash) was first employed to designate stock exchange crisis after the one which occurred in Vienna in 1874 at the close of the International Exhibition which took place that year in the Austrian capital. They have been called "bubbles" in England since 1720, because the companies then formed for trading in the Southern seas increased rapidly, like soap-bubbles only to collapse and disappear, leaving no trace of their presence. We can sketch this phenomenon in a few lines. The public generally are strongly in favor of a certain sort of enterprise, the shares which represent it are much sought after, the price of them rises higher and higher, until a moment is reached when the rise is no longer believed in, and then all falls through. The enchanted palace created by *fata morgana* fades away. Nothing real has been destroyed, but the sharp men have made money and innocent enthusiasts are ruined.

HISTORY OF CRISES.

A rapid glance at the history of crises will ratify our theories, but here again we will keep to the divisions we have adopted:

I. Commercial and Monetary Crises. Crisis of 1763.—The termination of hostilities in 1763 brings about a sudden change in the situation of commerce. Thirty important houses in Amsterdam and sixteen in Hamburg become bankrupt. Mistrust in England is general and cash alone is accepted for payments. Business is suspended for lack of means of exchange. Adam Smith speaks of this crisis and says that the bank considerably diminished its intensity "by supporting the merchants to upwards of a million," advancing them one million sterling.

Crisis of 1783.—The close of the war with the American colonies gives rise to extraordinary commercial activity in England. The bank raises its issue from £6,000,000 in 1780 to £9,600,000 in March, 1782. The drainage of gold commences, and continues until October, when the specie is reduced to £473,000. Following the advice of Bosanquet, one of the directors, the bank acts by a violent revulsion. A crisis ensues but gold is recalled, and soon afterwards credit recovered.

Crisis of 1793.—A period of great prosperity shortly commences. The treaty of Eden with France (1783) establishes freedom of navigation and almost free trade. Commerce spreads rapidly.

	Imports.	Exports.
1782.....	£10,341,628	£13,009,438
1792.....	£19,659,358	£24,905,200

County banks multiply on all sides. It is estimated that there were 50 in 1750 and more than 400 in 1792. In the midst of this impetus commences the dispute with France and the declaration of war (1793). The panic is now at its height. There are bankruptcies on all sides. Gold is hidden and refused. A committee of the House of Commons declares that some remedy must be discovered, that the discredit of county banks is inducing the hoarding of gold, and that there is such a lack of means of exchange that a general stoppage is imminent. A bill creates £5,000,000 in *Exchequer bills* which are advanced to trade. Contemporary authors remark the effect of this measure as extraordinary. Confidence at once returned and gold reappeared. Business transactions recommenced. It was a case of gold being interiorly absorbed.

Crisis of 1795 and 1797.—In 1794 the situation is favorable, but Pitt commences paying subsidies to Continental armies to aid them to carry on war against France. Gold leaves the country very fast after the month of May, 1795. In addition to this, country banks, whose notes do not circulate very freely, obtain their gold from the Bank of England. In December, 1796, the specie of the latter is reduced to £2,508,000. The drainage of gold assumes more alarming proportions, especially during February; on the 25th of that month the specie is reduced to £1,272,000. Credit is dead. To obtain resources people sell at any price. Three per cents. fall to 51. An order from council suspends payments. A general feeling of relief is the result of this. The bank, in one week, increases its advances to £2,000,000; 4000 city houses unite to prevent the bills being dishonored; bank notes for £1 and £2 are issued, and Spanish piastres are admitted as legal tender and their value fixed at 4s. 9d. The crisis decreases, and, under the influence of enforced notes, business gradually rights itself.

Crisis of 1810.—After the year 1806 a period of expansion commences. Numerous companies are formed for breweries, canals, factories of all kinds. 720 county banks send £30,000 in bank notes into circulation, and the Bank of England raises its advances from 3,000,000 in 1808 to 20,000,000 in 1810. The remaining gold flows towards the continent. J. B. Say estimates that smuggling took £9,000 to Belgium in a very short space of time. The paper sovereign rapidly depreciates. In 1813 it is worth but 14s. 2d. In 1815

a crisis was produced through excess of speculation; country banks were the special victims in this case; 240 of them suspended payment.

In November, 1816, the Bank of England announces she will reimburse notes in gold, but during the whole of 1818 corn and goods are largely imported at high prices, the rate of exchange becomes unfavorable and gold drains away. The specie of the bank in November has fallen to £5,000,000 sterling. From this monetary pressure results a contraction of credit, a fall in value, and considerable losses on the imported merchandise. Hence failures and a crisis. The reimbursement of notes is again suspended.

Crisis of 1825.—This crisis was far more severe than any previous ones. It is remembered in England as the earthquake at Lisbon in Portugal. The fire of London could not have left a deeper impression. A period of unexampled prosperity commenced in the year 1822. The money market was overrun with funds. The bank specie rose to £12,000,000 sterling. In November, 1824, consols were at 96. General attention was turned to the new States which were being formed in America, provinces of recently emancipated Spanish and Portuguese colonies. Immense quantities of merchandise were sent out there, and large amounts of capital were employed in mines, whose shares reached fabulous prices. At the same time, in England itself, many companies were formed for the advancement of different trades and industries; the shares of these were also greatly in request. A speculative spirit was upon all classes, and every one seemed to make money. The prices of most goods increased considerably, and a great deal of merchandise was imported from abroad. This had to be paid for, and an unfavorable rate of exchange ensued. The drainage of gold commences toward the close of 1824, and continues through 1825. In December of that year the bank specie is reduced to a million sterling, and in spite of this the rate of discount was not raised from 4 to 5 until the 17th of December, when the crisis already threatened. Credit was suddenly withheld. Every one wished to sell to secure resources. The prices of goods fell 30 or 40 per cent. There was a run on the banks, and more than 80 were obliged to suspend. Mistrust was general. Factories closed and the workmen without work ransacked the machinery. Despair reigned. What was wanting was a means of payment, that which makes credit having almost entirely disappeared. The bank sent into circulation all available notes. The banker, Baring, Lord Ashburton, relates in his book, *Financial and Commercial Crises Considered*, that a bundle of a million and a half bank notes of £1 found by accident and immediately made use of were productive of great relief. The month of January, 1826, was nevertheless hard to battle through, and on the whole there were many very heavy losses.

In New York the same year there was a similar crisis. In the spring abundant means, unlimited credit, fresh undertakings entered upon, goods bought, speculations chiefly on cotton. In the month of July metal disappears from banks, the instrument of exchange becomes rare, and credit is less readily given and obtained. Discount rises from 20 to 30 per cent. Prices lower during the month of August, and failures commence. The crisis then breaks out in all its rigor.

Crises of 1836, 1837, and 1839.—In the spring of 1836 the period of expansion is at its zenith. Railway companies and county banks are started to the number of 670. But, in America, Pres. Jackson counsels an increase of circulation at the expense of small notes, and thus gold emigrates from England thither. Credit is withheld, and in 1836 there are numerous failures and bankruptcies. In 1837 England succeeds in recalling gold, and then in May a formidable crisis breaks out in the United States which lasts until January, 1838. Nearly all the banks, numbering about 700, stop payment. Cash entirely

disappears. "The distress and panic now pervading the United States," says a contemporary writer, "have never been equalled since the revolutionary war." The shares of the United States Bank fell from 118 to 98; towards the spring of 1838 gold came back from England and the crisis abated. These two great commercial countries endeavored each to secure for themselves an instrument of exchange wholly insufficient for both, by raising exorbitantly their rates of discount. In 1838 a very severe crisis broke out in France and Belgium. All recent values connected with industry depreciated ruinously. A flow of gold from England followed which lasted from the middle of 1838 till November, 1839. On the 2d of September the specie at the Bank of England had fallen to £2,406,000. They were on the eve of stopping payment. The bankers, headed by Baring, prevented this by drawing on Paris and Hamburg for £3,000,000. At the close of the year the specie had increased to £4,532,000.

The crisis was still more terrible in the United States. Cash disappeared and bank failures commenced in March in the Southern States and soon afterwards the Western were attacked, but those of New England resisted much better. In the State of New York only 4 banks out of 198 stopped payment. The final catastrophe happened on the 10th of October. The United States bank having tried all possible means to save itself was forced also to stop payment. Statisticians compute that, in 1839, 959 banks stopped payment. There were 33,000 failures, entailing a total loss of \$440,000,000. (See *BANKING*, Vol. I., p. 431).

Crisis of 1847.—The period of expansion recommenced for England towards the year 1843. In 1844 capital is rapidly flowing in, and it is necessary to find employment for it. The specie of the Bank of England exceeds £15,000,000, and the rate of discount has fallen to 2 and even 1½. The fever for fresh enterprises, especially railways, commences. The *Economist* estimates that concessions granted at that time for new lines necessitated an expenditure of 200 millions sterling. The potato disease and a bad harvest in 1846 entailed the export of a large amount of cash in the spring of 1847. In January a violent upset of credit occurs, but during the summer gold returns and the danger is considered over; towards the autumn, however, a drainage of gold recommences. The Bank of England is obliged suddenly to raise its rate of discount and the panic declares itself. The first failures are among corn merchants, the quarter having fallen from 102 shillings in January to 49 shillings in September. In October the crisis has reached its zenith. Discount is at 8 per cent., consols at 79. Works and factories close and railway contractors discharge their workmen. Misery and despair reign everywhere. Sir Robert Peel's act of 1844 regulating bank issues is suspended. Soon gold returns, but the disasters were very considerable; France, Hamburg, and the whole of Germany having suffered.

Crisis of 1857.—This crisis commenced in America. The expansion period begins in both England and the United States in 1852. It is manifest also on the continent. New companies are formed in all directions, the shares of which rise at will in the market. In the United States the spread of riches was really something marvellous, but the consequence was unusual imports of European goods which had to be paid for in hard cash in 1857. The banks, having already employed their deposits in advances to companies, were unable to resist the monetary pressure. On the 24th August they began to stop payment and continued till the 13th October, when the financial cyclone was at its height. There was a general stoppage. Discount rose to 50 and 60 per cent. The very best values were unsalable. There was no instrument of payment. The mechanism of exchange no longer worked; 5123 bankruptcies were counted, entailing liabilities amounting to \$299,000,000, but the enormous fall in all values soon brought the gold back from abroad, and on the

1st of January, 1858, the banks, with the exception of those of Pennsylvania, had recommenced their payments; to the latter three months further delay was granted.

This crisis affected England as early as the month of October, but the financial convulsion did not break loose in all its strength until November. The Bank of England specie fell to £7,000,000. On the 10th and 11th of November the money market was in almost an agony. On all sides failures upon failures. The most stable houses were in despair when the suspension of the act of 1844 eased the market a little, but the consequences were most disastrous for industry. Hundreds of thousands of workmen were without employment. Thence coalitions, riots, and alarming increase of pauperism. The crisis then reached successively France, Hamburg, and the Scandinavian States; these all suffered cruelly. Germany, Austria, the north of Italy, Batavia, Singapore, Buenos Ayres, Valparaiso, and all South America then fell victims. The financial cyclone went round the world sowing ruin everywhere. This remarkable phenomenon proves clearly how nearly the solidarity of nations is completed at the present day.

Crises of 1861 to 1864.—The crisis of 1861, which affected the English market in January, and the French in the autumn, was brought on by England having to pay a heavy balance in favor of the United States. This took all the gold from the bank. The rate of discount was raised in February to 8 per cent. in order to get back cash. In 1863 and 1864 purchases of cotton in the Indies caused a disturbance on the European market. The war of secession in the United States preventing the export of American cotton, it became necessary to have recourse to Egypt and India; and these countries, not accepting goods in return, had to be paid in silver. England bought silver from France, paying for it in gold, but there was a continual struggle between the two countries as to which should be left to pay the balance for Europe, and each was alternately raising the rate of discount. Hence constant disturbances, reductions in bank specie, interest varying constantly between 6, 7, and 8 per cent. Serious difficulties arose and numerous failures took place; then came a stagnation in business; but no convulsions like those of 1825, 1847, and 1857. It was a mere struggle for cash, but was none the less most disastrous. The crisis of 1873-79 belongs to the following category.

2. *Monetary Contraction Crises.*—Mr. Francis Walker has studied the effects of an increase or a diminution of metallic money in his work entitled *Money, Trade, and Industry* (1879). In an extract from the report of the monetary commission of the Senate of the United States, reprinted above, a description of the contraction crisis which occurred in the United States from 1873 to 1878 is to be found. I have endeavored to describe the crisis from which Europe suffered during this period in my *Battle of Standards* (London, 1881). In my opinion a slow and unperceived crisis hung over Europe from 1816 to 1850, resulting from the fall in prices. From *Commonplace Fallacies Concerning Money* I repeat the following: "The effects of a slow and steady reduction of the stock of money are of a different character. They come into operation almost insensibly, being unaccompanied by any violent disturbance. Indeed, the cause of the evil is usually ignored, or else disputed. Instead of a burning fever it is a decline with which the social body is afflicted. A crisis of this description first occurred in the period 1816-1840, and it has been repeated from 1873 to 1880. Each was brought about by identically similar circumstances. They may be thus specified—1st, insufficiency of the production of the precious metals; 2d, exceptional demand for gold. Let us examine the facts. First, from 1816 to 1822, England, abandoning paper money, established the gold standard, and took from the general circulation

of the world £20,000,000 sterling. This was an immense sum for that period, for it corresponded to ten times the then annual production. Secondly, the average annual production, which was, from 1801 to 1810, 259,000,000 fr., fell from 1811 to 1820 to 159,000,000 fr., sank still further to 151,000,000 fr. from 1821 to 1830, and amounted only to 202,000,000 fr. in the period from 1831 to 1840. In the years following 1873, the United States, Germany, and the Scandinavian States, by adopting the gold standard, absorbed £100,000,000 of gold. The production of both the precious metals taken together has not decreased; but silver, being no longer received in any mints, save for the currency in India, the monetary stock has had to be fed by gold alone, the production of which has diminished by one-third. The annual influx into circulation of the precious metal has thus fallen one-half—viz., from £40,000,000 to £20,000,000. Added to this, during these last three-and-a-half years America has taken from us £50,000,000 of gold. These three circumstances combined produced subsequently to 1873, as they did also after 1816, a monetary contraction. It is a phenomenon exactly the reverse of the expansion after 1850 which has been neglected by economists, though striking references to it are to be found in different works, notably in Alison's *England in 1815 and 1845, or a Sufficient and a Contracted Money*; in D. Lubé's *Argument against one Gold Standard*, for the period 1815-1836; and for the period following 1873 *Report of the Monetary Commission of the Senate of the United States*, 1876; Dana Horton, *Silver and Gold*; F. A. Walker, *Money, Trade, and Industry*; R. Giffen, *The Recent Fall in Prices* (in the *Journal of Statist. Soc.*, March, 1879)."

The following are a few passages from these writings: "Is there one man of sense and reflection whose mind is not sometimes occupied, and whose imagination is not startled by the actual and prospective state of the country? The monetary standard of England was what it is now and has always been throughout the rest of Europe—silver. Monstrous and incredible delusion! We are now told that the question is settled forever. But with a gold standard, circulation cannot increase; so it opposes an effectual barrier to all improvement. By the gold standard the currency has been reduced below the point that would afford remunerative prices with the present taxes."—*Argument against One Gold Standard*, D. Lubé, M.A., Trinity College, Dublin. In 1832 Lubé strongly advocated the silver standard.

This is what Sir Archibald Alison says on the subject of monetary contraction: "The distress among the mercantile classes for years after the dreadful crisis of 1825, of the agricultural interest during the lowering of prices from 1832 to 1835, and of the whole community from 1835 to 1842, was extreme. The investment of capital in agriculture was, during this distress, everywhere grievously abridged, and in many places totally annihilated. Ireland, during the whole period, has been in a state of smothered insurrection. The heart sickens at the evidence, numerous and incontrovertible, which the Parliamentary reports for the last ten years have accumulated of widespread and often long-enduring suffering amongst the laboring poor of England." After having described the progress of this state of things Alison adds: "Some external cause must therefore have paralyzed and blighted the wealth of the country, in the midst of such an increasing growth of the national resources. Since the Peace, the all-important question arises, what was it which had this effect? The answer is, it was the contraction of the currency which was mistakenly made to accompany the resumption of cash payments by the bill of 1819 that has been the chief cause of all these effects." Alison gives a perfectly complete description of the unfortunate results of the monetary contraction, the real cause of which generally passes unobserved. "It is as difficult," he says, "to get the great bulk of men to understand that it is the currency itself that is shifting in value when great changes of price are going on around it, as it is to make them comprehend that the earth is moving rapidly through the heavens."—*England in 1815 and 1845; or, A Sufficient and a Contracted Money* (1846), page 51.

3. *Industrial Crises* are not treated here because they are apart from the present subject. English and American history offer numerous examples of them.

4. *Stock Exchange Crises or Krachs.*—The most remarkable were the Tulip mania in 1634–1638 in Holland, the Law mania in 1716 in France, and the *South Sea Bubbles* in 1718–20 in England. Of recent years may be mentioned the Vienna Krach in 1874, and the Boutoux Krach in 1882 in Paris. We will be brief. The passion for gambling and the desire to make money without any effort lead men to commit the same follies at different periods. They purchase at any price with the hope of selling higher and gain until suddenly everything gives way—the crash or “Krach” arrives.

In 1734 tulips were a *furor* in Holland: every one would have them, and the bulbs of this flower, brought from Adrianople by Busbeck in 1554, became objects for speculation. A regular market was opened up for them as for the public funds. Their value continued to increase, and all who purchased made money—a stock-jobbing fury seemed to have seized upon all classes of the population. Certain varieties, as for instance the *semper augustus*, were quoted at some thousands of florins, and peasants sold their land to buy tulips. Strange to say this mania lasted four years. When the awakening from this golden dream came the number of law-suits and of people ruined was countless. It was a general upset of fortune and capital.

In 1716 the Scotchman, Law, came to France under the regent's protection, and founded a bank like that of England, which has proved quite a success. Not content with that, he then started a Western Company for the Colonization of the Mississippi, and an Eastern Company for the Monopoly of Indian Commerce; and, finally, he issued shares for the conversion of the national debt and for undertaking the administration of the government taxes, which was to be placed in the hands of trustees. Six hundred and twenty-four thousand shares were issued at 500 livres each—at the same time 1,700,000 livres in bank notes were also issued for the purpose of buying up all the shares. The movement then became almost dizzy, and the market unnaturally inflated. In January, 1720, the shares of 500 livres were sold at 18,000. Shortly after the fall commences, and is most precipitate. Shares and bank notes are soon valueless!

At the same time the mania of the *South Sea Bubble* was raging in England. In 1711 the English Parliament authorized the formation of a society in favor of the state's creditors, which should be allowed to carry on a privileged trade in South American waters. Like Law this company undertook to reimburse and convert a portion of the national debt, and to effect this shares were issued which were soon feverishly sought after by speculators. As these shares rose to three or four times their nominal value numbers of persons gained much and quickly. Companies were then started on all sides and for all sorts of ends, frequently the most senseless imaginable. These starters of new companies asked one pound, and sometimes only one shilling, a share. Thus, with but a small sum, one could speculate in many different values. In London, as in Paris, all classes were drawn into the vortex. Change Alley, where the stock exchange was situated, presented the appearance of the Rue Guenampoix in Paris; in spite of a Parliamentary bill forbidding the formation of new companies, in spite also of the collapse of Law's system, which has just taken place (1720), the stock-jobbing fury amounted to absolute madness. For instance, newspapers advertised companies which requested so many millions “for a most promising undertaking, the object of which would be made known later.” Subscriptions poured in. The shares of the South Sea Company rose to 1050, and even those which represented nothing were at par.

The better to concentrate all available speculative resources on their own shares the South Sea Company induced the House of Commons to interdict by a *scire*

facias all creations or purchases of *bubbles*. This measure was disastrous. It proved the signal for realization. The fall then became far more rapid than had been the rise. Of all these companies scarcely one remained. An inquiry ordered by the House of Commons revealed countless forgeries committed by the directors of the South Sea Company. The consequence of this almost unexampled Krach was a tedious and painful depression in business.

Suggestions for the Prevention of Crises.—As there are three principal causes producing crises, so there are three remedies, each one applicable to a different cause.

1. Not to allow the metallic basis of circulation to become too much reduced. The most eminent financial men in England, and the Presidents of the United States who have specially studied the currency question, unanimously advocate an increase in cash which is the metallic basis of credit. And in point of fact France, where the metallic circulation is relatively two or three times more considerable than in England or the United States, has suffered much less from crises. The losses entailed by these crises, and even the monetary pressure so frequent in these two countries, costs far more to trade than the saving made on cash. The application of this remedy rests with the governments who can forbid the circulation of notes for small sums.

2. During the period of the expansion, not to join in the general movement and purchase shares or goods on credit. This remedy, of course, rests with individual prudence.

3. To raise from time to time the rate of discount. A failing in the observance of this rule greatly increased the violence of the crises of 1825 and 1847, and its application has prevented more than one of late years. This remedy is by no means agreeable to trade, but its disadvantages are nothing by comparison with the disasters it prevents.

Science, by studying the causes of phenomena, and wisdom, by applying the remedies indicated by science, may do much to prevent or, at all events, to mitigate the economic evils from which nations suffer. (E. L.)

CRITTENDEN, a family of Welsh descent, residing in the State of Kentucky, and prominently connected with the political and military history of the United States.

I. CRITTENDEN, JOHN JORDAN (1787–1863), a lawyer and statesman, was born near Versailles, Woodford co., Ky., Sept. 10, 1787. His father, John Crittenden, resided at first in Virginia, and was a major in the Revolutionary War, but settled in Kentucky at the close of that struggle. John, his eldest son, was educated in Virginia, and graduated at William and Mary College in 1807. Having studied law, he began the practice of his profession in his native county, but soon removed to Russellville, where he obtained a prominent place at the bar and great personal popularity. Like all talented young men of his State and time, he took an active part in politics. In 1809 he was appointed attorney-general of the Territory of Illinois, and two years later he was elected to the Kentucky legislature. His adventurous spirit also led him to join some expeditions against the Indians, who still gave trouble to the border settlements beyond the Ohio, and in the invasion of Canada in 1813 he was first brought in contact with Gen. Wm. H. Harrison, who, at a later date, when President of the United States, appointed his comrade-in-arms one of his Cabinet. In 1817, Mr. Crittenden, while Speaker of the Kentucky legislature, was chosen by that body to a seat in the United States Senate. Though the youngest member, he immediately acquired high reputation by a pathetic appeal in behalf of the unfortunate Gen. Arthur St. Clair, who presented a petition for payment of the arrears long due him. Crittenden was a supporter of Monroe's administration, but in 1819 he resigned his position in order to devote more time to the practice of his profes-

sion. He then settled at Frankfort, the State capital, and soon had great success through his power of working upon the feelings of jurors. The same qualities made him an effective stump-speaker, and as he did not renounce local office he was called frequently to serve in the legislature, and was generally chosen Speaker. In the violent controversy caused by the legislature's reconstruction of the court of appeals after the latter had pronounced a certain stay law unconstitutional, Mr. Crittenden was a conspicuous member of the Old Court party. He assisted in settling the boundary between Kentucky and Tennessee.

In 1827, Pres. John Quincy Adams, a man in whose character and career we may trace some points of resemblance to Mr. Crittenden's, appointed him district attorney for Kentucky, and a year later nominated him as a judge of the Supreme Court of the United States, but the Senate did not confirm his nomination. Pres. Jackson, in carrying out his policy of removing from office all friends of the former administration, did not overlook Mr. Crittenden, and from 1829 to 1834 the latter was engaged exclusively in the practice of his profession. He was then appointed secretary of state for Kentucky, and in the following year was again elected to the United States Senate. He had on previous occasions refused to permit his name to be used when his friend Henry Clay was a candidate. As there was at that time a surplus in the national Treasury, he advocated the distribution of it among the several States. In the main he adopted the system of the great Kentucky statesman, which included a protective tariff, a national bank, and internal improvements by the general Government. In Aug., 1840, at the South-western Whig convention in Nashville, both Clay and Crittenden set forth these principles with matchless eloquence and decisive effect. Gen. W. H. Harrison, the candidate of the Whig party, was elected to the Presidency, and appointed Crittenden Attorney-General in his Cabinet. After Harrison's death it became evident that Tyler would not carry out the ideas of the party by which he was elected, and the members of the Cabinet, except Daniel Webster, sent in their resignations. Crittenden was soon restored to his place in the Senate, being appointed by the governor of Kentucky to succeed Henry Clay when that statesman resigned in March, 1842, with the intention of retiring from public life. A year later the legislature elected Crittenden for a full term. The schemes for the annexation of Texas were then vigorously prosecuted by the extreme Southern politicians, but Crittenden, though representing a slaveholding State, resisted the movement. When at last war was declared against Mexico, he gave hearty support to all measures necessary to secure victory. At the close of the war, being convinced that his friend Clay could not be elected to the Presidency, he supported the claims of Gen. Zachary Taylor to nomination by the Whigs, and prepared a statement of principles which, when embodied in a letter by the general, formed the basis on which the campaign was conducted. As Mr. Clay had continued to seek the nomination, this act produced an estrangement between the old friends which terminated only a few days before Mr. Clay's death in 1852. The Kentucky legislature then appropriately selected Crittenden to deliver the address in memory of that great statesman. The oration was one of his most eloquent, and did ample justice to the eminent talents, patriotism, and love of liberty of the greatest of Kentucky's public men.

In 1848, Crittenden resigned his seat in the Senate to become governor of his State. In 1850, when Millard Fillmore succeeded to the Presidency, Crittenden again accepted the position of Attorney-General, which he held till 1853. About this time a new party rose into prominence, urging the danger to American institutions from the rapid influx of foreigners and from the growing influence of the Roman Catholic Church. Its leaders, among whom Mr. Crittenden

was the most prominent, called upon the people to elect only native-born Americans to office. This party was strongest in the border States, and by it he was again elected to the Senate in 1855. But another agitation on the ever-recurring question of the extension of slavery soon absorbed all the energies of the statesmen of the country. Crittenden steadily opposed the pro-slavery policy of Presidents Pierce and Buchanan. His special course had but few supporters outside of the border slave States, and this was further seen in the presidential election of 1860, when Bell and Everett, the compromise Union candidates, whom he favored, received the electoral votes of but three States, Kentucky, Tennessee, and Virginia. In vain for years did the veteran statesman, faithful to the traditions among which he had been reared, implore and beseech each side in turn to try again the devices which had satisfied their fathers and had for a time mitigated the inherent evil of their institutions.

Abraham Lincoln was now elected, and the extreme Southern leaders at once made preparations in their respective States for secession. To avert this calamity, Mr. Crittenden, in Dec., 1860, presented in the Senate resolutions proposing that certain constitutional amendments should be offered to the States. They re-established for the Territories the line of 36° 30', prohibiting slavery north and allowing it south of that line, admitted new States with or without slavery as their respective constitutions might provide, and made provision for enforcing the fugitive-slave laws which had become odious to the North. These resolutions, known as the "Crittenden Compromise," though supported by numerous petitions from all parts of the country, were not acceptable to either of the great parties. Their author ineffectually tried to induce Congress to provide a method by which they might be submitted to a popular vote. His sixth term as Senator expired in March, 1861, and when he presented the credentials of his successor, John C. Breckinridge, he delivered an impressive farewell speech. He was, however, elected to the lower House in June, and the War of the Rebellion having already begun, he presented resolutions defining its object on the part of the general Government to be simply the maintenance of the Union, without interfering with the rights or institutions of the several States. These resolutions were almost unanimously adopted, but as time passed on, and the necessity for vigorous and radical measures was felt by Mr. Lincoln's administration, Mr. Crittenden became conspicuous as an opponent of the methods employed for the suppression of the rebellion. He opposed the employment of negroes as soldiers; he objected to the formation of the State of West Virginia; finally, in his last speech in Congress, Feb. 22, 1863, he declared that the Government had broken its pledges and diverted the war from its original and proper object to the abolition of slavery. On his return to Kentucky, though in ill-health, he again became a candidate for Congress, but died suddenly at his home, near Frankfort, July 26, 1863. A monument to his memory, erected by the State of Kentucky, stands in the cemetery of Frankfort.

Mr. Crittenden was of spare figure and medium height, with a rather homely face, strongly marked with lines of thought. In speaking he was earnest and copious, yet often displayed a timidity at the beginning of his most effective addresses. Though an able advocate, he was not a profound lawyer. In social intercourse he was affable, generous, and dignified. Born in the year of the formation of the Federal Constitution, he was the last survivor of the distinguished statesmen of the second generation since its adoption. Full of reverence for that document, and firmly believing that the Union could be preserved only by a succession of compromises, he continued to the last to urge the application of palliating remedies which could never reach the seat of the disease of the body politic. However ineffectual were his efforts to prevent the calamities of civil war, it cannot be denied

that when the conflict did come his influence and earnest appeals saved his native State from plunging into secession, and kept its government faithful to the Union.

His daughter, Mrs. A. M. Coleman, has published *The Life of John J. Crittenden, with Selections from his Correspondence and Speeches* (Phila., 1871).

II. CRITTENDEN, GEORGE BIBB (1812-1880), a major-general in the Confederate army, was the eldest son of the preceding, and was born at Russellville, Ky., March 20, 1812. He graduated at West Point in 1832, and was made a lieutenant of infantry. He resigned a year later, and studied law with his father in Frankfort, Ky. In 1846 he again entered the army as captain of mounted rifles, and in the war with Mexico was conspicuous for gallantry. After the battles of Contreras and Churubusco he received the brevet of major, and in 1848 was made full major. In 1856 he was promoted to be lieutenant-colonel. At the outbreak of the Civil War he was stationed in New Mexico, but resigned with most of his fellow-officers, and returned to his home in Kentucky. Later in the year 1861 he entered the Confederate service, and being appointed major-general was active in endeavoring to establish the power of the Confederacy in his native State. He was engaged in the battle of Mill Spring, Ky., Jan. 19, 1862, and after the death of Gen. Zollicoffer, who had the chief command on the Confederate side, drew off his troops and retired from the State. He was not prominent in the remainder of the war. In Feb., 1870, he was chosen by the Kentucky legislature as State librarian. He died at Danville, Ky., Nov. 29, 1880.

III. CRITTENDEN, THOMAS LEONIDAS, an American general, was born at Russellville, Ky., in 1819. He is the second son of Hon. John J. Crittenden, and studied law with his father. When the war with Mexico commenced his adventurous spirit led him to join the army. He served as volunteer aide to Gen. Zachary Taylor at the battle of Buena Vista, Feb. 22, 1847, and brought the despatches to Washington announcing the victory. Returning to his native State, he was appointed lieutenant-colonel of the Third Kentucky volunteer infantry, and proceeded to join Gen. Scott's army in its march to the city of Mexico. On the accession of Gen. Taylor to the Presidency in 1849, Col. Crittenden was sent to England as American consul at Liverpool, and on his return, four years later, he engaged in mercantile pursuits in Louisville. In 1860 he was made a brigadier-general of the State Guard, and when Gen. Buckner resigned his position as inspector-general of the State troops, Crittenden succeeded him. In Sept., 1861, he entered the Union army as a brigadier-general of volunteers, serving at first under Gen. Robert Anderson, and afterwards under Gen. D. C. Buell. He commanded a division at the battle of Shiloh, April, 1862, and was promoted to be major-general of volunteers for meritorious service. He commanded an army corps under Gen. Buell, and was at the battle of Perryville, Oct. 9, 1862, though not closely engaged. When the Army of the Cumberland was formed under Gen. W. S. Rosecrans, Gen. Crittenden had command of one of the three divisions. He rendered effective service at the battle of Stone River, Tenn., Jan. 1, 1863. He accompanied Gen. Rosecrans in his march to Chattanooga, commanding the right wing of the army. At the battle of Chickamauga, Sept. 19, 1863, he detached two of his divisions and sent them to the aid of Gen. Thomas, thereby disconcerting the plans of the enemy. His remaining division, while changing its position in order to engage more actively in the fight, was cut in two by a Union battery retreating. The enemy, following close, prevented his troops from reuniting, and Gen. Crittenden was separated from the main body. Being left without support, and finding he could render no service there, he returned to Chattanooga. He was relieved of his command Oct. 10, 1863, but a court of investigation was afterwards appointed, and he was honorably acquitted, his conduct being highly commended. In the first campaign against Richmond in 1865 he commanded

a division of the Ninth corps, and at the close of the war he was made a brigadier-general by brevet in the regular army. He afterwards resigned, and in Jan., 1866, was appointed treasurer of the State of Kentucky. This position he resigned in Nov., 1867, to become a colonel in the regular army. (J. P. L.)

CROCKETT, DAVID (1786-1836), an American hunter and humorist, was born at Limestone, Tenn., Aug. 17, 1786. Having run away from home when he was about twelve years of age, he associated with drovers till he was eighteen. He then returned, went to school for two months, soon after married, and went to live in the wildest parts of the State. In 1813 he was among the hunters who served under Gen. Jackson in the war against the Creeks. Returning, he settled on Shoal Creek, in a lawless neighborhood, where he was soon elected a magistrate. He was a member of the legislature for three terms, still continuing to live as a hunter. In 1827 he was elected to Congress as a friend of Jackson, and attracted much attention by oddities of dress and language, which were soon found to cover good common sense. He was re-elected in 1829 and 1831, but in the mean time had become an opponent of Jackson's administration. He was afterwards one of the Tennesseans who flocked into Texas and took part in her contest for independence. At the siege of Fort Alamo, in San Antonio de Bexar, he was one of the six who last defended the fort, but were put to death by order of Gen. Santa Anna, March 6, 1836. Several books relating his exploits and eccentricities have been published, and his *Autobiography* was issued at Philadelphia in 1834, and republished in New York in 1882.

CROFTON, SIR WALTER FREDERICK, C. B., an English prison reformer, was born at Courtrai, Belgium, in 1815. He is the son of Major Walter Crofton (killed at Waterloo), and was educated at Woolwich Military Academy. He entered the royal artillery in 1833, and retired as captain in 1844. Becoming a magistrate in Wiltshire, he gave much attention to prison and reformatory subjects. In 1853 he went to Ireland as commissioner to inspect the state of the prisons, and in the next year was made chairman of the directors of convict prisons there. The system of progressive prison treatment and supervision of habitual criminals introduced by him was remarkably effectual in procuring their reform. As a part of this system intermediate prisons were established, consisting of cottages on farms, in which convicts were gradually prepared for using their freedom properly. This plan, commenced in 1856, has since been approved by the highest authorities on prison discipline and management in Europe and America. It has been adopted in Denmark and some other places on the continent of Europe. When reformatory schools were established in Ireland in 1859, the supervision of these was added to Mr. Crofton's other duties. In recognition of his valuable services the honor of knighthood was conferred on him when he resigned his office in 1862. While engaged in Ireland he had also carried out reforms in the Marshalsea debtors' prison, rendered famous by Dickens. In 1865 he established in England a refuge for female prisoners similar to the intermediate prisons. By frequent addresses and pamphlets in advocacy of his ideas, with the indorsement of many prominent persons, he succeeded in creating a public opinion on the proper treatment of criminals which led to the enactment of various laws on the subject. By these many serious evils previously existing have been entirely abolished. After the passage of the Prisons' Act (1865) he was engaged for three years as commissioner in seeing it properly carried out. He also assisted Miss Mary Carpenter in having the benefit of his reforms extended to India. In 1868 he was appointed a privy councillor in Ireland, and had further facilities for his favorite work. He also embraced the opportunity to introduce the industrial-school system which recently had been put in operation in England. In 1870 he retired from his position, but

in 1877 again became for a year chairman of the prison board in Ireland. The merits of his work and his valuable experience have caused his advice to be sought throughout the civilized world, and he has received several marks of honor from foreign countries. The *Transactions* of the British Social Science Association since 1856 contain numerous suggestions from him on matters tending to the prevention of crime and the reform of criminals.

CRONHOLM, ABRAHAM PETER, a Swedish historian, was born Oct. 22, 1809, in Carlskrona. He became professor of history in Lund in 1849, but retired in 1855 in order to devote himself exclusively to literature. He has published a large number of historical works, which give evidence of great industry and careful investigation of original sources. The most important are *Väringarne* (1832); *Forn-nordiska Minne* (1833-35); *Skånes Politiska Historia* (1847-51); and *Sveriges Historia under Gustaf II. Adolfs Regering* (1847-64).

CROOK, GEORGE, an American general, was born near Dayton, Ohio, Sept. 8, 1828. He graduated at West Point in 1852, and at once began his service on the western frontier. On the outbreak of the civil war he was captain in the Fourth Infantry, but in September, 1861, was made colonel of the Thirty-sixth Ohio Volunteers. He served with distinction in West Virginia, and with 1300 men defeated a large body of Confederates at Lewisburg, April 23, 1862. He was made brigadier-general Sept. 7, 1862, and had command of the district of Kanawha. He took part in the campaign in Northern Virginia and Maryland, and was engaged in the battles of South Mountain and Antietam. In January, 1863, he was placed in command of the Second Cavalry division of the Army of the Cumberland, and fought at Tullahoma and Chickamauga. In April, 1864, he returned to West Virginia, and defeated and killed Gen. Jenkins at Cloyd Mountain, May 9. For this and other services he was made brevet major-general of volunteers. He was conspicuous in Sheridan's campaign in the Shenandoah Valley, fighting at Opequan, Fisher's Hill, and Cedar Creek. In 1865 he was in command of the cavalry of the Army of the Potomac, and was captured Feb. 21, 1865, by guerillas, who surprised his quarters, but was exchanged March 20. He was afterwards engaged in the operations which resulted in the surrender of Gen. Lee's army. At the close of the war he was placed in command of the district of Wilmington, N. C., and in 1866 was transferred to the district of Idaho, his rank at this time being lieutenant-colonel of the Twenty-third Infantry, with the brevet of major-general. In Idaho he spent six years in active operations against hostile Indians. His valuable service as an Indian fighter then caused him to be placed in command of the district of Arizona, where the Pi-utes and Apaches were giving trouble. In the summer of 1883 he completely reduced these tribes, pursuing them to their stronghold in the mountains of Mexico. In October, 1873, he was promoted to the rank of brigadier-general.

CROOKES, WILLIAM, F. R. S., an English chemist and physicist, was born in London, June 17, 1832. He studied in the Royal College of Chemistry, and in 1855 became an instructor in the Science College, Chester. In 1859 he founded the *Chemical News*, of which he is still the proprietor and editor. In 1864 he became editor of the *Quarterly Journal of Science*, which was afterwards changed to a monthly. He early engaged in original research, his first paper "On the Seleno-Cyanides" being published in 1851. In 1861, by means of spectrum analysis and chemical reactions, he discovered the metal thallium, and in subsequent years fully investigated its properties and compounds. For this discovery he was in 1863 elected a Fellow of the Royal Society. In 1865 he discovered the process of separating gold and silver from their ores by sodium amalgamation. In 1872 he was led by his experiments

in determining the atomic weight of thallium to consider the subject of repulsion resulting from radiation, and invented the radiometer, which he afterwards modified as the otheoscope. He was engaged at the same time in examining the physical phenomena of modern spiritualism, and having become convinced of the existence of force exerted by an intelligent, disembodied agency, he announced his conclusions in his *Researches in the Phenomena of Spiritualism* (1874). He also pursued a course of investigation in regard to the properties of matter in a vacuum, and published some of the results in his *Molecular Physics in High Vacua* (1879). He claimed to have discovered a fourth state of matter, the ultra-gaseous, in which the molecules are not in contact as in a liquid or gas, but isolated. In recognition of his discoveries the French Academy of Sciences gave him in 1880 a gold medal and a prize of 3000 francs. Mr. Crookes has also given much attention to the applications of chemistry in the arts, and has published treatises on the *Manufacture of Beet-Root Sugar in England*, on *Dyeing and Calico-Printing*, and has translated and edited many important German and French works on chemical subjects. He is also an authority on sanitary questions, especially the disposal of city sewage, on which he has published some pamphlets. In 1866 he made a report to the British government on the use of disinfectants in the cure of the cattle-plague.

CROP REPORTS. This article will treat more especially of the history, purpose, value, philosophy, and causes of inaccuracy of agricultural statistics and "crop reports," and of the distinction between the two. The actual statistics of the agricultural products of the United States and of the different States will be found under the head of "United States" and of the several States.

Brief History of Statistics.—In 1753 a bill was introduced in the English Parliament to secure a census; but it met repeated defeat for nearly half a century, and not until 1801 was the first census actually taken. For thirty years the published statistics were simply returns made to Parliament without any system or regularity. In 1832 a statistical department was created for the purpose of systematizing returns and publications. This bureau was in connection with the board of trade. Subsequently statistical bureaus were added to several other departments, and much confusion and duplication or neglect of returns resulted, so that in 1877 a royal commission was appointed to simplify and systematize the whole body of statistical returns. Their work covered a period of four years, and their exhaustive report still awaits the action of the government.

From the first the farmers of England were hostile to the publication of agricultural statistics. They were suspicious that it would increase taxation and rents, a fallacy still common; the fact being that accurate statistics simply *equalize* and *properly apportion* the burdens of taxation. Nearly a score of schemes were proposed, and were either dropped or, on trial, rejected as impracticable. One scheme of Mr. Poulett Thompson, president of the Board of Trade, was to collect information through the clergy. Printed forms were prepared similar to those now in use, asking for acreage and yield of various crops, number of different kinds of stock and the like, and sent to the clergymen of Bedford county; only 27 out of 126 made any returns. In 1853 an experiment was made through the Poor-law Board in two English counties, and through the Highland Society in three Scottish counties; and the next year in eleven English and Welsh counties and in the whole of Scotland. The work was a partial failure in England through prejudice against the Poor-law Board, and was discontinued after two years. It was continued in Scotland until disturbed by a quarrel over the patronage involved. The treasury asserted its right to appoint the collectors and audit all accounts. The society desired both, and

settled the dispute by stopping the work. The same questions have arisen everywhere and always since, and only where the Agricultural Bureaus have been measurably free from the domination of political intrigue have they had any real vigor.

The success of this Scottish experiment showed the value of agricultural statistics and the feasibility of collecting them. It also diminished the prejudice against them, and after much discussion and effort the president of the Board of Trade obtained from Parliament, in June, 1865, an appropriation of £10,000 for the collection of agricultural statistics. The same month the rinder-pest appeared in England, and the measures used to prevent and check this pest, and the plan of compensating those whose stock was slaughtered to prevent its spread almost necessitated a cattle census. And yet so strong was the fear that it would increase individual taxation that it was necessary to state expressly, on the schedules or blanks, that "the number of live-stock belonging to individual persons would not be divulged." The returns were published in May, 1866, and were widely circulated among the farmers, both to impart the information contained and to convince the farmers that they contained nothing that could injure individual interests; and gradually the farmers came to see this and to show less reluctance in making returns.

Ireland.—As the rinder-pest gave England agricultural statistics, so the potato famine of 1847-48 gave them to Ireland, and so clearly showed their value that they have been maintained ever since. The data of the statistics are collected by members of the constabulary force, who visit each farm as assessors do in most of the United States. The Registrar-General at Dublin superintends the work and reports to the lord-lieutenant. An abstract is published at once, and a detailed report is presented to Parliament. In other European countries the growth of statistics has been somewhat similar. It will be sufficient to give the present condition, simply, and modes of collecting.

In *Belgium* and *Holland* agricultural statistics are collected by a body of local magistrates, usually landed proprietors, and a detailed report is published annually by the governors of the provinces.

In *France* statistical committees in the various districts report to the *prefects*, and these in turn to the minister of agriculture, who compiles special statistics on live-stock, vine-culture, silk-worm-rearing, and the like, and also makes monthly reports on the condition of the growing crops.

In *Hungary* the product of the crops is collected yearly by parish magistrates, aided by the most intelligent farmers, and these returns are examined, corrected, and compiled by the statistical bureau for the country.

In *Austro-Hungary* full statistics of crops and live-stock are collected. In Hungary crop statistics have been published since 1869, and stock statistics since 1875. They are prepared by special agents, unprejudiced and well informed on agricultural matters. The original data on crops are given by the Agricultural Unions of the several districts.

In the *German Empire* the agricultural information is obtained through the co-operation of the governments of the several States, under special instruction from the imperial authorities. The statistics cover the entire ground of agriculture, and are grouped under three heads, viz.: (1) agricultural employment of the soil; (2) proceeds of the harvest; and (3) returns of live-stock. This system of co-operation between the local State governments and the general government was adopted in 1878, and has proved most satisfactory. The United States Department of Agriculture, at Washington, is now wisely adopting this plan of State co-operation in the collection of monthly reports on the condition and outcome of the crops. This will be again noticed further on.

Sweden and *Denmark* have very complete systems

of gathering and publishing crop statistics. The other countries of Europe, the colonies of Australia, Victoria, New South Wales, South Australia, and Tasmania have their several systems more or less complete; in some, returns are voluntary; in some, enforced by penalty where reluctance to give returns makes it necessary.

In *Russia*, and even in *Austria* and *France*, the information is kept closely under the surveillance of the government, and is not permitted to go abroad when its publication can be supposed to injure the financial condition or prospects of the countries, or affect adversely the prices of meats or cereals, to be bought or sold as the case may be.

In the *United States* the collection and publication of agricultural statistics by the general government was first begun in connection with the census. Although the census was ordained by the Constitution itself, and the first one taken in 1790; and although the statistics of manufactures were taken in the census of 1810, as well as of the number of persons engaged in agriculture, commerce, and manufactures respectively; and although agriculture was overwhelmingly the largest industry; yet it was not until the census of 1840 that any attempt was made to take the statistics of agriculture proper. And even then, the schedules were most imperfect and the statistics were given very inadequately. In 1850 the control of the census was transferred from the Department of State to that of the Interior. The office of superintendent of the census was created, and greater attention was given to the statistics of agriculture. The ninth census, in 1870, introduced many valuable features into the agricultural schedules, one of which is that showing the total value of farm productions. This census presents the general statistics of agriculture by States, Territories, and counties, giving number, size, and value of farms, and value of farming implements; acres of land improved and waste; amount of wages paid during the year; value of orchard, garden, and forest products respectively; of home (farm) manufactures, and of animals slaughtered or sold for slaughter; the total value of all live-stock, of each kind; and the quantity and value of the several kinds of crops produced. The census schedules of 1880 contained much more exhaustive inquiries, and elicited fuller details.

So long is the period (ten years) from one census to another, and so long a time elapses after the facts are collected before they are published, that the various States of the Union finally saw the necessity for the collection annually of agricultural statistics within their own borders. But it is simply astonishing that they did not all see it sooner than they finally did. Ohio was first to move in the matter. The general census of 1840 was not fully before the people until 1842. The advantages to be derived from the agricultural statistics therein for the first time contained became manifest to the shrewdest of our farmers and legislators. Governor Allen Trimble and his son, Col. W. H. Trimble, of Highland county, were of those who clearly saw the need of annual statistics; and the latter, who was a member of the General Assembly of 1845-6, threw his whole force into an effort to establish a State Board of Agriculture, whose sole object should be to promote the agricultural interests of the State. Through his unremitting efforts, persistent even under temporary defeat, the law was passed that session creating such a Board, and establishing a special and perpetual fund for its expenses, from the show-licenses and the sale of escheated lands. Two of the first acts of this State Board of Agriculture were to establish an annual agricultural and industrial exhibition or "State Fair," and to provide for the collection of annual agricultural statistics. These statistics were collected, it is true, through the intervention of assessors and of the county and State auditors, but the inspiration, the impulse, and the publication were from the Board of Agriculture.

The older as well as the newer States were far slower in beginning the work, and even as late as 1862 the United States Commissioner of Agriculture found great difficulty in establishing any *basis for an absolute estimate* of the crops, because, as he distinctly states (p. 575 *Report for 1862*), "No State except Ohio has any means of giving the amount of farm crops with reliable accuracy, while the very imperfect returns in several of the States only serve to strengthen the prejudice against statistics so common among English farmers." Most of the older States, however, undertook the work with greater thoroughness a few years later, and most of the newer States undertook it soon after their admission to the Union, largely as a means of showing their resources and inducing immigration. It is not necessary to recount here the time of beginning and methods of conducting the work in the several States.

But even these annual State statistics, much as they excelled in promptness and immediate value the general decennial census, even these were not published until a full year after the crops they reported were harvested, and often sold. Their value was therefore chiefly historic and retrospective. Hence there arose the necessity for, and the conception and elaboration of, what are now known as *Crop Reports*.

The distinction between these and agricultural statistics proper is, and should be always kept, sharply defined. The latter are wholly retrospective, the former are chiefly prospective. The statistics help to adjust and rightly apportion the burdens of taxation; the crop reports help producer and consumer to meet in views, and the bulk of the sales to be made on prices fixed upon the rational basis of the known supply and demand, instead of leaving both in ignorance that forces both to contribute to the enormous profits of heavy speculators whose large transactions warrant large outlay for special information on the condition of the crops of the world.

An act of Congress, approved May 15, 1862, established the National Department of Agriculture, and made it one of its duties to collect and publish monthly reports of the condition and final outcome of the various crops, and of the condition and number of live-stock at such times as seemed important. Through the representatives in Congress, chiefly, the department obtained as far as possible the name of some one intelligent man in each county of each State, who would undertake, without pecuniary compensation, to report each month on blanks furnished for the purpose. Reports were to be made by percentages, 100 representing a full average crop, in each locality, under favorable circumstances. If a given crop at any given period of its growth had only half a chance of maturing a full crop, its condition was to be put down 50. If it was ten per cent. extra in vitality and promise it was to be put down 110, and so on. Thus the various crops were followed all through their growth, and immediately upon the maturity of each its probable total yield was estimated in pounds, bushels, tons, etc. Of course the value of these estimates as an aid in making a forecast of the tendency of prices depended largely upon the competence of the Commissioner of Agriculture, and especially of his chief of the bureau of statistics, as well as of the various county reporters. Under the management of the present able chief, Hon. J. R. Dodge, who was also chief from 1865 to 1878, these monthly reports came to be of great value, as was generally recognized. But afterwards they fell into neglect. The department several times failed to discover widespread disaster and almost failure in whole States, in such important crops as apples, potatoes, and even wheat, until long after almost every one else knew of the virtual failures. Such reports were a great damage to the interests of agriculture and of business, and brought the reports and estimates of the department into entire discredit.

One result of this is now to be described. The agri-

cultural departments of several of the great grain-producing States seeing this failure, this great lack of accuracy in the national department, and the resulting damage, themselves undertook the work in and for their own States. The Illinois State Board of Agriculture began the work, in a tentative way, in 1876, and the Kansas Board about the same time; though from the first the latter board worked the reports largely in the interests of immigration, and soon changed the monthly into more elaborate and persuasive quarterly reports. Georgia began in 1879 or 1880. The Ohio Board of Agriculture began in 1880, and with the four years' experience of Illinois freely given by its Secretary of Agriculture, Mr. S. D. Fisher, at once entered upon the work systematically and thoroughly.

But it was felt by the boards and secretaries, both of Ohio and of Illinois, that to secure the best results, all the great grain-exporting States must do a similar work, and that there must be concert of action and prompt intercommunication month by month, so that the actual condition and prospects of the crops might be known all the time, and the total product might be known, at least approximately, immediately on their maturity. This would give the solid basis of knowledge, so far as the crops of this country are concerned, on which to base valuable opinions as to the probable tendency and range of prices, and give it in time for the farmers to profit by it. The boards or secretaries of Illinois and Ohio, therefore, recognizing the need of concert of action, corresponded fully with the agricultural secretaries of the main grain- and meat-producing States, and united with several of them in calling the first Interstate Convention of State Boards of Agriculture. It convened at Springfield, Ill., Nov. 30, 1880, and its sessions lasted until Dec. 2. Delegates were in attendance from nearly all the great grain States. Other subjects were discussed in carefully prepared papers, such as "The Management of Fairs," by Secretary I. R. Shaffer, of Iowa; "Protection for the Cattle Interest from Pleuro-pneumonia," by Pres. L. B. Wing, of Ohio, etc.; but the main strength of the convention was devoted to developing the crop report idea. Able papers were read, on "The Growth of the Crop Report Idea in Illinois," by Secretary S. D. Fisher, of Illinois; on "The Relation of State Boards of Agriculture to the National Department of Agriculture," by Dr. R. T. Brown, Member of the Indiana Board of Agriculture; on "Crop Reports, their Scope and Value," by Secretary W. I. Chamberlain, of Ohio; on "The Work of the Indiana Board of Agriculture," by Secretary Alex. Heron, of that State; and "On Our Interest in the Foreign Grain Demand," by Secretary H. H. Young, of Minnesota. These papers were fully and freely discussed by the convention, nearly all the delegates taking part. It was fully agreed that an accurate knowledge of the condition of the growing crops of the world, month by month, is the only legitimate basis of prices and of trade. Also, that the agricultural departments of State and nation are bound to furnish such information to the people month by month in the interests of business, commerce, and agriculture, and to see to it that the information is accurate and impartial; that is, in the interests neither of bulls nor of bears in the grain markets, but of truth. Also, that this could be thoroughly done only by a free and cordial co-operation of State Boards with the National Department of Agriculture. These views of the convention were crystallized in the following resolutions, unanimously adopted:

1. "That we believe the time has fully arrived when each of the States represented by us should undertake the work of issuing prompt and accurate monthly crop and stock reports during the growing season.
2. "That in our opinion uniform and concerted action among these States in this matter will secure results most valuable to the agricultural and business interests of the country.
4. "That in order to determine the fair market value of the annual grain and live-stock products of the United

States, it is necessary to obtain the earliest and most complete information attainable as to the extent of the foreign supply of grain and live-stock, and the surplus for the markets of the world, and the proper officers of the government are therefore earnestly requested to obtain, through the consular and other foreign service of the United States, the most complete possible data concerning the extent of the annual production of grain grown in foreign countries, and the condition of the growing crops as the season advances.

5. "That the information so obtained be given to the associated press, and be forwarded through the national department of agriculture to the several State boards of agriculture at the earliest practicable date after receipt.

6. "That the several State boards of agriculture collecting live-stock and crop statistics are requested to reciprocate and forward such reports to the national department of agriculture as promptly as possible.

9. "That all the grain- and meat-producing States of the West and South be cordially invited to unite with us in our next meeting to be held next year at the call of our executive committee."

The proceedings, papers, and discussions of that convention were widely published in the Western daily and agricultural papers, and in full in pamphlet form, and had great influence on the legislatures and boards of agriculture at the West, nearly all of which States have since entered upon the work of reporting the crops monthly or quarterly, or at special periods of importance, and with more or less fullness and accuracy.

Before the next Interstate Convention was convened, a new administration had come into power in Washington, and Hon. G. B. Loring was appointed Commissioner of Agriculture. He had recalled the able statistician, Hon. J. R. Dodge, as chief of the department of statistics, and had issued a call for a national agricultural convention, to be held at Washington, Jan. 10-18, to consider, among other subjects, this very matter of efficient crop reports. The second Interstate Convention was held in Chicago during the Fat Stock Show in November. The full and free discussions then resulted in a series of resolutions, unanimously adopted. They were similar in scope, but more full than those of the first convention. The first three recognize the necessity and demand for prompt and accurate monthly crop reports in each State; recommend uniformity of action; offer a detailed plan for collecting these statistics in the several States, and pledge the hearty co-operation of the boards of agriculture there represented with the national department. The remaining resolutions are as follows:

4. "That the prompt consolidation and publication of these monthly reports from different States can be best accomplished through the national department of agriculture, and we recommend that all important final footings in each State be telegraphed to the commissioner at Washington not later than the 8th day of each month of the growing and harvesting season.

5. "That an executive committee of nine be appointed to attend the national convention called by Dr. Loring, United States Commissioner of Agriculture, and to be held in Washington the second week in January, 1882, and that said committee be authorized, in consultation with Commissioner Loring, to arrange all details necessary to harmonize the work of the State and national departments, and render it more efficient; and, especially, to prepare blanks to be used in common by all States in this monthly statistical work.

6. "That in order to determine the fair market value of the annual grain and meat products of the United States, it is necessary to obtain information as prompt and as reliable as possible, month by month, as to the condition and prospects of the foreign grain and meat product, and consequent probable demand for our surplus, and that, therefore, we urge our most able United States Commissioner of Agriculture to obtain such information through our consular and other foreign service (through courtesy of the department of state), and publish it promptly through the associated press, and send it by telegraph to the secretaries of all State boards that furnish like information from their own States to the United States department.

7. "That we urge each State to use every effort to perfect its own system of monthly reports, making it so prompt, thorough, and accurate that the United States department shall not be compelled to go over the ground with a separate

corps of correspondents; but being relieved of this drudgery of detail, shall have the more time and force for other important work in the interest of agriculture."

The delegates appointed under the 5th resolution above, as well as many others, attended the National Convention, and threw the entire weight of their influence into the effort to secure concert of action between the agricultural departments of the nation and of the several States, and especially into the effort to obtain through the national department monthly information as to the condition of the crops of the whole world. A very able paper was presented by Archibald Blue, Secretary of the Bureau of Industries, Toronto, Canada, on "The History, Value, Scope, and System of Agricultural Statistics." Also one by W. I. Chamberlain, Secretary of the Ohio Board of Agriculture, on "National and International Crop Reports." Free use has already been made of both these papers in the preparation of this article, and full credit is hereby given. The latter paper gave the history of the growth of the crop report idea in the United States, and urged the importance and showed the means of greater thoroughness here and of like work in every country of the world whose production or consumption materially affects the great problems of supply, demand, and price. It showed, by a careful array of figures, that our wheat export was increasing at an amazing rate, having been as follows: for 15 years, before and including 1877, 46,000,000, or 18 per cent. of total crop; for 3 years since 1877, 170,000,000, or 37 per cent. of total crop.

The paper showed, too, that the export was exceedingly variable, having been nearly three times as great in 1878 as in 1876, and just twice as great in 1879 as in 1877. "And yet," the paper adds, "notwithstanding the vastness, the rapid increase, and the great variability of this demand, the astonishing fact meets us that, up to the present time, we have had *absolutely no official means* of ascertaining the real condition of the European and Asiatic crops. The heavy grain speculators, on the other hand, have combinations by which they get this information promptly and with approximate accuracy. They keep each other informed, and by concert of action aid each other. No matter in what country they may be located, no matter how widely they may be separated, their correspondence is as frequent as occasion requires, even though at times it necessitates the daily use of oceanic cables. All this is legitimate. The information costs them much money, often up into the tens of thousands. It belongs to them, and they are under no obligation to divulge it, and they never do. Not only that, but there is nothing to prevent the constant and wide publication of false or misleading statements; reports exactly the reverse of what is true; and that such misleading reports are actually and most industriously published, no one can doubt who calls to mind the fact now notorious, that the actual and alarming shortage in European crops for the past four years has been concealed so far as possible each year, or at least strongly denied in the newspapers of this country, until the bulk of our wheat crop was largely out of the hands of the farmers."

The same paper claimed that the crops and crop prospects of each State could (for various reasons given) be best learned by the State agricultural bureaus or boards, but that this vast foreign work could only be done by the national department. It submitted a rough plan for mapping out the grain production and consumption of the various nationalities of the world, and frankly admitted the vastness of the work. On this point we quote from the paper as follows:

"But it is no light task to map out the nationalities of the world in comprehensive form, and show the population, wheat production, wheat consumption, including seed, and the consequent surplus or deficit of each, and thus deduce the grand total of the whole. It is no light task to get

prompt and fairly accurate estimates, month by month, of the condition of the crops, or at least of the wheat in every State of the Union and in every foreign nationality, whose production or consumption affects the future export demand and the consequent tendency of prices.

"But the interests of agriculture and of commerce, I think, require that this work be done, and well done, and done this coming season; and our national department of agriculture is capable of doing it. Our signal service, Argus-eyed, watches every current, cloud, wind, and storm, notes the storm-centre, the direction, the general velocity, and the local violence, and then with an hundred times the hundred hands of the fabled Briareus of old mythology, it daily flashes the facts over all our telegraphic lines, and posts them up in every port and hamlet, to aid or warn and protect our navigation, our commerce, and our agriculture.

"A similar service is now, I believe, imperatively demanded of this national department of agriculture in regard to the exact condition, month by month, at least of the wheat, in all important wheat-producing and wheat-consuming countries of the world. And as no work is more necessary, none can be more acceptable and popular, not only with farmers and business men, but with our legislators also, and so I am sure the necessary aid from Congress will be promptly given, if only the work is once well begun."

Immediately upon the conclusion of this paper Commissioner Loring seconded its views and claims in an able speech, and, after further discussion, resolutions were unanimously adopted urging immediate action in the matter of home and foreign monthly crop reports by the National Department of Agriculture, in harmony with the several State boards, according to the general federal idea and plan proposed in Sec. Chamberlain's paper, and urging Congress to make the necessary appropriations and take the necessary steps to make the foreign work a success.

It is gratifying to announce that Congress promptly responded, that the agricultural departments of State and nation are now working in harmony, and that the foreign work is begun. The commissioner says in his report:

"Western grain-growers have been especially anxious that the department should undertake prompt collection of European crop statistics; and the recent appropriation for the extension of work of its division of statistics renders practicable the initiation of an enterprise of so much importance.

"A central office for such collection of statistics is to be established, with headquarters in London, at the office of the United States consul-general, and Edmund J. Moffat, Esq., of New York, has been appointed special statistical agent in charge of the work, and he is also appointed by the department of state deputy consul-general at London."

The Philosophy of Statistics and Crop Reports.—The State and National Governments are justified in expending the people's money in collecting statistics and crop reports on the following grounds: *First.* Carefully prepared statistics of crops and stock, of actual acreage and yield, and the like, are absolutely necessary to enable these governments to apportion equitably the burdens of taxation, and to adopt wise laws regulating the various property interests concerned.

Second. Prompt and careful crop reports are necessary, month by month, to secure an equitable adjustment of prices, to prevent the wild fluctuations that always arise from ignorance of facts, and to aid the distribution of local abundance into regions of local scarcity. That the State and National Governments should gather and publish this information is evident from the fact that it is impossible for the great body of producers and consumers to gain any adequate knowledge otherwise, though heavy buyers or combinations of speculators can do so, and thus "bear" the market until the crop is bought at too low a figure for the facts, and thus defraud producers, and then "bull" the market till they have "unloaded" at too high a figure for the facts, and thus defraud consumers.

That such is the actual result may be seen from a review of the manipulation of the wheat crop of 1879. It is now known that though the crop was large in this

country, yet in England and other European countries it was small or nearly ruined by heavy storms, and that the foreign demand for our surplus *would be immense*. This latter fact the farmers had no means of learning; the heavy speculators suppressed the fact or stoutly denied it, until the bulk of the winter wheat-crop had left first-hands at about ninety cents per bushel. If the farmers had been as well informed as the large buyers, they would have held for the sure advance. But they were not. They were isolated. Each had but a small interest at stake, and could not afford to procure costly cable information from paid correspondents abroad. Of course, the contest for a fair adjustment of prices was most unequal, and the result was quite natural, as stated, viz.:—that the bulk of the winter-wheat left the farmers' hands at 90 cents to a dollar, and then the price rapidly advanced to \$1.30 per bushel, and the consumers had to pay that price. And the margin went into the hands of the few men who had the knowledge of the foreign needs.

But it is plain that the interests of agriculture and of business are best promoted, and future production is most increased, when the farmers really get the fair price for their products and the dealers simply get fair and full compensation for the cost and skill of handling the product. For example, in the case just cited over 100,000,000 bushels of wheat were sold for \$1 per bushel or less, when it was really worth on the basis of foreign demand \$1.25 per bushel. The consumer paid just as much for his flour, and this 25 cents per bushel, or \$25,000,000 or more, went into the hands of the speculators, to enrich them and to be expended largely in the cities on mere luxuries. But if the farmers get this \$25,000,000, it goes largely into better farm-buildings, improvements, stock, implements, machines, fertilizers, and appliances, that shall assuredly increase the total future products of the soil. In short, this \$25,000,000 is then turned into real productive capital—into agricultural prosperity that shall also increase our commercial prosperity for years to come.

The Accuracy of the Work.—Great accuracy has already been attained by the use of "Threshers' blanks." The plan was first proposed by Sec. Chamberlain, of Ohio, in the Interstate Convention of 1880, at Springfield, Ill., as follows:

"By suitable headings in the schedules or blanks used by township assessors, we can obtain in May the acreage for the then current year of the main cereal crops. Then by furnishing, when threshing begins, suitable threshers' blanks (for acres and bushels threshed) to our township correspondents to give the leading thresher or threshers of their townships, we can by August 10 or 20 know and publish the actual yield per acre of the first three weeks' threshing, and this would probably give the basis for an exceedingly close approximation to the entire amount of wheat in the State."

Exactly this plan was adopted in Ohio the next year, and by August 15 there was published the estimated wheat-total of the State, based on three weeks' threshing by about 1,000 machines. Just one year later the actual statistics were published of the yield as learned by the township (paid) assessors, on actual inquiry of each farmer in the State. The figures are as follows, as learned by the two methods:

Estimate from 3 weeks' threshing published Aug. 15, 1881.....	38,010,000
Actual returns of same crop published Aug. 15, 1882.....	38,100,000

The difference was less than one-fourth of one per cent. of the total. And the advantage of the first estimate was that it came before the crop was sold, instead of a year too late; and in connection with like reports from the other States and from Europe (hereafter to be had) would furnish the just basis of price in time to be of some service to producers. The annual statistics come a year too late to influence prices.

It is proper to state that this same system of threshers' blanks has already been adopted by Michigan and Minnesota, and probably will be by nearly all the great grain States by another year. It will furnish the basis of actual knowledge and not of mere opinion, and will be of immense use in forecasting the tendency and probable range of prices.

Causes of Inaccuracy.—Theoretically, the annual statistics should be more accurate than the monthly crop reports, since they are based on actual inquiry of each individual farmer. But, in point of fact, certain causes of inaccuracy must be carefully considered. The returns are taken nearly a year after the crops are harvested and sold, and the acreage and total yields are often in part forgotten. Then in the older States the idea of taxation leads farmers, perhaps unconsciously, to understate totals; while in the newer States and Territories the tendency is just as strong to overstate, so as to make a good showing and induce immigration. Both of these tendencies must be kept in mind. And our boards of agriculture are now doing wisely in strongly insisting, in all their circulars of instruction to correspondents, upon the fact that absolute truth is wanted—neither overstated nor understated, nor in anywise colored.

It is evident that these days of railways, steamships, telegraphs, and telephones require accurate information on the condition of the crops of the world, at least as often as once a month during the growing season. It is evident that our agricultural boards or bureaus must respond fully and accurately. And in time the demand may be even for more frequent bulletins. But greater frequency will endanger lack of accuracy. And accuracy is all-important.

The Actual Benefits.—The benefits already actually derived from these reports in the West have been great. For example, the apple- and the potato-crops in Ohio in 1881 were only about one-third of the usual crop. The Ohio crop report stated and emphasized this fact (though the Washington report gave them in August at 70 and 92 per cent. respectively). In certain counties there was local abundance. The farmers in these counties, having the crop reports before them in all the papers, held for and obtained \$1 or \$1.20 per bushel, instead of taking the 40 cents per bushel that speculators were early offering on contract, and that the local abundance seemed to pronounce sufficient. Again, the wheat-crop in Ohio in 1881 was fairly good—over 38,000,000 bushels. Had it been equally good all over the country, the price would not probably have gone above \$1 or \$1.10 in Chicago. But the June and July and even the May reports from Illinois, Iowa, Indiana, and Michigan (the only other winter-wheat States that had then adopted the plan of thorough monthly crop reports) made it plain that the total for those States would be only about one-half the previous year's total, and that the total shortage of winter-wheat in the United States would be nearly or quite 120,000,000 bushels, as compared with 1880. This information was promptly given to the press of Ohio and of the whole country by the Ohio Board of Agriculture, even though the Washington reports were far more conservative and named a far smaller deficiency. The farmers of Ohio and elsewhere believed their own report. They read the facts and conclusions in many papers and on every hand, and the whole community came to believe and know that at least the wheat and corn crops of 1881 were really very short, and that the prices must rule high. And, as a rule, the farmers held and received \$1.35 or \$1.40 per bushel for wheat—realized the profits that justly belonged to them. And so this information, thus gathered and widely published by the boards of five States and believed by the people, was, in the opinion of judicious men acquainted with the facts before and since this work began, worth \$10,000,000 to the farmers of Ohio alone: for that sum would be less than 27 cents per bushel on the total

crop; and this 27 cents (or \$10,000,000) would have gone largely into the hands of heavy speculators but for this prompt information spread before the eyes of all the people. Indeed, such was really the case with the crop of 1879, before this crop-report work was begun by any State except Illinois, and while the Washington reports were almost worthless.

It is gratifying to add that several States already have reporters in each township, and that others are rapidly following; that the "threshers' blanks" are rapidly coming into favor; that averages and totals are given by counties in the State crop reports, thus pointing out local scarcity or abundance; that the work of the State and national departments is now being harmonized, and that the latter has at last earnestly grappled the great problem of promptly reporting by telegraph the condition of the crops of the world.

What is claimed for the system when fully developed may be briefly recapitulated: (1) It will show at a glance each country's probable annual surplus of products or its deficit. (2) It will show whether the grand total of each crop for the world (or for the area of possible distribution) is large, with a tendency to lower prices, or small, with a tendency to high prices. (3) It will thus serve to prevent sudden and violent fluctuations in prices, and consequent panic and revulsions in business. (4) It will show the probable extent for the year of the carrying trade, and enable the railway and shipping interests to make timely provision. (5) It will in time create an equilibrium in prices, less the actual cost of transportation and distribution. (6) It will point out (by counties) the local abundance and scarcity, especially of fruits and perishable products, give shippers and carriers the necessary information, and thus prevent glut and waste in one place with great and corresponding scarcity near by. (7) It will show the resources of any country and serve as a wise guide to emigration and immigration, and to just legislation.

The crop-report idea is in its infancy. It rests, however, on a solid basis of philosophy. Its great utility has already been attested by abundant facts. It is destined to assume a breadth, a magnitude, a promptness, and an exactness and minuteness of detail of which even its most sanguine friends have no adequate conception. (W. I. C.)

CROPSEY, JASPER FRANK, an American landscape-painter, was born at Westfield, on Staten Island, N. Y., Feb. 18, 1823. In his youth he spent five years in the study of architecture, but afterwards turned his attention to landscape-painting, commencing with water colors. In 1847 he went to Italy, where he studied for three years, and produced among other paintings *The Pontine Marshes* (1850). On his return to America he was elected a member of the American Academy of Design, of which he was already an associate. In 1856 he went to England, where he remained seven years, busy with his art, and respected by the critics. Since 1863 he has resided in New York. His earliest notable picture was *Greenwood Lake*, and he has returned to this subject in later years. As fruits of his residence in Italy we have *The Pontine Marshes* (1850); *Southern Italy* (1875); and *The Sibyl's Temple* (1877). His English Pictures include *Corfe Castle*, *Under the Cliff*, *Roadside in the Isle of Wight*, *Stoke-Pogis*, *The Olden Time*, and *Anne Hathaway's Cottage*. But Cropsey is seen at his best in his delineations of American scenery, some of which have attracted especial attention when exhibited in London and Paris. Among these pictures are *The Backwoods of America* (1857); *Autumn on the Hudson* (1863); *Autumn in the White Mountains* (1864); *Mount Jefferson* (1868); *The Narrows from Staten Island* (1870); *On the Wawagonda* (1874). He has also produced several sketches in water colors, among which are *White Mountain Scenery* (1869), and *On the St. Lawrence River* (1878).

CROSBY, HOWARD, D.D., LL.D., an American Presbyterian minister and author, was born in New York, Feb. 27, 1826. He graduated at New York University in 1844, and was made professor of Greek in the same university in 1851. In 1859 he became professor of Greek in Rutgers College, New Brunswick, N. J., and served also for a year as pastor of the First Presbyterian Church there. In 1863 he resigned his professorship and became pastor of the Fourth Avenue Presbyterian Church, New York, where he still continues. He was elected chancellor of the New York University in 1870, and resigned in 1881. He received the degree of D. D. from Harvard University in 1859, and LL.D. from Columbia College in 1872. He was one of the American Revision Committee of the New Testament, and the founder and president of the New York Society for the Prevention of Crime. He has visited Europe three times, once extending the journey to the Orient. He has been a constant writer for reviews and magazines, and has published *Lands of the Moslem*, *Ædipus Tyrannus, with Notes* (1861), *Scholia on the New Testament* (1863), *Bible Manual* (1869), *Life of Jesus*, *Thoughts on the Decalogue*, *Social Hints*, *The True Humanity of Christ*, *The Christian Preacher*, *Commentaries on Joshua* (1875), *Nehemiah*, and the *New Testament*, besides numerous lectures and tracts.

CROSS, MARY ANN (1820-1880), née Evans, an English novelist, who won her fame under the pseudonym of "George Eliot," was born at Griff House, near Nuneaton, in Warwickshire, England, Nov. 22, 1820. Her father, Robert Evans, had begun life as a master carpenter, and at the time of her birth had become land agent to several of the large estates of that neighborhood. When she was fifteen years old her mother died, and her father afterwards moved to Toleshill, near Coventry. Here the two lived until the father died in 1849, the daughter during these years being busily engaged in severe study. One fruit of this is the translation of Strauss's *Leben Jesu* (1846). On her father's death Miss Evans went abroad with some friends and carried on her studies at Geneva. Some time after her return to England she became a boarder in the house of Mr. Chapman, the editor of the *Westminster Review*, and aided him in his literary work, contributing meanwhile a few articles to the *Review*. The most important of these are the following, written between 1854 and 1857, inclusive: "Woman in France—Madame de Sable" (Vol. vi.); "Evangelical Teaching" (Vol. viii.); "The Natural History of German Life" (Vol. x.); "German Wit" (Vol. ix.), on Heine; "Worldliness and Other Worldliness" (Vol. xi.), on Young and Cowper. In 1853 appeared her translation of Feuerbach's *Wesen des Christenthums* ("The Essence of Christianity"), but she had not yet found her real means of expression.

It was during these years that she made the acquaintance of many leading thinkers, and among others of Mr. George Henry Lewes. With him she afterwards lived as his wife and assumed his name, but without legal sanction, that being impossible on account of the existence of another wife, from whom the complication of English law made a divorce impossible. Mr. Lewes died in 1878, and in May, 1880, "George Eliot" (to use the pseudonym which her novels had by that time made familiar to the world) married Mr. J. W. Cross. She died Dec. 22, 1880.

It was to Mr. Lewes that she was indebted for the suggestion to try her hand at fiction, and her first attempt was the *Scenes of Clerical Life*, which appeared in Blackwood's Magazine in 1857, and in book-form in 1858. This book was followed by *Adam Bede* (1859); *The Mill on the Floss* (1860); *Silas Marner* (1861); *Romola* (1863); *Felix Holt* (1866); *Middlemarch* (1871-72); and *Daniel Deronda* (1876). Her other writings were the poem *The Spanish Gypsy* (1868), several miscellaneous verses united in one volume entitled *The Legend of Jubal* (1874), and a little col-

lection of social essays, *The Impressions of Theophrastus Such* (1879).

Every writer, no matter how great his genius, is dependent for a good part of his method of expression upon the literary fashions of his time; and George Eliot is no exception to this rule. On the other hand it is equally true that no great writer leaves the form of composition which he chooses exactly where he found it. He is constrained to adopt a familiar method, but his genius stamps that with its own mark. Thus, George Eliot found the novel awaiting her as the readiest form for the conveyance of her views on life and its lessons. The English novel, too, was well advanced in its development from the story of incident to the study of character. The romantic novel, which had reached its highest form in Scott's hands, had begun to lose its importance. William Harrison Ainsworth and Bulwer were unable to rival the great master, and the last named had begun to study single characters. To be sure, the surroundings in which he placed them were unreal, and he sought to give a romantic interest to exaggerated villains. Dickens went farther in the gradual advance towards realism by letting the vicissitudes of paupers and outcasts take the place of the mental struggles of the vicious; while Thackeray studied society as he saw it. Thackeray's method was the one most prominent in English fiction when "George Eliot" began to write. His principal subject, fashionable society, attracted her less because, for one thing, it had not come under her observation, and we may well doubt whether, if she had known it well, she would have been attracted by the artificiality of the relations it implies. As it was she followed the most important current by selecting for her subject human beings whose main importance was not their social position; and in the way she wrote about them she shows how much she was influenced by Thackeray. In her early novels we find bits of social satire which were inspired by him, but they are singularly inapposite in so serious a writer and profound a thinker as her writings show her to be.

In her first stories, *Scenes of Clerical Life*, we find George Eliot apologizing for her selection of "commonplace people" for her subject, with a deprecation of criticism that her success has made unnecessary. The commonplace people who were already known to literature had been introduced mainly as curiosities; in Bulwer's hands they were exceptional villains; even in Dickens's they shone with unaccustomed virtue; but George Eliot saw them as they were, and in the simple stories of Amos Barton and of Mr. Gilfil she showed the world how full of fascination, how deserving of study, were the far from exceptional adventures of far from extraordinary people. It is not the general importance of our own lives that makes our own careers interesting to ourselves, and we are not concerned in the fate of our friends simply because their experience abounds in melodramatic incidents, but because we know with precision how we have been tempted and have withstood or succumbed to temptation—have struggled and failed, or have struggled and partly succeeded. It is our knowledge of the doings of our friends that helps to endear them to our hearts. George Eliot has the rare power of giving us similar knowledge of the inmost experience of the characters of whom she writes—of making them real, vivid, living creatures, with whom we sympathize because we understand them.

The advance of literature towards democracy has, of course, been gradual, and in the work of certain French novelists we may see it extending its field so as to include social outcasts; and these are now treated with exaggeration. Before long melodramatic naturalism will give way to a truer form of art, and the field is now open for some writer to do for this subject what George Eliot did for another class. The connection between literary interest and political struggle is suffi-

ciently obvious. The anarchists of whom we read in the papers are beginning to feel their own power just when they become of interest to writers. In the same way, George Eliot studied "commonplace people" at the moment that the *bourgeoisie* attained political power.

What George Eliot studied with especial pains was the moral nature of her characters. This interest in the ethical side of life is seen in all her work; it is one of the qualities that most commands our attention, and the one, it may be added, that most endangers the future fame of her work. We see it appearing in the precise study of motives that makes her novels read like revelations of undeniable truth in a representation of her personages that shows us how good and evil are twisted in a mingled strand in every human being. She understands the complexity of life, and is far from calling any one person wholly good or wholly bad, as we are forever tempted to do with regard to ourselves and others. It is our continual struggle to find one adjective that shall fully describe each one of our friends; her books, life-like, teach us the impossibility of such swift judgments. Amos Barton is not merely odious; he is faithful and painstaking. Mr. Gilfil is not simply a harsh, weather-beaten, sharp-tongued old man; beneath his apparent severity there lies the memory of his early love. "Many an irritating fault," George Eliot says, "many an unlovely oddity, has come of a hard sorrow, which has crushed and maimed the nature just when it was expanding into plenteous beauty; and the trivial, erring life which we visit with our harsh blame may be but as the unsteady motion of a man whose best limb is withered." In *Janet's Repentance*, again, we see George Eliot's tenderness for failure, the gentleness which is part of the same sympathy that makes her clear-eyed to detect the real solemnity and picturesqueness of even the most arid-seeming life. This same forgiving sympathy, which is in part a consolation for the agony of more sensitive perception, shows itself in George Eliot's treatment of the various obscure persons with whom she fills the pages of her novels, the incidental, unimportant characters who form the vivid background for the principal heroes and heroines.

This interest in the ethical questions of life admits of explanation; in part it was doubtless one of the manifold results of the general literary interest in individuals, which demanded exacter study of society. There were, however, other causes at work, among which was the decay, in the generation to which George Eliot belonged, of a belief in the dogmas of religion. As a matter of fact, we know that this writer went through this experience, and doubtless she felt the necessity of reconciling the world of sin and misery with what was to her the gospel of morality. We see in Clough's poems continual traces of his mental struggle over his less serious religious difficulties, and in George Eliot's stories the basis is always the relation of conduct to the ethical sense. It is true that almost all English novels are vehicles for the conveyance of moral instruction, but while in the last century they attacked gross vices, and under the inspiration of Miss Edgeworth they fostered rudimentary virtues, we find George Eliot, with a wider vision, discussing intricacies of character rather than chronicling a mere list of misdeeds. She sees that real corruption lies in the heart of man, and she dissects wickedness until she finds its cause in vice or weakness. The skill with which she does this is nothing less than appalling; and she performs her task without betraying emotion. She is not hostile to the weak or vicious; she is as impartial as life. They are sufficiently punished by the natural consequences of their actions, which accumulate the inevitable results as does the Buddhist's Karma. Certainly the ordinary novelist's wilful heaping together of horrors is trivial by the side of the slow march of destiny which George Eliot chronicles. In *Adam Bede* we see the fatal

consequences of weakness that overrides generosity and good intention. In *The Mill on the Floss* we have a most vivid representation of the complicated way in which one's very virtues may become the faults that wreck one's life. Thus Tom's uprightness turns into cruelty, and his sister's happiness is destroyed by his independence, and her affectionate and imaginative nature, which is her greatest charm. The wise perception of these complex truths raises George Eliot to a high position among moralists, and in all her work we find traces of similar fruitful study of life.

Silas Marner has another claim upon our attention, of a sort that is lacking in some of her other novels, in that it is a story after the conventional fashion, with a beginning and an end. What is still more striking is the allegorical method in which is told the poor weaver's consolation for the loss of his gold by finding the little girl at his fireside. This is a dramatic incident of a sort that George Eliot generally avoids. In *Romola*, again, we find certain traces of concession to the dramatic instinct in the final vengeance of Baldassoro. This ending, however, sinks into insignificance in comparison with the deeper tragedy which the story contains in the account of Tito's treachery and Romola's unhappiness. The book, in spite of its undeniable merit, has a certain remoteness of interest, because the historical novel is distinctly a thing of the past, and the very qualities that lend the framework of the story exactness add to it a tone of pedantry which mars the total effect. Nothing more distinctly marks the movement of the age towards realism than the general distrust of stories that aim to set before us a picture of the past. We are never quite sure that the representation of remote times has the same exactness that we require in a story of the present, and the suspicion of this error is fatal.

Where George Eliot infallibly commands admiration is in her English stories, although possibly less in *Felix Holt* than elsewhere. At least this novel pales before *Middlemarch*, which is generally regarded as the greatest of her works. Certainly it would be hard to name a book in which modern life is so admirably mirrored as it is here. It is not a story of life as it might be if human nature were different; it is not inspired by an eager enthusiasm for a remote ideal, like George Sand's stories; it is a record of various human lives, told without exaggeration and without other intention than that of showing how important is morality. So long as novelists describe life, it is not easy to see how they can well avoid discussing the conduct of life, which is morality. When carried to excess, the result is the tract; when it is ignored, the fairy-tale. When we consider the omnipresence of ethical judgment in all the affairs of life, it is not surprising that so true a realist as George Eliot should give it great prominence. Yet one consequence is, that we are disposed to shun a second reading of her novels with their grim certainty of retribution for evil-doing, as we shun the memory of any great mental struggle in our own life. The same mind avoids renewing old combats as the mature man avoids unnecessary wrestling-matches, and we choose for re-reading quiet, unagitating novels. We are always ready to turn from a world of injustice or painful justice, of failure and disappointment, to one in which the imagination loosens the chains that are inseparable from mortality. These soft novels are less important because less true, just as games are less important than action. Yet there are moments when we prefer games to performing our duty—when we prefer seeing burlesque acted to seeing Shakespeare, and had much rather read a detective story than George Eliot's novels.

In *Middlemarch* the relief from the misery of Lydgate's unhappy marriage, and everybody's money-troubles—for it was not a foolish remark of a critic that real agony comes into novels with the loss of

money—is to be found in the beauty of Dorothea's character. This stands out in marked contrast to the mingled wickedness, weakness, and error that conspire to make up this tale of disappointment; and the relief is obtained, not by an exaggeration of her qualities, but by representing them in a possible combination. The very lack of success in Dorothea's life, its apparent failure in her marriage with the unheroic Ladislaw, do but prove the truthfulness of the writer. There are other rewards in life than dramatically striking husbands, and gentry of this sort have had more than their deserts in fiction.

The point about Dorothea is a relief in another way, for the tone of the rest of the book is one of despairing irony which seems to partake of the misery it describes. The irony of an earnest person is often melancholy reading, and it is not alleviated by appearing in George Eliot's novels under the form of social *badinage*. Irony requires, to be successful, absolute calm and self-repression, but she seems to chafe beneath her mask at injustice and vulgarity, and only in drawing Dorothea does she do justice to her own seriousness. The wonderful skill with which she puts her characters and their surroundings before her readers needs no praise; every one knows her unrivalled power; but the picture is depressing, except when we come across what may be called the constructive part of George Eliot's view of life as shown in Dorothea's aspirations and unselfishness. As Sainte-Beuve said of Obermann, "A force d'être ennuyé, Obermann court risque à la longue de devenir ennuyeux;" and George Eliot, by dint of being disappointed with life, came near being disappointing in her picture of it; what redeems it, however, is her exalted vision of the possibilities that lie before every human being. This is the poetical side of the realism of the present day, for it shows us what really exists, and sets it before us a commendable model. What is particularly to be noticed is the altered ethical interest which not merely concerns itself with denouncing gross violations of what we may call the statute law of society, such as intemperance and dishonesty, but encourages attention to a subtler regard for one another's rights. A list of rules to govern life must always be meagre and, in a way, insufficient. The most difficult questions of civilized life are those of the conflict of laws, or such as are not provided for in the code, those for which the conscience is the sole arbiter. The literature of the last century concerned itself with simpler problems; it was didactic, but it taught rudimentary virtues, the observance of social laws; only later has fiction gone behind the observance of a code and busied itself with the remote foundations of character. No one, it is safe to say, has set the ethical standard higher than George Eliot. She is a profound moralist, conveying instruction by means of novels, rather than a great artist valuing her work above everything else. The very formlessness of her work shows this; she frequently combines different stories within the covers of a single book, as in *The Mill on the Floss* and *Middlemarch*; and it is further exemplified by the abandonment in her later novels of the time-honored custom of selecting a hero and heroine around which all the other characters shall revolve as dependents and inferiors. Thackeray began this change, and later writers have carried it on, for truth to nature demands that even the less important personages should have greater justice done them than is possible when the leading characters are alone of interest.

In *Daniel Deronda* we have what appears to be the author's conception of a faultless hero, who gives his name to the book, and two separate stories connected together by tolerably slender threads. That the combination is a fortunate one cannot be affirmed; the chapters on the Jews and their hopes are remote from general interest, and the book distinctly made upon its readers the impression of a failure. Yet it is a failure that was more admirable than many trivial successes,

and in the character of Gwendolen, George Eliot shows all her skill and abundance of observation and imagination.

This brief record of what this writer has done the reader will supplement by recalling George Eliot's never-failing mastery of her subject, whatever the circumstances, whether terrible or delicate, in which she places her characters, and in the vividness and sympathy with which these are drawn. The conversations, too, are not, as is often the case in modern novels, examples of the author's brilliancy, but are the precise, far-reaching expression of very different individualities. Her skill as a novelist makes us impatient of her frequent appearance as a commentator on her own inventions. No novels ever stood less in need of accompanying exposition from the author than hers, and none have more of it. She makes sufficiently clear her power of moral analysis in her keen detection of motives; she leaves nothing for herself to explain, and her thoroughness is almost as terrible as remorse, as M. Scherer has well said. What redeems this is her sympathy even when she is most impartial. Her sympathy is for those who are faithful to duty, who are chilled by the indifference of society to the higher claims of life; and doubtless George Eliot profited from her own experience of what awaited those who offended the social conventionalities which are upheld with more than Mosaic rigidity.

Her poetical comprehension is more clearly marked in her prose than in her verse. Her poems have many admirable qualities, but they lack *inevitableness*; and while her novels stand out as the most important contribution to the form of literature which is the most genuine expression of the interest of the present day, her verses have an air of good work, to be sure, but such as is rather an experiment on a new instrument than the result of overmastering inspiration. The poems are interesting, as all the work of a great genius is interesting, but the reader is led on more by wondering how George Eliot will tell the story that she has to tell than by delight in the poem. Whatever merit her verses may have, their author does not sing "as the linnet sings," and many of the qualities that are aids to her novels are hindrances to her poems. The light that she throws in from all sides, her patience, her tolerance, might be properly employed in verse, as we see when we read Browning, but the rarer, indefinable essence is lacking.

Yet we should be grateful for her prose. After its long, slow development, the novel which turns its white light on society without the interference of conventionalities of form appeared in her hands as a representation and criticism of life that give it a place among the greatest instruments through which literature has spoken. We see reflected in her work not merely the image of society fifty years ago, but the hopes and interests of the best thinkers of to-day, and, possibly, what may be the truisms of fifty years hence. When the chatter of those writers whose sole claim to attention is their novelty has become silent, George Eliot's work will remain to show how a great mind regarded the rights and duties of life. She has shown what poetry there is in the commonest things, and how the great question before us all is how to live well.

(T. S. P.)

CROSS, SIR RICHARD ASSHETON, G. C. B., D. C. L., LL. D., F. R. S., a British statesman, was born at Red Scar, Lancashire, May 30, 1823. He was educated at Rugby, under Dr. Thomas Arnold, and at Trinity College, Cambridge, under Dr. Whewell. He was called to the bar at the Inner Temple in 1849, but became a banker, and sat in Parliament as a conservative, 1857-62, for Preston. In 1868 he was returned for South-west Lancashire, defeating Mr. Gladstone himself, the Liberal candidate. In 1874 he was re-elected without opposition. In that year Mr. Disraeli appointed Cross home secretary and privy counsellor, and in 1876 he was chosen a bencher of the Inner

Temple. He was made a G. C. B. in 1880 on his retirement from the cabinet. Sir Assheton Cross is an able and persuasive parliamentarian, a man of firmness, industry, vigor of thought, large business capacity, and wide sympathies. He published a work on the Poor-laws (1853) and, with H. Leeming, prepared a treatise on *The General and Quarter Sessions* (1858). Questions of laws regarding education and social and sanitary reform are among the topics to which he gives special attention. He took a very prominent part in the recent legal reforms in England.

CROSS-BILL, a genus of oscine passerine birds, of the family *Fringillidae*; the *Loxia* or *Curvirostra* of authors, prominently distinguished from all other birds, whatsoever, by having the mandibles falcate, deflected to opposite sides, and crossed at the end; constituting the condition known as *metagnathism*. Correlated with this distortion of the bill is more or less a symmetry of the whole skull and of the muscles moving the mandibles. The purpose of the structure appears in the readiness with which the birds use their singular bills in husking pine-seeds out of the cones, the fruits of the coniferæ affording their usual and principal food. There are several species, inhabiting chiefly pine woods of cold and temperate portions of the northern hemisphere. The bill excepted, they are closely related to the pine grosbecks, red-polls, purple finches, and other northern *Fringillidae* which have a ruff of feathers at the base of the upper mandible. In all the cross-bills, the males are red of some shade, relieved or not by white; the females, dingy brownish or olivaceous, more or less streaked, and to some extent marked with saffron or yellowish; the young resemble the latter. There is the greatest irregularity in the assumption of the red dress, and adult males often vary to bronzy, coppery, or yellow. Two North American species, well illustrating the whole, are the common red cross-bill (*Loxia curvirostra americana*), a variety of the European; and the white-winged cross-bill (*L. leucoptera*). In the former the male is normally tile-red, with blackish wings and tail, without markings; in the latter, the red is rosy or carmine, and the wings are twice crossed with white; females of the two may be distinguished by the latter mark, being otherwise very similar. The length of either is about 6 inches; the wing $3\frac{1}{2}$, pointed; the tail $2\frac{1}{2}$, forked. The bills may cross indifferently on either side, *e. g.*, the one mandible may pass either to the right or left of the other; but whichever it is, it is fixed for each individual. The variation in the size of the bills is unusually great; a large-billed variety of *L. curvirostra* from the southern Rocky Mountain region and alpine portions of Mexico, is *L. c. mexicana*. The cross-bills are sociable, gentle, and affectionate birds, generally seen in flocks, which rove about irregularly in winter, according to exigencies of the food-supply and of the weather; but they are nearly stationary in mountainous and northerly parts of the United States. They breed very early in the spring, or even in winter, when the trees are still leafless and snow is on the ground, building a slight shallow nest of twigs, rootlets, etc., on the bough of a tree; the eggs are usually 4 or 5 in number, pale-blue, with dark spots. The brooding parent is very gentle and devoted to her charge, even suffering herself to be taken in hand on the nest, and returning directly to it when released. (E. C.)

CROSS-EXAMINATION, in law, the examination of a witness by the party opposed to the party who called him, and who examined or was entitled to examine him in chief. In practice, a witness is scarcely ever cross-examined unless he has given evidence in chief. It seems, however, that in strictness if he be sworn the opposite party is entitled to cross-examine, even though the party calling him has not chosen to examine him in chief.

The power of cross-examination has been justly said

to be one of the principal and most efficacious tests which the law has devised for the discovery of truth. By means of it the situation of the witness with respect to the parties and to the subject of litigation, his interest, motives, inclination, and prejudices, his means of information and powers of discernment, memory, and description, are all fully investigated, ascertained, and submitted to the consideration of the jury. It is not easy for a witness who is subjected to this test to impose on a court or jury, for, however artful a fabrication may be, it is almost impossible that it should embrace all the circumstances to which a cross-examination may be extended. In England it is held that counsel may upon cross-examination ask questions bearing upon the whole case, so as to bring out matters of independent defence. In the United States, however, this is not generally the case. Cross-examination is here confined to the subject of the examination in chief, including, of course, all the *res gestæ*. In some respects much greater freedom is allowed to the counsel in cross than in direct examination. He may, for example—and almost invariably does—put to the witness leading questions of a kind which would undoubtedly be ruled out on examination in chief. This course is often necessary in order to extract an answer from an unwilling witness, and is sanctioned as being in any event best calculated to promote the ends of cross-examination.

A counsel cross-examining a witness is also at liberty to inquire further into collateral facts and circumstances than is admissible in direct examination. This will only be allowed, however, so far as to prove bias or falsity on the part of the witness, and cannot be carried to such an extent as to distract the attention of the jury from the real point at issue.

In most of the United States salutary laws have been passed enabling a party in a cause to call the opposite party as for cross-examination. By this means all necessity for the bill of discovery in chancery has been done away with. (L. L., JR.)

CROTON. See **AQUEDUCT**.

CROW, an oscine passerine bird of the family *Corvidæ*, sub-family *Corvinæ*, and genus *Corvus*, the species of which are numerous, including ravens, rooks, and daws, as well as crows; generally distributed over the world, excepting South America. With few exceptions, the whole plumage is glossy black, the bill and feet being of the same ebony color; the wings, which have ten developed primaries, are long and pointed, surpassing the moderate twelve-feathered tail; the bill is cultrate, and overhung with dense tufts of bristly feathers directed forward, concealing the nostrils. The species are numerous, some fifty being described; but owing to the uniformity of color of nearly all of them they are difficult to determine. They fall in two groups—the *ravens*, with the feathers of the throat loosened, lengthened, lanciolate, with firm, distinct edges; and *crows*, with the same feathers rounded, blended, and soft; the former include, as a rule, the largest species; but the unqualified terms “raven” and “crow” do not imply specific distinctions, all ravens being crows. The United States species may be described in illustration of the whole genus. 1. *Corvus corax*, the common raven, is nearly or quite the same in America and Europe; the American bird may be, on an average, slightly larger and stronger billed, but the difference, when any, is slight; the name *C. carinivorus* is applied by those who argue its distinctness from *C. corax*. It is about 2 feet long, with a stretch of wings of $4\frac{1}{2}$ feet; the wing 16–18 inches, the tail 10. The raven has been generally distributed over North America and Mexico, but has so far retired with the settlement of the country as to be now seldom seen in most of the United States east of the Mississippi, though still abundant in the Western Territories, especially in those regions where the common crow is wanting. It is still common on the N. Atlantic coast,

and occasionally seen in New England, and even on the New Jersey coast. It reaches high latitudes in Arctic America and Greenland, and in the opposite direction extends to Guatemala. 2. *C. cryptoleucus*, the white-necked raven, is smaller than the foregoing, and distinguished, furthermore, by having the bases of the feathers of the neck snowy white; but this white is entirely concealed except when the plumage is disturbed. It is confined to the South-west, and especially characterizes the Llano Estacado of Texas. 3. *C. frugivorus* (*O. americanus* Aud.) is the common crow of North America, distinct from the carrion crow (*C. corone*) of Europe. This well-known bird is about 19 inches long and 36 inches in extent, the wing $13\frac{1}{2}$, tail 8. It inhabits temperate North America, but especially the United States, in those regions where there are no ravens, holding its own in the most populous districts by the exercise of its wits. Constantly alert to danger as it is, and subjected to endless persecution, its sagacity, wariness, and cunning have become developed to the highest degree, proving on the whole more than a match for man's ingenuity in attempting its destruction with gunpowder and poison. The injury done by the crow to the crops is certain, while the benefits it confers by the destruction of noxious insects is not so obvious; yet there can be little question that the despised and outlawed crow is not man's creditor, on fairly balancing the harm and good it does. Much depends on the time and place. The most remarkable trait of the crow is its tendency to colonize in particular districts, and form great "rookeries" or roosts, to which thousands of the birds resort regularly to pass the night, coming from many miles distant and consuming hours, each day, in making the tedious journey to and fro, to no obvious purpose. The bands disperse at earliest daybreak, radiate over the country in search of food, and reassemble at night-fall, during the whole of the year, except the breeding season. Some of these resorts have become historic in the annals of American Ornithology. There is one near the Potomac river above Georgetown, west of Washington; and during the whole afternoon, in fall, winter, and early spring, a steady stream of crows pour over Washington, always due west, and the reverse in the gray of the morning. The strong westerly winds, which often prevail in that region, greatly impede the afternoon flight, which is accomplished sometimes most laboriously by tacking and shifting. In summer, crows are generally dispersed in pairs in woodland, selecting some tall or thick tree for the nest, which is a large, bulky structure, becoming a conspicuous object when the leaves fall, but ordinarily hidden with care in the foliage. The eggs are 4 or 5 in number, dull-green, spotted and blotched with browns, purplish-grays, and neutral tints. The crow is absent from most of the treeless and uninhabited regions of the West, where the raven is specially numerous, but not as common in some parts of California. Were it protected by law, as should be done, it would probably assume some of the social habits of the rook. 3. *C. caurinus*, the North-west crow, is a smaller species peculiar to the Pacific coast. 4. *C. maritimus* (*C. ossifragus* Wils.), the fish-crow, is common in the Atlantic States, especially along the coast, as far north as Long Island, but rarely enters New England. This is only about 15 inches long, the wing $10\frac{1}{2}$, the tail $6\frac{1}{2}$; it also differs from the common crow in the relative proportions of the tarsus and toes, and, in some cases, at least, it has a naked space about the corner of the mouth. A large male fish-crow, however, is not always easily distinguished from a small female common crow. The habits are substantially the same; but the fish-crow is not known to flock to the same extent, and is especially fond of frequenting beaches, mud-bars, marshes, etc., to feed upon crustaceans, mollusks, fish, and other aquatic animals, as well as any refuse left by the tides. It is commonly found to be less shy and wary than the larger species, probably because it is not so much ad-

dicted to the farmer's grain and, therefore, less frequently molested.

(E. C.)
CROW BLACKBIRD, an oscine passerine bird of the family *Icteridae*, sub-family *Quiscalinae*; the purple grackle. *Quiscalus purpureus*. See GRAKLE.

CROWN POINT, a village of Essex co., N. Y., is on Lake Champlain, at the mouth of Putnam's Creek. It is on the New York and Canada Railroad, at the junction of the road to Hammondville, and is sometimes called Hammond's Corner. It has 3 hotels, a bank, a weekly newspaper, 6 churches, and several schools. There are 2 large iron-furnaces, a sash- and blind-factory, and wagon-factory. The Crown Point Iron Company has a narrow-gauge railroad to its mines, 12 miles distant. Mineral phosphate of lime is also found in the vicinity. There is a light-house on the point which gives name to the place. The population consists of Americans and Swedes, and in 1880 numbered 4287. Crown Point was a noted place in American history in the eighteenth century. It was at first a trading-post between the English and the Indians, but in 1731 the French took possession of the cape and erected Fort Féderic. This excited alarm in the neighboring colonies, and in 1755 an expedition against the fort was led by Sir William Johnson. Though successful in a battle, he did not attack the fort, but contented himself with erecting Fort William Henry at the head of Lake George. A similar expedition in the following year accomplished nothing. In 1759, when Gen. Amherst approached with a large army, the French abandoned Crown Point and joined the garrison at Ticonderoga. Amherst, who should have pushed on to join Wolfe in the campaign against Quebec, delayed here, and finally went into winter-quarters. He employed his troops in erecting a fortress, half a mile in circuit, with solid limestone walls and barracks. Although the British government spent £2,000,000 on it, the fortress was never completed. After the conquest of Canada an insignificant garrison was maintained here, and in May, 1775, a detachment of American volunteers, under Seth Warner, captured the place without difficulty. It lost its importance, though its picturesque ruins still attest its former strength.

CROWS, ABSAROKAS or UPSAROKAS, a tribe of American Indians, kindred to the Dakota race. Their ancestors inhabited the valleys of the Yellowstone, Big Horn, and Tongue Rivers. But the tribe was driven farther west by assaults of the Sioux and Northern Cheyennes. From an early date the Crows possessed horses and made marauding excursions, robbing Indians and whites alike, though carefully avoiding an open rupture with the latter. They are very expert horsemen, and are skilled hunters. They are tall and athletic, with broad features and unusually dark complexions. They are particularly noted for the extraordinary length of their hair, in which they take great pride, anointing it profusely with bear-grease. Catlin painted one whose hair was so long that it swept the ground as he walked. They have great skill in the dressing of buffalo-skins for their lodges and clothing. They succeed in making these perfectly white, so that a Crow warrior or village can be readily distinguished. They are divided into three bands, each with a distinct dialect.

The first treaty with the Crows was made in 1825. It bound them to keep peace, and to permit traders to pass through their country. A treaty in 1851 gave the United States the right to make roads through their lands, for which right they were to be paid an annuity of \$50,000 for 50 years. By the treaty of 1868 they agreed to go upon a reservation in Montana, where they now are. They as yet display little indication of assuming the habits of civilization. They number at present about 4200. They are reputed to be cowardly, but their bravery is no doubt equal to that of any other tribe. On their present reservation they are well contented and somewhat prosperous.

CROWTHER, SAMUEL ADJAI, D.D., an African

bishop, born about 1810, of a family living at Ochugu, in the Yoruba country. His native name was Adjai or Edj-ai. In 1821 he was captured by a party of Mohammedan slave-dealers, and three times sold—first for a horse, and afterwards for some tobacco. In 1822 he was released from a slave-ship by an English man-of-war, and landed at Sierra Leone. In 1825 he was baptized, taking the name of the Rev. Samuel Crowther, a well-known English clergyman. In 1827 he married a native woman, who had been taught in the same school with him, and became a mission school-teacher. He accompanied the expedition sent by the British government to explore the Niger in 1832. He then went to England, and, after studying at the Missionary College, Islington, was ordained by the bishop of London. He became a missionary at Akessa, and in 1864 he was consecrated bishop of the Niger country, having his diocesan seat at Lagos. He is author of a good account of the second Niger expedition, and of various religious writings in West African languages. He also published a Yoruba dictionary (1843 and 1852), and translated the Bible into Yoruba.

CRUCIBLES are open or covered vessels for the reception of substances to be subjected to intense heat. It is requisite that they should be able not only to withstand successfully very high temperatures, but also sudden changes of temperature and the corrosive action of certain fused substances, besides being sufficiently strong and refractory to hold securely and support the molten mass while being lifted out of the furnace. Crucibles vary in size, in form, and in the material from which they are made, in accordance with the uses for which they are intended. While some assaying crucibles are not much larger than a thimble, those intended for zincing shot are of sufficient size to hold 800 lbs. of molten metal. In form some are nearly cylindrical, some triangular with round bottom, and others skittle-shaped. For certain laboratory purposes crucibles are made of charcoal, platinum, silver, gold, or iron; the materials, however, most commonly used in the manufacture of crucibles for assaying and in the arts are certain kinds of fire-clay mixed with silica, powdered coke, burnt clay, graphite, etc.

Charcoal crucibles are best formed by making a cavity in a piece of well-burned charcoal, corresponding in size to the substance to be operated with, and providing this cavity with a charcoal stopper or cover. As charcoal undergoes considerable contraction when exposed to very high temperatures, it will be necessary to ignite the charcoal previous to using it for a crucible or a stopper, so as to avoid subsequent derangement from contraction. The charcoal vessel is afterward fitted into a common clay crucible, which last is to be well covered and luted.

Platinum crucibles are the most generally useful among metallic crucibles, and should always be accompanied by covers of the same material. They are made either with a flat bottom, meeting the sides at a sharp angle, or with a rounding bottom, making them egg-shaped. The former are peculiarly liable to injury at this angle, because the metal is usually thinner there than elsewhere; but the latter, while avoiding this disadvantage, are less convenient to handle, since they require especial supports. A platinum crucible may with advantage be inserted into a Cornish crucible, but no intervening substance should be introduced. The metal crucible is thus protected from impurities in the fuel and from the forcible action of the tongs in moving it in and out of the furnace.

Silver crucibles and their covers should be made of pure silver. They are of great use in the evaporation of mineral-waters and various solutions, but require careful attention in heating, since silver fuses at a yellow heat. Near the fusing point the metal becomes exceedingly friable and brittle, so much so that, although appearing quite sound, if held at one edge its weight is sufficient to break out a piece. Hence it is best never to use them in any other

than a crucible furnace where it can be most conveniently watched.

In the application of fixed alkalis to the analyses of minerals by heat it has been found that both platinum and silver are so much acted upon by them that crucibles made of pure gold have been recommended and are used. A gold crucible is by no means liable to the same kind or extent of injury, but is very fusible in the fire.

Iron crucibles are occasionally required for experiments of ignition. Although cast-iron is far more fusible than wrought-iron, the former is preferable for crucibles.

No other furnace-fuel than charcoal should ever be used with metallic crucibles. The sulphurous fumes which rise from coke and coal injure them, and iron and other substances present do not merely form slags which adhere to the vessels and soil them, but actually corrode and destroy them.

In the use of metallic crucibles it is to be observed that fusible metals or compounds of metals likely to be reduced must never be heated in vessels of silver, gold, or platinum, otherwise alloys will be formed, the crucible destroyed, and its contents lost. They should, therefore, be used only with infusible substances in mass or powder, or with such fluids as will not act upon them.

By far the greatest number of crucibles are, however, made, as before stated, of *clay*. They possess the advantage of being cheap, and of resisting well high temperatures and the action of bodies which, from their fixedness, admit of or require the application of great heat. *Clay crucibles* are made of fire-clay mixed with silica or other infusible matter. A very common mixture consists of two-thirds of raw clay to one-third of burned clay. The celebrated *Berlin* crucibles are made of 8 parts fire-clay, 4 parts black lead, 5 parts powdered coke, 3 parts old ground crucibles. The *English crucibles* in most common use in Birmingham and its neighborhood, as well as in Sheffield, England, are made of fire-clay found near Stourbridge. The mixture has about the following proportions: 4 parts fire-clay, 2 burned-clay cement, 1 ground coke, 1 ground pipe-clay. These Stourbridge clay crucibles are mostly used in melting steel; they are only carefully dried, but not burned until required for use, when they are put into the melting-furnace first with the mouth downward, and when red-hot are taken out and put back again with the mouth upward.

Hessian crucibles very far surpass the English in resistance to high temperatures and to the action of fluxes. They are the cheapest and answer for all purposes where a single melting will suffice, as in refining or experiments. They come in nests of sizes from 2 to 8 inches high and are round at the bottom, but are furnished both round and triangular at the top. *Cornish crucibles* are chiefly used in assaying copper; they are made of a clay found in some parts of Cornwall. They are equally good with the Hessian crucibles in resisting high temperatures, but on softening do not become vesicular and frothy. In France an excellent crucible is made of a sort of kaolin and fine sand, and is largely used by the melters of bronze and brass in Paris. Notable among these crucibles are those of Beaufay called the *Creusets de Paris*, and those of Deyeux called *Creusets de Saveignies*. Of the crucibles thus far mentioned the Hessian and the Cornish are the most valuable for laboratory uses.

In the arts, the *blue pots* or *black-lead* crucibles find the most application. They were first made by the Dutch, in the early part of the seventeenth century, of clay and graphite, and in their day were the safest melting-pots, because they could withstand from 4 to 5 meltings and submit to considerable change of temperature before cracking.

In 1827 Joseph Dixon began the manufacture of *graphite crucibles* in the United States, by mixing graphite with a clay used by glass-makers for melting-

pots. These crucibles proved superior to the Dutch blue-pots, being able to resist very great and sudden changes in temperature. In 1828 he procured the first shipment of foliated graphite from Ceylon, which was found preferable to the New Hampshire graphite, which had been used previously in making these melting-pots. About 1830 Mr. Dixon adopted the Dutch pipe-clay to mix with the Ceylon graphite. The proportion of the ultimately perfected mixture is 10 pounds of ground graphite to 7 pounds of clay, 2 pounds of fine kaolin, and 1 pound of fine quartz-sand mixed with a sufficient quantity of water to make the mass plastic enough to be turned on a potter's-wheel to the desired shape. For steel melting-pots half a pound of pulverized charcoal or coke is added to the mixture. The pots are carefully dried and then burned to a white heat in a potter's kiln, when they are ready for use. For melting brass, copper, silver, gold, or alloys of metals, a Dixon graphite crucible should run from 20 to 40 meltings, according to the fuel, draft, care, etc. For steel melting they will run from 4 to 6 times, and longer, by a systematic cleaning of the slag from the furnace after each melting, and coating the crucible with a mixture consisting of fire-clay, charcoal, and pure quartz-sand. These crucibles are made at the Dixon works, Jersey City, N. J., of all sizes, from those that hold but 2 ounces up to 600 pounds capacity. Covers are made for all sizes. The crucible mixture is also applied to retorts of all shapes, and different kinds of chemical ware. The melting-pots are sized by numbers, the figures denoting the kilogrammes of brass they will hold—thus No. 1 holds 2.2 lbs., No. 10 holds 22 lbs., and so on up to No. 300.

Crucibles are moulded on a wheel or in a press according to the requirements of size and material. Special machines are also employed for this purpose, prominent among which is one designed by T. V. Morgan. In use crucibles should be placed in the fire, not on it. The fire should surround the crucible to the very top, and a blast, if used, should not strike the crucibles direct. They must be kept in a dry place, as dampness is most injurious to them. If they are thoroughly well made they need no annealing before use—the purpose of this operation being merely to complete shrinkage, which ought, however, to have been accomplished in “burning” by the maker of the crucible.

The use of crucibles in the arts and sciences was well known to the ancients, as is attested in Egyptian paintings, and by the reference to them made by Greek authors.

(A. F. H.)

CRUIKSHANK, GEORGE (1792–1878), an English artist, was born in London, Sept. 27, 1792. His father was of Scotch birth and was an artist of some repute as a political caricaturist. The son developed artistic talent at a very early age, and received his only instruction as a draughtsman and etcher from his father, who employed him as an assistant. As he was ambitious to engage in work of a higher class he applied for admission to the classes of the Royal Academy, but was rebuffed by Fuseli, who was the master in charge. It was perhaps fortunate that he did not succeed in entering as a student at the Royal Academy, for the instruction at that time was such as would probably have cramped his inventive faculties and limited his originality. There was, it is true, a certain kinship between his genius and that of Fuseli, but it may be doubted whether the elder artist would have sufficiently appreciated the strong qualities of his pupil to devote himself to their proper development. After the death of his father, George and his brother Robert industriously devoted themselves to the support of their mother and sister by illustrating children's books and making comic valentines and political caricatures. When Cruikshank commenced his career caricatures were very potent weapons of political attack and defence, and his ready invention, facility of hand, and satirical humor caused him to be much sought after for designs

of this class. A series of plates, entitled *Life in London*, which he executed in conjunction with his brother Robert, obtained great popularity. This series enjoyed the dubious honor of being dramatized at several of the minor theatres, and it was followed by another series entitled *Life in Paris*. Shortly after this an opportunity was afforded Cruikshank by a series of illustrations to the Brothers Grimm's collection of German stories, to develop the finer side of his genius. Cruikshank was at his very best in dealing with fairy themes, especially those in which the element of the grotesque predominated. No artist has ever surpassed him in designs of this class. The *Point of Humor*, which has been praised as one of his most characteristic works, appeared about this time, and was followed by illustrations of familiar English and Irish life, and by a vast number of plates. The best known and most important, from an artistic point of view, are those illustrative of *John Gilpin*, *Tom Thumb*, *Sketches by Boz*, *Oliver Twist*, *Jack Sheppard*, *The Tower of London*, *Windsor Castle*, Fielding's, Smollett's, and Scott's novels, *The Fairy Library*, and the *Life of Grimaldi*. The designs furnished by Cruikshank to the texts of Dickens, Ainsworth, Fielding, and Smollett are among the most carefully executed and most truly expressive that ever came from his hand. The boisterous and generally coarse humor of *Tom Jones*, *Roderick Random* and other works of Fielding and Smollett, was an inspiration to him, and the plates made for these novels were, in the most liberal sense of the word, illustrative. The designs made for the *Sketches by Boz* are very much better than the text; while in *Oliver Twist* author and artist fairly went hand in hand. The representation of Fagan in the condemned cell, which belongs to the *Oliver Twist* series, is justly celebrated as one of Cruikshank's most powerful designs. But little if any inferior to this is the one representing Bill Sikes attempting to destroy his dog after the murder, while the episode of Oliver asking for “more” owes its fame quite as much to Cruikshank as it does to Dickens. *Oliver Twist* is, however, certainly Dickens' book, for Cruikshank was as incapable of writing such a text as Dickens was of designing such a set of illustrations. Cruikshank quarrelled with Dickens during the progress of this work, and never afterwards collaborated with him; and the probabilities are that, as he aged and continued to nurse his grudge against the novelist, a sense of the importance of his share in the making of the story grew upon him. The controversy, however, never would have become of consequence had Dickens and his friends pursued a moderately discreet course.

The plates made for Ainsworth's archæological and very labored novel of *The Tower of London* are esteemed to be among the best ever made by Cruikshank. The fine ladies who figure in them, like all the fine ladies drawn by Cruikshank, resemble in shape the figures in a child's Noah's ark rather than the women of nature's make, and the designs have an abundance of other technical faults. For the rest, the most important of them are intensely realistic, with their realism tempered by as characteristic grotesqueness rather than by any higher quality. The representation of the burning of Underhill on Tower Green, and that of the execution of Lady Jane Grey, have elements of the disgusting in them—as all attempts to treat such subjects in a spirit of uncompromising realism must have—but there is no denying their power. That which depicts the execution of Northumberland is marvellous on account of the manner in which an immense crowd of people has been described on a few square inches of surface; while the one in which the executioner is shown in the act of testing the edge of the axe which he is engaged in sharpening is as gruesome a design as ever proceeded from the hand of its maker. The workmanship on these plates is very fine indeed. Cruikshank's work as an etcher has been warmly and justly praised. Cruikshank's method was admirably

simple and direct, but he was not the master of effect that some etchers have been. In the *Tower of London* series of plates, for example, peculiar and striking effects have been aimed at in a number of instances. These designs are all of them excellent so far as they go, but while all of them are carried far enough to reveal plainly the artist's intention none can be regarded as entirely adequate treatments of their themes.

In 1847 Cruikshank became a total abstainer, and from that time he was an enthusiastic advocate of the temperance cause, and made a great number of plates having for their object the exposition of the evils of strong drink. Of these the most celebrated are the eight comprising the series entitled *The Bottle*. These designs have had an enormous popularity, and, in addition to being dramatized, they have been many times reproduced on both sides of the Atlantic.

During the last years of his life Cruikshank devoted much time and attention to painting in oil and water-colors, and he was a frequent exhibitor at the Royal Academy and elsewhere. His most important composition in oil was a large picture called *The Worship of Bacchus*. Among his other paintings may be mentioned *Tam o' Shanter*, *Titania and Bottom*, *Cinderella*, *The Runaway Knock*, *Grimaldi Shaved by a Girl*, and *Disturbing a Congregation*.

The number of designs made by Cruikshank has never been computed. In 1840 Thackeray expressed his astonishment at his indefatigability and at the enormous amount of work which he had performed, while, during the greater portion of the remaining thirty-eight years of his life he was as industrious and as fertile as he had been previously. Cruikshank was fond of attending and presiding at temperance meetings. He was a member of a volunteer rifle-company, before he was of age, and always maintained his connection with the citizen-soldiery; for several years before his death he was lieutenant-colonel of the Forty-eighth Middlesex Rifle Volunteers. His histrionic talents were of a high order, and he frequently assisted in private theatricals, and occasionally acted in public for charitable purposes. He died Feb. 1, 1878.

(W. J. C., JR.)

CRUMMELL, ALEXANDER, D. D., an American clergyman, of African descent, was born in New York city, about 1820. His father, though a slave, was the son of a king or chief of Timanee, near Sierra Leone. Alexander was sent, in 1835, to an academy at Canaan, N. H., but a mob soon after drove the colored students from the place. Crummell's education was continued at the Oneida Institute, N. Y. He was ordained a deacon in the Protestant Episcopal Church by Bishop Griswold, and a presbyter by Bishop Lee, of Delaware. He afterwards entered the University of Cambridge, in England. For many years he was a missionary in Liberia, where he was also a college professor. He afterwards returned to the United States, and became rector of St. Luke's Church, Washington, D. C. He published *The Greatness of Christ and Other Sermons* (1882.)

CRUSÉ, CHRISTIAN FREDERIC, D. D. (1794-1865), an American Episcopalian minister and author, was born in Philadelphia in 1794. Having graduated at the University of Pennsylvania in 1817, he studied theology, and was ordained as a Lutheran minister. Some years later he entered the Protestant Episcopal Church, and was ordained by Bishop White. In 1831 he became assistant professor in the University of Pennsylvania, but resigned in 1833 and removed to New York. He was associated with the educational efforts of his friend and classmate, Rev. Dr. W. A. Muhlenberg, teaching in Flushing Institute and in St. Paul's College, Flushing, L. I. He afterwards held several pastoral cures, and was librarian of the General Theological Seminary of the Episcopal Church, New York. The last three years of his life were spent in the home of his friend, Dr. Muhlenberg. He died in New York, Oct. 5, 1865. He was well versed in ancient and Oriental

languages, and received the degree of D. D. from the University of Pennsylvania in 1838. His principal work was the translation of the *Ecclesiastical History of Eusebius* (Phila., 1833), which is the standard English translation, and has been republished twice in England. Dr. Crusé added to his translation a history of the Council of Nice. He also translated Eschenburg's *Classical Manual* (Phila., 1833).

CRUVELLI, SOPHIE, a German singer, was born at Biele, Prussia, March 12, 1826, being the daughter of a Protestant pastor named Cruwell. At the age of thirteen she was taken to Paris to study under Permarini and Bordigni. After some years she proceeded to Milan, where, following the directions of Lamperti, she prepared for a first appearance on the lyric stage, which took place in the autumn of 1847, her name being given in the Italian form, which she henceforth used. Cruvelli then proceeded to London, and became a member of Mr. Lumley's company. Although only eighteen years of age (Jenny Lind being then the reigning favorite) Cruvelli succeeded fairly well, and then returned to her native country. From Berlin she went to Trieste, and appeared in operatic parts requiring great versatility. In 1850 at La Scala, in Milan, Cruvelli made her first really great success. In the spring of the same year she made her first appearance in Paris, and created great enthusiasm in that highly critical capital. The following year she went to London for the second time, and there made a profound impression in Beethoven's *Fidelio*. In 1854 she returned to Paris and gave so remarkable an impersonation of the part of Valentine in *Les Huguenots* that the composer wrote the part of Selika in his *L'Africaine* specially for the display of her artistic powers.

After eight years of public life as a singer she married Baron Vigier, of Paris. Cruvelli's voice was not remarkably fine at first, but under judicious cultivation it became a clear soprano with beautiful chest-tones. Her acting was much above the average of that of great operatic singers, and therefore she could not fail to find in the part of Leonora, by Beethoven, great opportunities for the exercise of her special gifts and acquirements. Her power of expressing despair and hope, hatred and love, resolution and hesitation, and the feeling of rapturous joy, enabled her to make a profound impression in this character. Cruvelli's chief faults were those of exaggeration and unbridled demonstration; but these and similar defects, which called forth adverse criticism, at the same time generated enthusiasm among passive or otherwise indifferent spectator-auditors.

CUBA, which Columbus, on discovering it in Oct., 1492, regarded as "the most beautiful land that eyes ever beheld" (*la mas hermosa tierra que jamas ojos vieron*), lies at the outlet of the Gulf of Mexico, between 74° and 85° W. long. and 19° 50' and 23° N. lat. It is the largest of the West India islands; its greatest length is 760 miles and its greatest breadth is 135 miles, but the average breadth is 80 miles. Its area is nearly 40,000 square miles, and with the adjoining islands amounts to 42,000 square miles. Its principal harbors and bays are Bahia-honda, Cabañas, Mariel, Havana, Matanzas, Cárdenas, Sagua la Grande, Caibarien, Nuevitas, Manati, Puerto Padre, Gibara, Banes, Nipe, Levisa, Tánamo, and Baracoa on the north; and on the south Guantánamo or Cumberland Harbor, Santiago de Cuba, Manzanillo, Casilda, and Iagua or Cienfuegos. The latter is one of the most magnificent harbors in the world, both for area and depth of water, yet smaller than the bay of Nipe, which embraces 65 square miles of deep water. There are 570 adjacent isles and keys about the northern and 730 along the southern coast. Late in the year 1511 Don Diego Velasquez, who had been appointed to conquer Cuba, sailed from the neighboring island of Haiti in command of some 600 Spaniards, and landed at the east end of Cuba, which was soon conquered

and became the starting-point for the conquest of Mexico. The progress of its settlement, development of its resources, and course of its affairs generally, are recorded in the *ENCYCLOPÆDIA BRITANNICA*. But an important royal decree concerning Cuba, addressed to its governor-general under date of March 28, 1825, has been omitted by several who have given a history of the island. Faithfully translated into English it reads as follows:

"His Majesty, the King, our Lord, desiring to obviate the inconveniences which might result, in extraordinary cases, from a division of command, and from the interference of powers and prerogatives of the respective officers; for the important end of preserving in that precious island (Cuba) his legitimate sovereign authority and the public tranquility, through proper means, has resolved in accordance with the opinion of his council of ministers to give to your excellency the fullest authority, bestowing upon you all the powers which by the royal ordinances are granted to the governors of besieged cities. In consequence of this His Majesty gives to your excellency the most ample and unbounded power, not only to send away from the island any persons in office, whatever be their occupation, rank, class, or condition, whose continuance therein your excellency may deem injurious, or whose conduct, public or private, may alarm you, replacing them with persons faithful to His Majesty, and deserving of all the confidence of your excellency; but also to suspend the execution of any order whatsoever, or any general provision made concerning any branch of the administration, as your excellency may think most suitable to the royal service."

This decree has been and continues to be the fundamental law of government in Cuba. At the close of the year 1825 the island contained a population of 715,000, divided as follows:

	Males.	Females.	Total.
White.....	175,000	150,000	325,000
Free colored.....	63,000	37,000	100,000
Slaves.....	170,000	120,000	290,000

The taxes levied on the island for that year amounted to \$5,722,198, which the people paid, unconscious of their having just been placed under martial law. Harmony among them was heartfelt until General Tacon, who, being one of the Spanish officers that survived defeat in the war of independence of the colonies of Spain in South America, came over to Cuba and assumed command in 1834, according to appointment of the home government. During his term of office as captain-general he was as severe with the native Cubans as he was lenient with the old Spaniards, who only were appointed to offices of profit or honor under the government. Such a policy worked out a breach between Cubans and Spaniards wide enough to prevent their combining against misrule. Taxation grew heavier from year to year, and Cuban persecution increased, now by summary expulsion of suspected parties, now through trial of other parties by court-martial under the royal decree above quoted; whilst on the other hand the slave-trade continued to flourish between Africa and Cuba to the great advantage of the Spaniards, who controlled that trade, and who, in the face of their enormous profits from it, did not complain of the growing taxation. The most remarkable instance of Cuban court-martialing occurred during the year 1844, when, in consequence of the report of a plot among the African slaves of the sugar plantations about Matanzas for a rising against the white people, several officers of the permanent military commission at Havana for the trial of political offences were detailed to form a court-martial under the presidency of Brig.-Gen. Salas, at Matanzas, in order to trace out the reported plot and punish the culprits. Many persons were arrested and closely examined, but as by the usual mode of examination no clew to the alleged plot was found, the prosecution determined to resort to torture, the unwilling witness being flogged while stretched face downward on a ladder. This process of eliciting evidence, first applied to African slaves, was

soon extended to free-colored creoles, and then into the circle of white people. The subjoined table shows the number of prisoners tried and how they were disposed of:

Result of trial.	Slaves.	Free Colored.	Whites.	Aggregate.
Shot, (including 1 slave female).....	39	38	1	78
Condemned to hard labor (10 years).....	202	126	.....	328
Condemned to hard labor (1 to 8 years).....	303	345	4	652
Condemned to hard labor (1 to 6 months).....	38	272	2	435
Banished.....	.....	433	2	435
Consigned to service in charitable institutions (including 10 females).....	.....	27	.....	27
Sentenced to lighter penalties.....	8	1	5	14
Discharged.....	193	955	82	1,230
Total.....	783	2,197	96	3,076

Out of the aggregate number of prisoners on trial 1846 were found guilty and punished, besides a large number of similar prisoners untried, who perished in the plantations during the proceedings. These iniquitous proceedings were later on followed by a revolutionary movement in Central Cuba to liberate the island under the leadership of Gen. Narciso Lopez, who, in consequence of detection, fled to New York, where a goodly number of Cuban exiles joined him during the year 1848 to forward his plans for the liberation of Cuba, with a view to annexation to the United States. His attempt to sail for that island in 1849, at the head of a few hundred men, was baffled by the United States Government. Yet, renewing the attempt in the subsequent year and mustering his forces outside the United States, he sailed for Cuba in command of more than 600 men. He landed at Cardenas on May 19, stormed, captured, and held that place together with its governor and garrison, but evacuated it at dusk and re-embarked to land somewhere else in the island. But the expeditionary steamer "Creole," while steaming out of the harbor, got aground and only floated after a large quantity of war materials had been thrown overboard almost in sight of a Spanish man-of-war that chased her to Key West, where the expedition was disbanded. During the summer of 1851 partial risings of the people in Central Cuba caused Lopez to hasten from New Orleans to their aid, at the head of about 450 men, by the steamer "Pampero." The expedition landed on Aug. 12 at a point called Playitas, some 30 miles to the west of Havana. Gen. Lopez then detailed 130 picked men, under the command of Col. Crittenden, of Kentucky, to bring up the expeditionary baggage, and marched at the head of the main body of his forces inland. But soon both Lopez and his lieutenant were engaged by heavy odds. Crittenden confronted manfully the enemy, only to find his command cut down to 50 men without arms and ammunition. These were taken prisoners to Havana, where all of them were shot.

Meanwhile Gen. Lopez continued to fight from day to day at the head of his devoted band within a large circle of troops shutting out all help from the surrounding country, until a severe tropical storm swept away his scanty supply of arms, ammunition, and provisions. Then his forces scattered and wandered through the woods without food till they fell prisoners. Lopez was taken to Havana and executed there September 1st, but his surviving followers were pardoned. Born in Venezuela and but a lad at the outbreak of the war of independence of his native land, he was induced to fight on the side of Spain, where after the close of that war he continued his military career, attaining the rank of a major-general by gallantry in many a field. The troops hurled against him in his short Cuban campaign aggregated about 7000, of which over 1500 were reported killed and disabled, including Lieut.-Gen. Enna, who had the chief com-

mand. As nearly all the coadjutors of Lopez, both in Cuba and the United States, survived him, some two years after his death they renewed their efforts for the liberation of the island in concert with Gen. Quitman, of Mississippi. Large sums of money were raised and remitted to the United States for arms and ammunition, as well as vessels to convey them. The men enlisted at numerous places in Western Cuba were to rise simultaneously in arms on the arrival of Gen. Quitman in the island at the head of a strong force conveying the requisite war materials for the contemplated movement. But early in the year 1855 the leaders of that movement were betrayed and thrown into prison. Gen. Quitman then abandoned the attempt, and all was lost. Two of the most prominent leaders in Cuba were executed at Havana under court-martial proceedings, and the others, to the number of about 80, were retained in prison to be disposed of at the pleasure of the government. This event was succeeded by a lull, during which Cuba became quite prosperous. Her agricultural resources were considerably developed, particularly as regards sugar-cane, which, at the close of the year 1860, grew in 1365 estates, embracing an area of 59,447 "caballerias" ("caballeria" being a Cuban measure of land containing $33\frac{1}{3}$ acres), according to the statement published by Mr. Charles Rabello with Spanish official approval, as follows:

	Total. Estates.	Caballerias.		Crop in 1860.
		Sugar- cane.	Other Lands.	Tons.
Western Department ...	1,065	19,250	26,826	462,098
Eastern Department....	300	1,507	11,864	49,436
Aggregate	1,365	20,757	38,690	511,534

Many of the estates enumerated in the foregoing table improved the cultivation of their soil and the process of their sugar-making by the introduction of suitable implements and machinery; while their aggregate number increased from year to year to the advantage of the planters and the benefit of the country at large. But leading Cubans still endeavored to have the political condition of their native land ameliorated through pleading. They kept on their endeavors till the home government signified a willingness to hear their plea. Then several Cuban gentlemen well versed in the affairs of their country were commissioned to wait upon that government, which heard them but granted nothing substantial to ameliorate the political status. Smarting under disappointment the commissioners returned home during the year 1867. Shortly thereafter the people of Central and Eastern Cuba met in their respective departments and decided to assert with force the rights denied them through pleading. They concerted a plan between the two departments for a rising as soon as their organization to that effect was completed. But before completion Charles M. de Cespedes, a lawyer of Bayamo and one of the leaders of the movement in Eastern Cuba, rose at Yara, Oct. 10, 1868, at the head of 128 men wretchedly armed, to the surprise of his coadjutors, who, however, supported him, and in a few weeks that handful of men became a body of about 15,000 resolute fighters, though badly armed. After setting forth in their Declaration of Independence, then issued, the grievances which constrained them to rise in arms against the authority of Spain over Cuba, they went on to say: "And as Spain has many a time promised us Cubans to respect our rights without having hitherto fulfilled her promises; as she continues to tax us heavily, and by so doing is likely to destroy our wealth; as we are in danger of losing our property, our lives and our honor under further Spanish domination; as we have reached a depth of degradation unutterably revolting to manhood; as great nations have sprung from revolt against similar disgrace after exhausted pleading for relief; as we despair of justice from Spain

through reasoning, and cannot longer live deprived of the rights which other peoples enjoy, we are constrained to appeal to arms to assert our rights in the battle-field, cherishing the hope that our grievances will be a sufficient excuse for this last resort to redress them and secure our future welfare." As soon as their warlike movement was fairly started they framed a political constitution providing for a republican form of government with a chamber of representatives. It provided also among other subjects for the immediate abolition of slavery within Cuban territory. That constitution was duly proclaimed April 10, 1869, at Guaimaro in Central Cuba, where the chamber therein provided for was then organized, and where at the same time that chamber proceeded, according to constitutional provision, to elect Cespedes president and Francis V. Aguilera, of Bayamo, vice-president of the republic of Cuba. Thereupon the president-elect took the oath of office and appointed his cabinet and foreign commissioners with the advice and consent of the chamber. Of the members of the cabinet only the secretaries of state, war, and interior had immediate duties to perform.

From the outbreak of this insurrection to the close of the year 1870 the fortunes of war favored the Cubans in their struggle for freedom and self-government. They worsted the enemy in almost every field and drove him to his fortified positions on the seaboard and elsewhere, but could not make further headway from want of sufficient war materials. During this period they received from their agents abroad only a few thousand stand of arms (mostly old style Springfield or Enfield pattern), and but a comparatively small supply of ammunition; while their enemy had his numerous troops equipped with the best approved weapons of the United States, and kept the island surrounded by many war-vessels, of which the most efficient to prevent any outside help to the struggling Cubans were 30 light-draft steam-gun-boats built in New York expressly for Spain, which kept in-shore around Cuba. Nevertheless the insurgents held their own throughout more than half of the island, while their force aggregated probably 50,000 able-bodied men. But out of that number hardly one-fifth were properly armed, their arms and munitions having to a great extent been taken from the enemy. Most of those who were operating in the large district of Camagüey in Central Cuba, despairing of war materials from abroad, signified to the enemy early in 1871 a readiness to lay down their arms, provided their lives were spared. Being answered that on surrender they should be pardoned, their surrender commenced at once, and soon Gen. Agramonte, who was the Cuban chief commander in Camagüey, was left with 35 men, but determined, however, to remain in the field. On being asked on what he relied to prosecute the campaign, he curtly answered: "On dignity!" He was as good as his word, for through unremitting efforts he succeeded in raising a fine body of cavalry which restored Camagüey to the insurrection, and which rendered otherwise excellent service not only under his command but also under the leadership of his successor. Agramonte fell dead at their head at the very moment of routing the enemy after a protracted engagement in the spring of 1873. While such was the course of affairs in struggling Cuba, where fresh troops from Spain had been taking the field to cover the heavy losses, and where the Cubans had in their turn suffered severely, riotous and murderous proceedings kept the western department wrought up to a high pitch of excitement. Indeed shortly after the breaking out of the insurrection the old Spanish residents of the towns throughout that department began to organize themselves into battalions of volunteers, each battalion under the command of a colonel, who in almost every instance happened to be a wealthy slave-trader, for the Havana corps, which mustered about 20,000 men. But the volunteers under arms in Western

Cuba preferred remaining as home guards to do garrison duty, while their countrymen of the regular army were gallantly confronting the insurgents in the field. Their first feat at arms at Havana was to fire volley after volley upon the main entrance of a theatre and on the people as they came out at the end of a play performed, it was supposed, for the benefit of the insurgents, the performers being Cubans. Many persons were killed and wounded. Shortly thereafter, while out on parade, they fired into a saloon and again killed several persons. Their next exploit was an assault upon the residence of a prominent Cuban gentleman, who happened to be with his family away at the time in one of his sugar estates, fortunately for their personal safety; but their rich household goods were destroyed at the hands of the assailants. Later on they deposed Capt. Gen. Dulce and constrained him to return to Spain smarting under the indignity offered him and the home government, which had appointed him only a few months previous to his lawless deposition. But his government put up with the outrage perpetrated on him, and this emboldened the volunteers, who soon deposed also Brig.-Gen. Lopez-Pinto from the governorship of Matanzas, and began to turn out in force through the country, where many harmless people were killed by them. Hundreds of Cubans were torn from their families and shipped off by the government under volunteer escort to distant penal colonies of Spain. A greater outrage ensued. In November, 1871, 43 medical students of the University of Havana were arrested and subjected to trial by court-martial at the suit of the volunteers. The cause alleged therefore was that these boys while at the general cemetery had scratched the glass plate of a vault containing the remains of a volunteer. The trial ended in the acquittal of the defendants, through manly pleading for them by an educated officer of the Spanish army; but the volunteers called upon the captain-general for a new trial by court-martial composed of regular army and volunteer officers. He complied once more with their wish by ordering a court of five army with nine volunteer captains and a major of the army to conduct the prosecution under the presidency of an army colonel. These officers, organized into a court-martial, soon condemned eight of the unfortunate students to death; while their remaining companions, with the exception of four of them sentenced to imprisonment for six months, were consigned to hard labor. On the following day, November 27, 15,000 volunteers turned out under arms and the death-doomed boys were shot by a detachment from that force. This heinous deed produced general consternation in Western Cuba, and elicited a burst of indignation throughout the United States. Even the Spanish Parliament execrated the Havana volunteers, but required no atonement for the crime.

During 1871 the insurgents received but a scanty supply of arms and ammunition; they then determined to get war materials by assaulting the enemy wherever such materials could be had. Success crowned their efforts so well that at the close of the subsequent year they had on hand a pretty good supply of arms and ammunition for the campaign of 1873, which was the most active of the war, particularly in Eastern Cuba under the able command of Gen. Calixto Garcia, and in Camagüey under the leadership, first of gallant Agramonte, and next of his veteran successor. But during the last quarter of that year the Cuban chamber, which had been in recess for a long time, met at Bijagual in Eastern Cuba, and deposed President Cespedes, who was succeeded *ad interim* in his office by the chairman of that body, Salvador Cisneros, better known by his title of Marques de Santa Lucia. Shortly thereafter the steamer *Virginus*, a regularly documented American vessel, conveying a supply of arms and ammunition for the insurgents, was captured by a Spanish cruiser in sight of Jamaica and taken to Santiago de Cuba, where 53 of the passengers and crew were slaughtered. Their remaining companions, to the

number of some 130, would have shared the same fate but for the sudden appearance there of the British sloop-of-war *Niobe*, under Commander Lorrain, who peremptorily required the governor of that place to stop his bloody work. This affair brought the United States to the verge of war with Spain, but it was averted through diplomatic negotiations which ended in the surrender of the *Virginus*, together with its surviving passengers and crew, by Spain to the United States. In February, 1874, ex-President Cespedes, who, since his deposition, had retired to San Lorenzo in the mountains of Eastern Cuba, was, while alone, surprised by a detachment of the enemy, but manfully confronted them till he fell lifeless. He was a high-minded and stout-hearted man, and had shown remarkable executive abilities since the outbreak of the insurrection, but seldom, if ever, agreed with the assembly that deposed him. During 1874 fresh troops from Spain took the field by thousands, the Spanish forces having sustained very heavy losses in the preceding year. But towards the close of spring of 1875, owing to further losses in battle, or in hospital from the effects of the climate, the remaining Spanish forces were compelled to fall back on their fortified positions. A lull ensued in the insurrectionary districts, with the exception of Camagüey and Eastern Cuba, where the insurgents attacked every now and then Spanish columns escorting heavy trains of war materials and provisions, which the former generally wrested from the latter. But meantime partisan strife raised its hideous head among the struggling Cubans. However, the campaign was vigorously carried on with varying fortunes on both sides until late in the spring of the following year, when the Cuban forces, reduced to hardly 5000 men, scattered in bands of a few hundred men each. But even these thinly scattered forces were enabled by their mighty ally, the climate, to cause the Spanish troops severe losses by steadily harassing them. Such losses were, nevertheless, amply covered with 25,000 men arrived from Spain during the subsequent autumn under the leadership of Gen. Martinez Campos, who some time before had been duly appointed to the chief command of the Spanish forces against the Cuban insurgents, whose mode of warfare was quite familiar to him from his having fought them in the earlier years of the insurrection. He deployed his troops as he deemed best for a decisive campaign. But seeing them frequently baffled in Eastern Cuba and constantly harassed in Central Cuba to considerable falling off in their ranks, at the close of spring in the year 1877, he resorted to negotiations with insurgent chieftains to bring the war to an end. Success rewarded his efforts, for early in the year 1878 an armistice was agreed to between the belligerents in Camagüey, where the seat of the insurgent government was at the time, and where the Cuban chamber of representatives held a session to consider the overtures of Marshal Campos for peace. The chamber appointed a committee of nine members to wait on Gen. Vicente Garcia, who had been recently chosen President of the tottering Republic of Cuba, and arrange for a meeting, which took place shortly afterwards at Zanjón, in the district of Camagüey. There appeared on the part of Spain Marshal Campos, with a few general officers of his staff, and on the part of Cuba President Garcia, with the committee above mentioned. At that meeting the remaining insurgent forces in war-torn Cuba capitulated to the restoration of peace throughout the island in February, 1878. During the contest just outlined, which raged without quarter on either side, despite the best Cuban efforts from the outset for an exchange of prisoners, the Spanish losses aggregated 8000 officers and 200,000 privates killed in battle and died in hospital from the effects of the climate, as recorded in the war office in Madrid. By adding to these figures some 15,000 troops left in Cuba after the capitulation above pointed out, and 34,000 Cubans under the command of Marshal Campos at the time of that

capitulation, according to his personal statement, it will be seen that the forces which Spain gradually pitched against the insurgents aggregated 257,000 men, besides about 50,000 volunteers then and still organized in the island. The number of Cubans killed in battle, and otherwise, is variously estimated at from 40,000 to 50,000. The outlay on both sides amounted to some \$300,000,000 raised in Cuba, the great bulk of it being for the Spanish side. The value of property destroyed by the insurgents and confiscated by the Spanish government aggregated quite as many millions of money. The bravery and endurance of the Cubans arrested public attention, as they were not only destitute of clothing and provisions, but also badly armed against heavy odds well equipped and appointed; while the Spanish troops elicited the admiration of every one who observed their courage and steadiness at war in a climate as deadly to themselves as genial to their active enemy. Though in the earlier years of the contest Cuban belligerency engaged the attention of Congress more than once, it was not recognized by the United States government. But several of the Spanish-American republics recognized Cuba as a belligerent power, among them Peru, which shortly afterwards acknowledged the independence of that island.

The following tables, showing the population of Cuba in 1867, 1869, 1877, 1879, afford means of important comparison :

Census Tables.

	Males.	Females.	Aggregate.
1867 {			
White persons.....	491,512	341,645	833,157
Free colored people..	121,708	126,995	248,703
Colored slaves.....	203,412	141,203	344,615
Total.....	816,632	609,843	1,426,475
1869 {			
White persons.....	423,604	373,992	797,596
Free colored people..	116,402	122,525	238,927
Colored slaves.....	217,300	145,988	363,288
Total.....	757,306	642,505	1,399,811
1877 {			
National whites.....	522,719	383,763	906,482
Foreign whites.....	6,523	3,054	9,577
Coolies at large.....	21,833	57	21,890
Ditto under contract..	25,197	29	25,226
Free colored people..	128,853	143,625	272,478
Colored slaves.....	112,192	86,902	199,094
Total.....	817,317	617,430	1,434,747
1879 {			
White persons.....	569,640	396,095	965,735
Free colored people..	141,800	146,027	287,827
Colored slaves.....	89,517	81,570	171,087
Total.....	800,957	623,692	1,424,649

According to these tables the average population of Cuba at the beginning of October, 1868, and end of February, 1878, was respectively as follows, viz. :

	Whites.	Free colored.	Slaves.
October, 1868.....	819,822	245,050	351,617
February, 1878.....	963,430	273,757	196,760

Therefore, if the official figures are correct, the white and free colored population increased 17.52 and 11.71 per cent. respectively; whilst the slave population decreased 44.04 per cent. during the insurrection—a strange result, particularly as regards the free colored people, whose increase ought to appear in proportion to the decrease of the slaves, unless a large number of the latter perished in that war. But the fact is that after formal proclamation by the Cubans in arms of their political constitution declaring “all the inhabitants of the Republic of Cuba to be absolutely free,” the Spanish government issued a decree July 4, 1870, setting free every child born of a slave mother in the island after that date, and granting freedom to such slaves as had helped or would help the Spanish troops against the Cuban insurgents. The same decree pro-

vided also for the freedom of every slave sixty or over sixty years old, and gave rise to the law promulgated Feb. 13, 1880, for the gradual abolition of slavery, which, under the working of that law, shall be finally extinguished towards the close of the year 1887. Shortly after peace was restored, as above stated, Marshal Campos assumed command of Cuba as its Captain-General. Pursuant to his unlimited authority from the king, he proclaimed at once freedom of speech and the press, which gave rise to lively discussions of public matters in mass-meetings and through the newspapers. Then followed a royal decree dated June 9, 1878, entitling Cuba to elect to the Spanish Parliament one representative for every 40,000 white and free colored inhabitants. By another decree of that same date the island was divided into six provinces. A further decree was issued June 21, 1878, providing for provincial and municipal laws, which were at once enacted and duly supplemented with the requisite election law promulgated on August 16, 1878. The following table gives the statistics of these provinces as now organized :

	Area in sq. miles.	Population.	Judicial districts.	Municipalities
Pinar del Rio.....	5,117	200,000	3	25
Havana.....	2,842	450,000	12	33
Matanzas.....	3,165	260,000	5	22
Santa Clara.....	7,891	315,000	6	29
Puerto Principe....	9,495	65,400	2	5
Santiago de Cuba..	12,123	203,500	6	15

NOTE.—In the above statement of area the isles and keys adjacent to the provinces are excluded, except in case of Havana, which includes the island of Pinos, with an area of 985 square miles.

In each of the provinces the administration of its affairs is committed to an assembly elected by the people, and a governor appointed by the home government according to the provincial law above referred to, the same governor being a general officer of the army, and the province entitled to three representatives for every one of its judicial districts pursuant to that law. But no province shall elect more than 20 nor less than 12 representatives, the former number being allowed to the most thickly peopled districts. As soon as the provincial representatives are duly elected they meet and proceed to name by ballot three candidates from amongst themselves to have one of them chosen president of the assembly by the governor-general, who may, however, according to the aforesaid law, discard the ternary candidacy and choose any other member of that body to preside over it. Then the assembly chooses a vice-president and appoints two secretaries to keep a record of its sessions. Next the provincial governor selects five assemblymen and sends their names to the governor-general for him to appoint them as the provincial committee required by the law. That committee acts as a consulting body whenever called upon for an opinion on provincial affairs; decides all questions on municipal elections, and performs duties of the assembly during recess of the latter subject to the approval of the same assembly as soon as it meets again. The vice-president of this committee is appointed from amongst its members by the governor-general at the suggestion of the provincial governor, who may, whenever it suits his pleasure, preside, with a right to vote, over any sitting of the same committee, or of the assembly.

The provincial representatives are elected for the term of four years, but one-half of them is replaced every two years by new representatives. Their biennial elections take place during the first fortnight of September. They assemble together at the capital of their respective provinces on the first working day of the fifth and tenth month of every fiscal year. If during the time of their assemblage anything should happen likely to render their deliberations dangerous, it shall be the duty of the provincial governor to prorogue the assembly and report at once to the governor-

general, who is, on the other hand, fully authorized to suspend any of the provincial assemblies in a body from its functions and report immediately to the home government, whenever in his judgment public order shall require such suspension. According to the municipal law above referred to, the smallest number of inhabitants entitled to local self-government is 500, who may elect five aldermen. But the latter are gradually increased in proportion to population up to 20,000 inhabitants, who are entitled to 21 aldermen. Then one alderman is added for every 2000 inhabitants up to 30, which is the maximum number of aldermen in any of the larger municipalities. Their election takes place during the first fortnight of the eleventh month of the fiscal year, one-half of them being replaced every two years by new incumbents. The aldermen name by ballot three candidates from their own body to have one of them chosen mayor by the governor-general, who may, however, ignore the ternary candidacy and appoint as mayor any citizen outside the corporation. The provincial governor may, with a right to vote, preside at pleasure over any sitting of the board of aldermen. This board takes the census within its jurisdiction every five years and levies municipal taxes. The same board meets in common council, with as many tax-payers as there are aldermen, to take into consideration the taxes levied, the decision of that council being final. In fact, the municipalities help considerably their respective province to carry on local government. Both the provincial and municipal laws refer in several instances to the council of administration, composed of 12 councillors appointed by the home government to advise the governor-general on all administrative questions requiring his decision. The public discussions above referred to brought about two political parties: one known as conservative and the other as liberal. The former is composed of old Spaniards, with their ranks considerably swelled by members of the volunteer organization above noticed. The latter is organized by Cubans, but includes also some intelligent and well-informed old Spaniards. Their leaders are bright-minded men, distinguished for their ability, both as public speakers and vigorous writers; whilst their antagonists are not so well gifted or accomplished, but use greater boldness to attain their aims, particularly at the elections, which they generally carry, and become thereby enabled to control the provincial administration. The conservatives have the support of the government, but the liberals are left to shift for themselves within the law, which is frequently stretched to prosecute and silence their journals. Indeed, according to the press law dated April 7, 1881, and promulgated in Cuba early in the ensuing May, every editor or manager of a daily or weekly journal must send, duly signed by him, two copies to government headquarters, and two other copies of its issue, as soon as printed, to the district attorney, for him to see whether any objectionable remarks are contained therein. In several instances liberal journals have been suspended from publication for many weeks and their editors fined according to their respective degree of delinquency under the press law. That law, which contains numerous articles defining transgressions against itself, holds sacred the royal family and form of government under the Spanish constitution.

Cuba has two high courts: one in Puerto Principe, with jurisdiction over that and the adjoining province of Santiago de Cuba; the other in Havana, with jurisdiction over the remaining provinces. But the governor-general is above either court, as appears from a royal decree dated June 9, 1878, defining his duties and prerogatives. According to that decree, he is the commander-in-chief of the army and navy in Cuba, as well as the highest authority in every other respect over the island. Hence his power not only to overrule any decision at a meeting of all the superior authorities, including the justices of the court of indicature,

under his presidency, but also to withhold the execution of any order or resolution of the home government "whenever he may deem it best for the public interests."

Religion and Education.—Cuba is divided into two dioceses, which are the archbishopric of Santiago de Cuba, containing 55 parishes, and the bishopric of Havana, containing 144 parishes. Education is still much neglected. The chief educational institutes are the Havana University, two professional schools with meteorological observatories attached, one agricultural school, and two seminaries. There are several private as well as public schools, aggregating in all 750 institutes, with some 30,000 students and scholars. The several railways embrace about 950 miles, and the telegraph wires cover some 1620 miles.

Sugar.—The sugar and molasses crop of Cuba is given in the subjoined table in tons for the respective years:

Year.	Sugar.	Molasses.
1868.....	710,609 tons.	265,024 tons.
1869.....	664,155	233,985
1870.....	684,032	225,123
1871.....	527,000	163,812
1872.....	667,850	200,450
1873.....	719,441	175,000

The exports and home consumption of sugar, as well as the exports of molasses, during each fiscal year is shown in the subjoined table:

Year.	Sugar.	Consumption.	Molasses.
1878.....	505,000 tons.	45,000 tons.	98,000 tons.
1879.....	641,000	45,000	127,000
1880.....	511,000	45,000	108,000
1881.....	467,000	45,000	92,000
1882.....	561,000	45,000	125,000
1883.....	443,000	45,000	100,500

The ensuing table shows the taxes levied on Cuba for each fiscal year (ending June 30):

1867.....	\$32,852,233	1877.....	\$60,132,638
1869.....	52,359,708	1879.....	54,752,977

The taxes levied on Cuba by the Spanish Parliament for the fiscal year ending July 1, 1884, amounted to \$34,269,410, to meet disbursements according to the following details:

"General Obligations".....	\$12,075,999.02
Department of Justice.....	1,020,504.02
War Department.....	9,625,378.18
Treasury Department.....	1,823,223.01
Navy Department.....	2,204,677.96
Department of the Interior.....	5,730,966.50
Department of Public Works.....	1,036,812.00
Department of State.....	616,160.20
Penal Colony of Fernando Po.....	37,160.00
Aggregate.....	\$34,170,880.89

Under the head of "General Obligations" appear \$468,000 for civil and military pensions; \$918,500 for military, civil, and naval officers on the retired list; \$97,175 for the colonial department, including salary of the minister; and \$10,115,420 for interest and instalments on the public debt. The appropriation to the department of justice includes \$379,757.52 for the clergy and church in Cuba. Among the items of expense in the war department are \$5,000 for pensioned military decorations, and \$200,000 for the volunteer organization in the island. The expenses of the department of the interior include \$50,000 for salary of the governor-general, \$708,848.72 for police service, and \$2,537,119.09 for the pay of foot and mounted gendarmery. Of the two items making up the total amount of the state department, one is for \$121,300 to pay salaries and defray office expenses of nearly the whole diplomatic corps and consular body of Spain in America, excepting the United States, while the other

item is of \$494,860.20 to meet outstanding claims, pursuant to final decision of the Mixed American and Spanish Commission in Washington. The revenue corresponding to the total outlay includes \$2,300,000 for taxes on city real estate; \$2,150,000 on commerce, industry, arts, and professions; \$1,100,000 on cattle and swine at the slaughter-house; \$11,400,000 for duties on foreign importations; \$6,466,200 duties on exports; and \$3,334,820 net gain from the "Royal Lottery." During that year there were 29 lottery drawings, and the amount realized out of the sales of tickets therefor reached \$13,317,320, according to official statement. Out of this amount \$9,982,500 have been applied to payment of prizes drawn, leaving the gain above pointed out. According to the government reports the forces garrisoning Cuba are 22,866 officers and men of the regular army and 12 vessels of the navy. The same reports show that the foot and mounted gendarmery aggregate 5076 officers and men in the island, while the Havana police number 767 men. The total amount of revenue exceeds the disbursements above set forth by \$98,529.11, and therefore this balance must have been left in the national treasury if Cuba paid in full, which, however, is questionable. Her impoverished condition has been frequently urged by her representatives upon the attention of the Spanish Parliament without avail. These representatives are 24 congressmen and 12 senators, who, though supported by 12 congressmen and 6 senators from the sister island of Porto Rico, are utterly powerless on any Cuban measure put to a vote in that Parliament. (P. G.)

CUCKOO, any bird of the family *Cuculidæ*, order *Picariæ*. The American cuckoos are all different from any of the old world, not only in species and genera, but in sub-families. They are most numerous and diversified in the warmer parts of America.

There are some twenty-five or thirty species of the genera *Crotophaga*, *Guira*, *Geococcyx*, *Dromococcyx*, *Diplopterus*, *Saurothera*, *Piaya*, *Morococcyx*, and especially *Coccygus*, which has the largest number. None are regularly parasitic on other birds, like cuckoos of the old world; but some occasionally drop their eggs in other birds' nests, or destroy the eggs and young of other birds, and many are known to be irregular in nidification, or oviposition, or both. North America alone possesses representatives of three sub-families of *Cuculidæ*. I. *Crotophaginae*: see ANI.

II. *Saurotherinae*, ground cuckoos. Although the feet are zygodactyle, the toes being arranged in pairs, two before and two behind, as in all the family, the birds of the family are fitted for terrestrial habits by the size and strength of the feet, and run with great rapidity. The ground cuckoo, chaparral cock, road-runner or *paisano* (*Geococcyx californianus*), is one of the most notable birds of the south-western territories of the United States, from Texas to California. It is nearly two feet long, the tail a foot or more, narrowly fan-shaped, of ten tapering graduated feathers; the wings short, rounded, concave-convex; the bill about as long as the head, stout, tapering, decurved at the end; the tarsus longer than the toes, scutellate before and behind; the head crested; a naked space about the eye; most of the feathers of the head and neck bristle-tipped. The coarse plumage is bronzed greenish, blue on the crest, variegated with whitish or buff; the under parts soiled white, but the fore-neck streaked with black and tawny; the tail-feathers with broad, white tips. The *paisano* is noted for its surprising swiftness of foot, which taxes a horse in a race. It feeds upon reptiles, crustaceans, insects, and various seeds and fruits. It nests in bushes, building a large shallow structure of sticks, and lays numerous pale greenish elliptical eggs, the peculiarity being that these are gradually deposited, incubation taking place before the full complement is laid, so that fresh eggs and others in various stages of development may be

found together with young birds. A second, smaller species (*G. affinis*) occurs in Mexico and Central America. The West Indian species of *Saurothera* belong to the same sub-family. III. *Coccyginae*, tree cuckoos, including the great majority of the genera and species. The leading genus is *Coccygus*, with eight or ten species, three of which inhabit North America, two of them reaching Canada, the other confined to Florida. They share the peculiarity of egg-laying noticed above, and the nidification is substantially the same; eggs are occasionally dropped in alien nests, but such is not the rule. The yellow-billed cuckoo (*C. Americanus*) is the commonest species, often known as the "rain-crow," its reiterated, uncouth cry of "cow, cow, cow," being thought a sign of falling weather. The plumage is peculiarly silky, quaker-color above, milk-white below; the wings are extensively suffused with cinnamon-brown; the lateral tail-feathers black, with large white tips; the bill black and yellow. This bird is 11 to 12 inches long, the pointed wings 5 to 5½, the graduated tail 6 to 6½, the bill stout, decurved. The black-billed cuckoo (*C. erythrophthalmus*) resembles the last, and is of the same size, but the bill has but a trace of yellow, if any; the skin about the eyes is red and bluish; the wings are scarcely suffused with rufous, and the tail-feathers are less strongly marked. The habits and general distribution are the same; both are migratory birds of the woodland of the United States east of the Mississippi, and feed chiefly upon insects. The mangrove cuckoo (*C. seniculus*) resembles the yellow-billed, but is pale orange-brown below instead of white, and the auriculars are dusky-gray: the size is about the same. This is a West Indian species, only a visitor to Florida. (E. C.)

CUDLIP, ANNIE THOMAS, an English novelist, known to literature as Annie Thomas, and as Mrs. Pender Cudlip, was born at Aldborough, Suffolk, Oct. 25, 1838. She came of an Irish family of distinction, named Thomas, and her mother was a relative of Lord Reay. Among Mrs. Cudlip's most successful stories are *Sir Victor's Choice*, *Barry O'Byane*, *Denis Donne*, *Theo Leigh*, *Walter Goring*, *A Narrow Escape*, *The Two Widows*, *High Stakes*, and *A London Season*. She is a prolific writer, of high moral purpose; her tales are principally of the class called society novels. In 1867 she was married to the Rev. Pender H. Cudlip.

CUFFEE, PAUL (1759-1817), an American negro navigator and philanthropist, was born at Westport, Mass., in 1759. His father, John Cuffee, a native African, though a slave in Massachusetts, purchased his own freedom, and bought a farm of 100 acres, upon which he lived respected by all, and reared a family of four sons and six daughters. His wife, Ruth Moses, was one of the Nantucket tribe of Indians. Paul was the youngest son. At the death of his father, 1774, the care of the family devolved upon the sons. The land was poor, and the struggle for existence was bitter. With little help Paul learned to read and write, and acquired a fair knowledge of arithmetic. In two weeks he mastered the general principles of navigation. At sixteen he shipped as a green hand on a whaling vessel. On a voyage to the West Indies he was captured by a British cruiser, and was kept a prisoner, in New York city, for three months. For the last two years of the Revolutionary War he remained at home assisting his brothers on the farm. In 1780 the negro population of Massachusetts were denied the right of suffrage, though taxed. Paul Cuffee, though not yet twenty years of age, had felt the spirit of liberty, by reason of his voyages and experience. He induced his brother John to join him and others in a petition, Feb. 10, 1780, to the General Court for the right of suffrage. The petition was refused at that session, but granted in 1781, and ultimately affected the legal status of all persons of African descent in that State.

Beginning about 1781-2 with an open boat, manned

by himself, he became master, and owner, in turn, of a schooner, a brig, and a ship. He made voyages to Russia, England, and the West Indies. In 1806 he was not only an experienced navigator, possessed of much landed property, houses, and stores, but in addition he owned a ship, two brigs, and several smaller craft. With increased wealth Cuffee developed the proper spirit of using it. He had earned the title of navigator and merchant by his numerous voyages; he now aspired to add to these the higher one of philanthropist. Mindful of his early disadvantages, he erected at his own expense a school-house at Westport, hired a teacher, and opened the school, the only one in the neighborhood, to the public. In the winter months he taught navigation to his own sons and those of his neighbors in the same building.

It is a matter of tradition that many of the early seamen of the Elizabeth Islands, Nantucket, and Martha's Vineyard, were taught navigation by Captain Paul Cuffee. He had early joined the Society of Friends, and became a minister in that religious body. In accordance with their principles he never dealt in liquor or slaves, at that time fruitful sources of New England wealth. The discussions at the formation of the Union (1789), and the failure to abolish the slave-trade, led to discouraging views for his race in the United States. He was familiar with Mr. Thornton's scheme (1787) for founding a colony of free blacks in Africa; also with those of Rev. Dr. Hopkins (1789), Fairfax, of Va. (1790), and Rev. Dr. Stiles (Yale Coll.). In 1811 he sailed for Sierra Leone in his own vessel, the *Traveller*, manned by a colored crew, his nephew, Thomas Wainer, being the captain. He was kindly received there, and soon won favor with the whites and blacks. He instituted the "Friendly Society of Sierra Leone," which is still in existence. Being invited to visit England by the leading members of the African Institution, among whom were Clarkson, Wilberforce, and Strange, in August, 1811, Paul Cuffee, with his black crew, arrived at Liverpool, England, where they were cordially treated, Cuffee himself being the recipient of especial attention. He visited London twice, and was commissioned by the African Institution to carry goods to Sierra Leone. Upon reaching the United States, Cuffee corresponded with the leading negroes of his day in New York, Boston, Philadelphia, and Baltimore, with a view of forming associations for trade and settlement in Africa. The plan was well thought of, and promised success. When the war of 1812 began, he went to Washington to solicit the aid of Congress, and was well received, but the fact that his ground of operations lay in the domain of English territory prevented, at that time, any active co-operation. While the war lasted, he devoted himself to correspondence and the perfection of his plans. In the fall of 1815 he sailed again for Sierra Leone with thirty-eight negroes, eight of whom paid their own expenses, the first emigrants from America to Africa, most of them coming from Boston. Cuffee had so successfully worked up his plan that he had some 2000 names enrolled, when sickness and death finally overtook him. In his zeal Cuffee exceeded the limit set by the African Institution, and was obliged, on arriving at Sierra Leone, to provide from his own funds nearly \$4000 for the support of the extra number he had brought. When the American Colonization Society were preparing to select a site for a colony in Africa, Rev. S. J. Mills, their agent, sought Paul Cuffee, whom he found upon his death-bed. He had then been sick over five months, keeping up, however, an extensive correspondence, at home and abroad, on African migration. He died, Sept. 7, 1817, a few days after Mr. Mills' interview. His death was the occasion of many eulogies, in which his character, labors, and talents were clearly and fairly stated.

He was industrious, temperate, of the strictest integrity, eminently successful in business, charitable

and public-spirited. In manner he was unassuming, dignified, and grave, partaking of the characteristics of the Society of Friends among whom he was reared. Judge Bushrod Washington said of him, "I cannot forbear a momentary tribute of regret to the memory of a man to whom Africa is indebted for a vindication of her capacity for moral and intellectual improvement, and the world for an illustrious example of disinterested benevolence." (R. T. G.)

CULIACAN. A city of Mexico, capital of the State of Sinaloa, on the Culiacan River and the Sinaloa and Durango Railway, about 200 miles W.N.W. of Durango. It is 43 miles by this railway from Altata, a port on the Pacific Ocean near the Gulf of California. It has a beautiful situation, a genial climate, and is surrounded by a fertile country, in which gold and silver mines have been opened. It is the literary and educational centre of North-western Mexico, and the seat of a Bishop's College and of the National College of Rosales. Culiacan has a large cathedral, a costly mint, a newspaper-office, a cotton-factory, a sugar-mill, and a fine public square. The climate from October to May is said to be perfect, and the temperature is always above the freezing-point. The Spanish settlement of this place was founded by Nuño de Guzman, in 1532, near the site of the Aztec city of Hucicolhuacan. Population about 12,000.

CULLEN, PAUL (1803-1878), an Irish prelate and cardinal, was born in the county Kildare, April 27, 1803. He had been dedicated to a religious life, and was early sent to Rome to be educated for the priesthood. Soon after his ordination he was made professor of Hebrew in the College of the Propaganda, and afterwards he became rector of the Irish College at Rome. During the revolutionary movements of 1848 he had charge of several colleges, which he saved from disturbance by the republicans. On the death of Archbishop Crolly, of Armagh, in 1849, the suffragen bishops being divided as to the choice of a successor, Pope Pius IX. appointed Dr. Cullen primate of all Ireland. The new archbishop, consecrated in February, 1850, abandoned the conciliatory policy of his predecessor, and set himself in opposition to the plan of national education, which had for some time prevailed in Ireland. At the synod of Thurles, held in August of that year, he succeeded after an animated struggle in securing, by a majority of one, the condemnation of the national schools and of the Queen's colleges, then recently established. He thus prepared the way for the foundation of a Catholic university, to which he devoted himself with great energy. That he might more effectually carry out this scheme, he was, in 1852, after the death of Archbishop Murray, transferred from Armagh to the more important, though less dignified, see of Dublin, being at the same time made delegate apostolic for life, and thus retaining his place at the head of the Irish hierarchy. The Catholic university was opened in Dublin, in 1854, under the presidency of Rev. Dr. J. H. Newman, who, however, soon relinquished that position. Archbishop Cullen introduced and firmly established changes in the ecclesiastical system of Ireland, by which the former independence of the parish priests was destroyed, and bishops were no longer elected by the clergy. He discountenanced the interference of the clergy in political affairs, and steadily opposed secret societies, as well as the mixed system of education. In June, 1866, he was made a cardinal priest, being the first Irishman who attained this dignity. He had always been noted for his ultramontane views, and in the Vatican Council, in 1870, he warmly supported the declaration of papal infallibility. After the death of Pope Pius IX., in February, 1878, Cardinal Cullen left Ireland to attend the conclave, but on account of ill-health was unable to be present at the election of Leo XIII. He returned to Dublin, and died there Oct. 24, 1878. He was austere and even ascetic, and was especially noted for his ability and success as an administrator.

CULLUM, GEORGE W., an American general, was born Feb. 25, 1809, in New York City. He graduated at West Point, 1833, and was promoted to the corps of engineers, in which arm of service he rose to the rank of colonel. He was engaged for many years in the construction of fortifications and other public works at Boston, New Bedford, Newport, New London, New York harbor, West Point, and North and South Carolina. Among these public works were Fort Sumter and other defences of Charleston, and the New York assay office. From 1848 to 1855 he was instructor of practical engineering in the U. S. Military Academy. At the beginning of the Civil War he was aide-de-camp to Lieut.-Gen. Winfield Scott, and upon his retirement (Nov. 1, 1861) was appointed a brigadier-general of U. S. volunteers. Being assigned as chief of engineers and chief of staff to Maj.-Gen. Halleck, he was engaged in establishing defensive works in the Department of Missouri and Division of the Mississippi, directing at Cairo, Ill., operations auxiliary to the Western armies in the field, and served as chief of engineers in the campaign and siege of Corinth, and after its evacuation in fortifying its approaches. When Gen. Halleck became general-in-chief he continued at the head of his staff and directed numerous engineer operations for the defence of places. He served on many military boards, and was appointed (Sept. 8, 1864) superintendent of the U. S. Military Academy at West Point. Nov. 24, 1866, he became a member of the board of engineers for fortifications for the defence of the territory of the United States. For faithful, meritorious, and distinguished services in the rebellion he received three brevets, and, being over sixty-two years of age, was retired, Jan. 13, 1874, from active service. On the day of his retirement he was elected vice-president of the American Geographical Society, and Nov. 12, 1880, became president of the Geographical Library Society of the city of New York. He is the author of the *Biographical Register of the Officers and Graduates of the West Point Military Academy* (3 vols. 8vo), *Systems of Military Bridges* (1863), *Campaigns and Engineers of the War of 1812-15 against Great Britain*. He has also published various military memoirs and geographical papers, and translated and edited Duparcq's *Military Art and History* (1883).

CULPEPER, or COLEPEPER, THOMAS, LORD (d. 1688), a colonial governor of Virginia, was the son of John Colepeper, who was made Baron Colepeper of Thoresway, England, in 1644. He was one of the grantees of the territory of Virginia, and in 1669 purchased the exclusive right to the land lying between the Potomac and the Rappahannock rivers. In 1673, King Charles II. granted to him and the earl of Arlington the whole of Virginia for thirty-one years. In 1675 the king gave him a further commission as governor of the province for life. Culpeper, however, remained in England till 1680, when the king insisted on his assuming his duties. He caused the governor's salary, heretofore £1000, to be doubled, and the duties on tobacco and other merchandise to be placed under the exclusive control of the king. In return for these concessions made by the assembly, he brought a general amnesty for past offences in the province. In a few months he returned to England, while the people groaned under their burdens, and some of them endeavored to put a stop to tobacco-planting by violence. Culpeper came back to the province in 1672, hanged the leading "plant-cutters," and then, with the king's consent, debased the currency and took away the privilege of appeal from the governor and council to the assembly. Returning to England in 1683 in violation of his orders, he was prosecuted and deprived of his office and patent, yet he was allowed an annual pension of £600 for the remaining time of his original grant. He was mercenary, despotic, and cruel, entirely indifferent to the interests of the colony. On his death, in 1688, his vast estate in Virginia descended to his daughter Catharine, Lady Fairfax.

CUMBERLAND, a city of Maryland, county-seat of Allegany Co., is on the north bank of the river Potomac (North Branch), at the mouth of Wells Creek, 178 miles W. of Baltimore. It is on the main line of the Baltimore and Ohio Railroad, at the junction of its Pittsburg Division, and is a terminus of the Cumberland and Pennsylvania and the George's Creek and Cumberland Railroads, and of the Bedford Division of the Pennsylvania Railroad. The Chesapeake and Ohio Canal extends hence down the Potomac to tide-water, at Washington, D. C., while to the north-west extends the old National Road. Here the Potomac is bridged. The chief public buildings are a city hall, a court-house, jail, and a fine hotel. The public schools are five in number. The town has 3 national banks, 2 daily and 4 weekly newspapers, 15 churches, 2 academies (1 Catholic), gas- and water-works, a hospital, 2 convents (1 Ursuline, 1 Sisters of Mercy), a house of Capuchins, and an academy of music. It is chiefly a manufacturing town, but it also is the point of shipment for the excellent steam and blacksmith coal which is mined near by. The manufactures include lumber, furniture, sash, doors, castings, flour, tobacco, pipes, etc.; and there are five glass-works and a rolling-mill. The surrounding scenery is very fine. Population in 1870, 8056; in 1880, 10,693.

CUMBERLAND GAP is a narrow pass in the Cumberland mountains, near the dividing line between Kentucky and Tennessee, 50 miles N. of Knoxville, Tenn. The Cumberland range is about 1300 feet high, and the gap is about 450 feet deep; in parts it is just wide enough for a single roadway. West of the gap there are others, among which the principal are, Baptist, Rogers', and Big Creek; but these are very difficult to pass, and are very infrequently used. For 150 miles to the east there are no passes in the range. Cumberland Gap was of great strategic importance during the civil war. When occupied by a Union force, it severed the communication between the Confederate armies in the east and west; and when it was in Confederate hands it kept the Federal forces out of East Tennessee. In 1861 it was garrisoned by the Confederate Gen. Stevenson with about 13,000 men, who strongly intrenched it with earthworks and rifle-pits. The Union Gen. G. A. Morgan, with about 12,000 men, arrived at Cumberland ford in April, 1862, and formed his plans for taking the gap in the rear, but deceived the enemy by demonstrations in front, while at the same time Gen. Buell made a diversion towards Chattanooga. Morgan then passed unobserved through Rogers' Gap, which the enemy had considered impracticable, first with one brigade, speedily followed by two more. He reached Powell's Valley on the south side of the mountain range, June 11, a few of his troops having also passed through Big Creek Gap. Thus threatened by numbers in his rear, Gen. Stevenson evacuated the gap June 18, and Morgan entered without resistance. For two months he was in unmolested possession, but in the summer of 1862 the Confederate Gen. Bragg made a strong advance northward, in connection with a supplementary corps under Gen. Kirby Smith, and, marching towards the Ohio, threatened Cincinnati. In doing so he moved by the eastern route from Chattanooga and Knoxville. Gen. Stevenson now marched upon Cumberland Gap in front, while Kirby Smith made a demonstration in rear, and Morgan was in danger of being cut off from the north. The place was no longer tenable: indeed hemmed in by these forces Morgan must have surrendered, had not Kirby Smith been obliged to fall back to procure supplies. Morgan, who had held out for some time on short rations, then evacuated the gap, destroying everything he could not carry away, and set out on September 17 on a march of 250 miles to the Ohio. The enemy harassed his rear; he was in want of supplies, and often of water; but he conducted the retreat so skilfully that he reached the Ohio on

Oct. 4 with 10,000 men, 400 wagons, and 20 guns. The gap was at once occupied and newly strengthened by the Confederates, who held it for a year, but incident to the movements around Chattanooga under Gen. Grant and the occupation of Knoxville by Gen. Burnside, it was easily taken again by the Federal troops under Gen. Shackelford Sept. 4, 1863. Further events and the progress of the Federal arms caused it to lose its strategic importance. In January, 1864, Lieut.-Gen. Grant inspected the gap, amid winter snows, on his journey from Knoxville to Louisville, to have personal knowledge of its value, should it again enter into the strategy of the war. (H. C.)

CUMBERLAND PRESBYTERIAN CHURCH, an American branch of the Presbyterian family, arose out of differences between the ministers of the Synod of Kentucky, of the Presbyterian church, on the questions of revivals of religion, the education of the ministry, and the doctrines of the Westminster Confession of Faith. The name Cumberland came from the Cumberland Presbytery, in that Synod to which the men who organized the new church belonged.

History.—During the early years of the nineteenth century a revival of religion prevailed through portions of Kentucky and Tennessee embracing what was known as the Cumberland country. This region had been rapidly peopled by immigrants from Virginia and the Carolinas. There were few churches and fewer ministers of the gospel, and coldness characterized the preaching and lives of many. Infidelity and wickedness prevailed to an alarming extent.

The Rev. James McGready, who had been for years a member of the church, and a candidate for the ministry in the Presbyterian church, was converted and became a very zealous preacher, making special effort to awaken the formalists in the church. It was mainly through his labors that the revival began which has become known as the "revival of 1800." This spiritual awakening spread over the Cumberland country, then embraced in the Transylvania Presbytery of the Presbyterian Church. The earnest, pointed preaching of Mr. McGready very naturally excited great opposition from both infidels and formal church-members. At one place his pulpit was burned, and a letter, written in blood, warned him against continuing. Soon after this he became a pastor in the bounds of Transylvania Presbytery. Two parties were formed in this Presbytery, which became known as the revival and anti-revival parties, and ultimately the revival party formed what has become the Cumberland Presbyterian Church.

Through the great immigration into the valley of the Cumberland, and the interest awakened by the revival, the demand for preachers and religious instruction became much greater than the supply. Institutions of learning were scarce; there were, indeed, none of high grade in the country, and the rapidly growing communities could not wait on the slow and uncertain work of a few schools in distant States. Men who could not go East and take a classical course of study became impressed with the duty of preaching the gospel to the multitudes ready to receive it. The Rev. David Rice, then the oldest Presbyterian minister in Kentucky, knowing the pressing demands for the means of grace, recommended that "men who appeared to possess talents and a disposition to exercise their gifts publicly be chosen to preach the gospel, although they might not have acquired that degree of education required by the Book of Discipline." The Transylvania Presbytery was divided in sentiment as to what should be done, and hesitated, but finally yielded to the wants and petitions of the people and by a small majority licensed a number to preach without a classical education. They justly claimed this as one of the "extraordinary cases" provided for in the *Form of Government* (sec. vi., chap. 14). Against this, protest was entered by those not in sympathy with the revival and the matter was brought before the Synod.

In 1802 the Synod of Kentucky divided Transyl-

vania Presbytery and formed a new one, calling it Cumberland. The new Presbytery having a majority that favored the revival work and measures, received the probationers licensed by Transylvania Presbytery without a classical education. Cumberland Presbytery having charge of the work within its own bounds, licensed and ordained some men not classically educated, who gave evidence of aptness to teach, to supply the many new churches which the revival had formed.

During the controversy about the revival work there had sprung up a much more serious difficulty in the form of dissent from some of the doctrines of the Westminster Confession of Faith, such as unconditional election and reprobation, and a limited atonement. A number of men licensed and ordained by Cumberland Presbytery were allowed to "except the idea of Fatality" which they believed taught in the doctrines of Decrees and Election as expressed in chap. 3 of that Confession. Out of this "unsoundness of doctrine," "adopting the confession with reservations," grew divisions that ultimately led to the organization of the Cumberland Presbyterian Church.

The liberty granted probationers to "except the idea of fatality" when adopting the Westminster Confession was strongly opposed by the anti-revival party, and by it the matter was brought before the Synod of Kentucky. At the meeting of the Synod in 1804 all the members of the Cumberland Presbytery were cited to appear at its next meeting. The members of the Presbytery did not obey the citation on the ground that the Synod did not have authority for such action under the constitution of the Presbyterian Church. The Synod, at its meeting in 1805, appointed a "commission with synodical powers" to which the whole matter of the Cumberland Presbytery was referred. The commission met with the Presbytery and proposed to re-examine members already ordained, but the Presbytery felt that even a "commission with synodical powers" had no authority for such a course and would not submit its members for re-examination. The commission made two specifications against the Presbytery: "1st. Candidates in their licensure and ordination had been permitted to adopt the Confession of Faith with reservations. 2d. The literary qualifications required by the discipline had been dispensed with."

The Presbytery having refused to submit the men it had licensed and ordained to be re-examined, the commission resolved to prohibit all the men licensed and ordained by Cumberland Presbytery from "preaching, exhorting, and administering the ordinances," and the older members were cited to answer to Synod for refusing to allow the re-examination. The members of Presbytery in sympathy with the revival work, after consulting together, determined to disregard the acts and demands of the commission as in violation of their rights, and, so far as they might be able, to go on with their work. The Synod in 1806 suspended some of the members of the Presbytery for refusing to submit the young men for re-examination by the commission, and dissolved Cumberland Presbytery and attached some of its members to Transylvania Presbytery, leaving out those who "excepted the idea of fatality" in adopting the Westminster Confession of Faith. The ministers and probationers thus cut off, not by their Presbytery but by the Synod, formed themselves into a council and made various efforts to secure a redress of their grievances, appealing to both the Synod and the General Assembly. Failing in this after four years of effort, Rev. Finis Ewing, Rev. Samuel King, and Rev. Samuel McAdow, in Dickson co., Tenn., on Feb. 4, 1810, united in organizing an independent Presbytery to which they gave the name Cumberland, after the one with which they had been connected, and which had been dissolved four years previous. After constituting this Presbytery, it ordained Ephraim McLean, who had been licensed by the old Cumberland Presbytery. This was the origin of what is now the Cumberland Presbyterian Church.

The new Presbytery met March 20, 1810, and ordained two more probationers of the old Cumberland Presbytery. It adopted the Westminster Confession of Faith, with the provision that probationers ordained might "except the idea of fatality" as they had been permitted to do in the old Presbytery. Covering the doctrinal differences between the new Presbytery and the mother church, it adopted the following: "All candidates for the ministry who may hereafter be licensed by this Presbytery, and all probationers who may hereafter be ordained by this Presbytery, shall be required, before licensure and ordination, to receive and adopt the Confession and Discipline of the Presbyterian Church," except the idea of fatality that seems to be taught under the mysterious doctrine of predestination. It is to be understood, however, that such as can clearly receive the confession without an exception shall not be required to make any. Moreover, all licentiates, before they are set apart to the whole work of the ministry or ordained, shall be required to undergo an examination on English grammar, geography, astronomy, natural philosophy, and church history. It will not be understood that examinations on experimental religion and theology will be omitted. The Presbytery may also require an examination on all or on any part of the above branches of literature before licensure, if they deem it expedient."

This was the position of the new organization, until in 1813, when the first Synod was formed, and to which the name Cumberland was given. At this first meeting of the Synod a committee was appointed to prepare a Confession of Faith, Catechism, and Form of Government. It also adopted a brief doctrinal statement, giving the points of dissent from the Westminster Confession, which was given in Buck's *Theological Dictionary* (3d ed.). This gave these points: "(1.) That there are no eternal reprobates. (2.) That Christ died not for a part only, but for all mankind. (3.) That all infants dying in infancy are saved through Christ and the sanctification of the Spirit. (4.) That the Spirit of God operates on the world; or, as co-extensively as Christ has made the Atonement in such a manner as to leave all men inexcusable." These points make plain to all what was meant by "excepting the idea of fatality."

Under the preaching of these doctrines the revival of 1800 was perpetuated, and was, in fact, transferred to the church founded on them in the wilderness. The new organization had a rapid growth. The Synod continued the highest court until 1828, when it was decided to form a General Assembly. The vote was between a delegated Synod and a General Assembly, there being 20 votes for the Synod and 67 in favor of the Assembly. The first General Assembly met in Princeton, Ky., May 19, 1829. The new church then had 4 Synods and 18 Presbyteries, 16 being represented in the first General Assembly. These were from Tennessee, Kentucky, Alabama, Illinois, Indiana, Missouri, and Arkansas. The early records are quite meagre, and but little attention has been given to statistical reports. A complete report from all of the churches and Presbyteries has never been made. The stated clerk of the General Assembly, in his report for 1884, with incomplete reports from 16 Presbyteries, made the following showing: Synods, 27; Presbyteries, 117; ordained ministers, 1505; licentiates, 249; candidates, 214; congregations, 2462; ruling elders, 9373; deacons, 3104; additions during the year on profession of faith, 9960; by letter, 3395; total in communion, 122,240. Churches of this order are now found in Western Pennsylvania, West Virginia, Ohio, Indiana, Illinois, Tennessee, Kentucky, Georgia, Alabama, Mississippi, Louisiana, Arkansas, Texas, Indian Territory, Iowa, Missouri, Nebraska, Kansas, Colorado, California, Oregon, and Washington Territory.

The doctrines of this church make it liberal, and

its ministers labor freely and earnestly with all evangelical Christians, and much of their labor has gone to build up other denominations. At first its ministers were excluded from the pulpits of the mother church, but a more liberal spirit soon prevailed, and it has long been in fraternal correspondence with the other Presbyterian bodies. A number of efforts, through committees appointed by their respective General Assemblies, have been made to effect a union between it and the mother church, but without success. Its essential doctrine, that Jesus died for all men in the same sense, could not be surrendered, and until this is fully and clearly accepted by other Presbyterian bodies, no union can be accomplished.

The Cumberland Presbyterian Church has been an earnest friend of education. As early as 1827 a college was chartered and located at Princeton, Ky., with Rev. F. R. Cossit at its head. In 1845 Cumberland University, at Lebanon, Tenn., was donated to the church, and a department of theology was opened, with Rev. Richard Beard, D.D., at its head, in 1854. Up to the outbreak of the civil war, this institution was in a very flourishing condition, having from 400 to 600 students, and extending its influence all over the South and South-west. The war destroyed its buildings and its endowment, but with the return of peace the university resumed its work. Its Law School still stands at the head in the South. The alumni of the Law School number 1000, and from these have come many of the leading lawyers and statesmen of the South. The other institutions of the church are Waynesburg College, Pa., Lincoln University, Ill., Trinity University, Tex., Bethel College, Tenn., with a number of minor grade in different States.

A Board of Missions and a Board of Publications were organized by the General Assembly, in 1845. The former is now located in St. Louis, Mo., and the latter in Nashville, Tenn. In addition to its home work, the Board of Missions has 7 missionaries in Japan. A Woman's Board of Foreign Missions was formed in 1880, and a Board of Ministerial Relief was formed in 1881, both located at Evansville, Ind.

Although extending over both free and slave States, this church was not divided by the civil war. It is now in a healthy condition, with an unlimited field before it and more work than it has men and means to perform. (J. R. B.)

CUMMING, JOHN, D.D. (1810-1881), a British divine, born in Aberdeenshire, Scotland, Nov. 10, 1810. He was educated at King's College, Aberdeen, and in 1833 was ordained minister of the Scotch Church, Crown Court, Covent Garden, London. He clung with persistency to the Scottish National Church, and strongly opposed the Free Church movement and the disruption of 1843. He early acquired renown as a brilliant and impassioned pulpit orator, and his intense opposition to Romanism attracted much attention. Not less conspicuous were his championship of the doctrine of the speedy second coming of Christ and his attempts, in sermons, lectures, and books, to explain the prophecies of Scripture. In his later years his popularity waned, and for some years he was unable to preach. He died in London, July 6, 1881. Among his works are *Apocalyptic Sketches* (1849); *God in History and in Science* (1851); *The Great Tribulation* (1859); *The Great Preparation* (1861); *Voices of the Night*; *The Destiny of Nations* (1864); *The Sounding of the Last Trumpet* (1867); *The Fall of Babylon Foreshadowed* (1870). These and other works of his had an extensive sale on both sides of the Atlantic.

CUMMINS, GEORGE DAVID, D.D. (1822-1876), an American bishop, born near Smyrna, Del., Dec. 11, 1822. He graduated at Dickinson College in 1841; entered the Methodist ministry as a licentiate; took orders in the Episcopal Church in 1846; held rectorships in Baltimore, Norfolk, Richmond, Washington,

and Chicago, and in 1866 was consecrated assistant bishop of Kentucky. He was early recognized as a leader of the low-church or evangelical party. In 1873 he withdrew from the Protestant Episcopal Church, not wishing any longer to countenance what he regarded as the errors of the high-church party in matters of faith and practice; and in the same year there was organized under his leadership the denomination known as the Reformed Episcopal Church. Bishop Cummins was an eloquent and conscientious man, and entered upon the work of building up the new denomination with great zeal and energy; but the care and labor of his new position were too great for his strength, and he died at Lutherville, Md., June 26, 1876. (See *Memoir of Bishop Cummins, by his Wife*, 1878.)

CUNNINGHAM, ALEXANDER, an English archaeologist, second son of Allan Cunningham, the Scottish poet, was born at Westminster, Jan. 23, 1814, and educated at Christ Hospital and at the Military College, Addiscombe. He was appointed second lieutenant of engineers in 1831; aide-de-camp to the governor-general of India in 1834; was sent on a special mission to Cashmere in 1839; and became engineer to the king of Oudh in 1840. In 1846 he was made head of a mission to Thibet, and chief-engineer of the north-west provinces in 1858. In 1870 he received the office of surveyor-general of Indian archaeology, and in 1871 was made a member of the order of the Star of India. He now holds in the army the rank of major-general. He is the author of many articles on archaeological subjects, published in the *Journal of the Bengal Asiatic Society* and other periodicals, and has issued the following works: *An Essay on the Aryan Order of Architecture* (1849); *The Bhilsa Topes, or Buddhist Monuments of Central India* (1854); and *Ladak, Physical, Statistical, and Historical* (1854); with voluminous official reports upon the antiquities of Northern Hindostan, which have been reprinted by the Indian government.

CURCI, CARLO MARIA, an Italian theologian, was born in Naples in 1810. He was educated at the Jesuit College in Rome, and when 15 years old entered the Society of Jesus. He became a popular pulpit orator, and distinguished himself in a controversy with Gioberti, who had attacked the Jesuits. His first publication was *Fatti ed argomenti*, in defence of the Society to which he belonged. After some years' residence in Paris he returned to Naples, where he founded and edited *La Civiltà Cattolica*, in which he advocated concessions by the Catholic Church to the movement for Italian unity. His course was not approved by the Society, and in 1865 he retired from the management of the *Civiltà*, which was then published at Rome. He preached in several Italian cities, and was everywhere received with great attention. His work, *Lezioni esegetiche e morali sopra i quattro Evangelii* (5 vols., Florence, 1874-76), produced a great sensation. In the preface of it he maintained that the temporal power of the pope, though it had subserved a good purpose in former ages, was not essential to the effective working of the church. He therefore urged an acquiescence in the present practical relations of the church to the state. For this he was visited with ecclesiastical censure, his preface was condemned, and he was expelled from the Society of Jesus. He subsequently made a declaration of his opinions which was accepted as a recantation, and he was restored to the society. On the accession of Leo XIII. to the papal chair, Curci was received for a time into the Vatican by his old friend Cardinal Giovanni Pecci, the pope's brother. He now expressed still more plainly his views in his essay, *Il moderno dissidio tra la Chiesa e l'Italia* (1878), in which he supported the opinions of Gioberti, which he had originally opposed. His work was condemned, but he recorded his protest against the prevailing party in another essay, *La nuova Italia e i vecchi zelanti* (1881). He had also in the meantime

pursued his scriptural studies, and had completed and published his Italian translation of the New Testament, accompanying it with exegetical and moral notes (Turin, 1879-80). His latest publication is *Il Vaticano Regio* (1884), in which he strenuously assails the autocratic sway of the pope, and urges a return to a simpler and more spiritual method of conducting the work of the church as essential to its success.

CURCULIO, PLUM (*Conotrachelus nenuphar*, Herbst). The "little Turk," or "the Curculio," as it is commonly called, is found all over the Atlantic slope and in the Mississippi valley wherever the plum is cultivated. It is by no means confined to this fruit, however, but matures alike in nectarines, peaches, apricots, cherries, apples, pears, and quinces. It is also found in "black knot" upon the plum. It is single brooded, and hibernates as a beetle under sticks and stones and often just beneath the surface of the ground. In its beetle state the curculio feeds continually during mild weather, gouging holes in the fruit as long as it lasts, and after it has gone feeding upon the leaves, and even upon the bark of the more tender twigs. The time in spring when it begins to puncture fruit for oviposition varies, of course, in different parts of the country, but it may be said in general that it is when the peach has attained the size of a small marble. The method of work is briefly as follows: the female curculio, alighting upon a peach, first cuts a hole through the skin and inserts her beak to the depth of a sixteenth of an inch, working it back and forth until quite a cavity is formed; then, turning around, she drops an egg into this cavity. Reversing her position again she cuts a semi-circular flap in front of and including the egg cavity, and the operation is finished. The flap is cut so that the growing fruit may not crush the egg. The ovipositing continues for from six weeks to two months, and each female lays from 50 to 100 eggs. The egg is oval, pearly white in color, and large enough to be seen with the naked eye. It hatches in from four to six days, and the young maggot eats its way to the stone, boring round it, and finally causing all infested fruit (except cherries) to fall. The length of the larval life is from four to five weeks, and the pupa is formed underground. The pupa state lasts about three weeks.

Remedies.—Among the natural enemies of the curculio it may be mentioned that a number of ground-beetles (*Carabidae*) and other predaceous insects destroy the *larvæ* and *pupæ*, and that it has two true parasites—*Sigalphus curculionis*, Fitch, and *Thersilochus conotrachelii*, Riley. Of artificial remedies the most effectual of the hundreds which have been proposed consists in jarring the tree and catching the curculios in sheets stiffened by wooden arms. This principle is the basis of several curculio-machines such as the "Hull Curculio-Catcher," an instrument shaped like a large inverted umbrella mounted on a barrow-wheel. The "chip-trap process" consists in trapping the curculios under chips placed upon the ground around the butt of the tree in the early part of the season.

CURLEW, a long-billed, long-legged wading bird of the family *Scolopacidae*, and genus *Numenius*, including about 14 species of all parts of the world. They are characterized by the length, slenderness, and decurvature of the bill, which always exceeds the head in length, is sometimes several times as long, grooved for a great distance, with the upper mandible terminating in a slight knob, which overhangs the tip of the under mandible; the wings long and pointed; the tail short and nearly even; the legs long, naked above the suffrago or heel-joint; the tarsus scutellate in front; the front toes semipalmate with basal webbing, the hind toe short and elevated; the body plump, with rather long neck. Their nearest relatives in the family are the godwits (*Limosa*), like which they are characterized by a general rufous col-

oration, varied above with blackish. Curlews inhabit dry, open uplands as well as the marshes, sand-bars, and mud-flats of rivers, lakes, and estuaries of the sea, feeding much upon berries and other fruits, as well as any kinds of aquatic animals, as small mollusks, crustaceans, annelids, and numberless insects, especially grasshoppers. They nest upon the ground, laying three to four comparatively large pyriform eggs, of some drab or olivaceous ground color, heavily spotted and splashed with browns, grays, etc. They are gregarious, especially during the migrations, when in the cases of some species flocks of thousands assemble at favorite feeding-grounds and move in concert. Some species also colonize to a certain extent during the breeding season. In the northern hemisphere, at least, curlews are migratory, generally breeding in the far north, and performing vast journeys in spring and fall. The voice is loud and resonant, consisting of a monotonous reiteration of strident single syllables. Most species belong to the northern hemisphere. Those in North America are five in number: 1. The largest and longest billed species of the genus is *N. longirostris*, the total length of which is about 24 inches, the wing 11 or 12, the tail about 4, the tarsus $2\frac{3}{4}$, while the bill ranges from 5 to 8 or even 9 inches. The color is cinnamon-brown of varying shade, brightest under the wings, varied above with black, especially on the back, wings, and top of the head, and the breast and sides with dusky streaks, arrow-heads or cross-bars; the tail barred throughout with black and cinnamon. The long-billed curlew inhabits the United States more particularly, breeding within such limits, and not proceeding to the high north like the others. In most localities it is the usual species. 2. The Hudsonian curlew (*N. hudsonicus*) is smaller than the last; length 16 to 18 inches; wing 9; tail $3\frac{1}{2}$; bill 3 or 4 inches; it is also distinguished by its much paler coloration, and by having the primary wing-quills barred. It breeds far north, passing through the United States in flocks in the spring and fall. 3. The European Whimbrel (*N. phaeopus*), resembling the last and of about the same size, occurs as a straggler to Greenland. 4. The Esquimaux curlew (*N. borealis*) is one of the smallest species of the genus, about 14 inches long, the wing under 9, the bill under 3, and extremely slender. The pale tone of plumage is much as in the last, but the primaries are unbarred as in the first. Vast flocks of these birds are found on the coast of Labrador in the late summer months, feeding upon the "curlew berry" (*Eupetrum nigrum*), which there covers the ground in profusion. The flocks reach New England and the Middle States late in August and in September, are in good condition, and highly esteemed for food. Both the Esquimaux and the Hudsonian penetrate far into South America in winter. 5. The bristle-bellied curlew (*N. taitrensis*) is only a straggler to Alaska. All the species resemble one or another of the three leading North American species. The European *N. arquatus* is one of the largest and best known. The name *numenius*, signifying "new moon," has reference to the slenderly crescentic shape of the bill. (E. C.)

CURRANT. The garden-currant being a native of far northern regions was not known to the Greeks, and there is no evidence that the Romans knew anything of it, though, as a native of Britain, it must have been met with in that province. It has been long under culture in Italy, and one of its oldest names, *Uva di Fratri*, indicates an early place in the gardens of the monasteries. There is no trace of any early English name, and its original improvement is probably due to the people of the low countries. Dodonæus, in his *Stirpium Historiæ Pemptades* (Antwerp, 1583), speaks of it as being then common in gardens, and figures both the black and red currants. He says it had been known as *Grossularia*

transmarinum, indicating that even there it had been introduced, though he says at that time it had come to be known as *Ribes*. Ray, writing in 1688, shows that the plant cannot be identical with the *ribes* of Serapion, and modern investigators have identified that plant with a species of rhubarb. The common name *currant* is derived from its resemblance to the "grape of Corinth," or currant of commerce. Ray says in his time they were known as "squiancy-berries;" this name comes from a popular belief that the currant was a good remedy for the "squiancy," or quinsy. An early German name was *Sankt-Johannisbeere*. That the improved currants came to Britain from the continent is clear from the name of the earliest-known and still most popular variety—*Red Dutch*.

In America the red currant, *Ribes rubrum*, is found wild in the north across the continent, and the imported varieties are favorite fruits in northern gardens. Whenever the summer temperature is not often above 85° it thrives very well, and especially if the atmosphere be humid. In Canada and British Columbia the plants grow with especial vigor, often attaining a height of four or five feet. In parts of California, where the water is not far from the surface, and the location not distant from the moist atmospheric currents from the Pacific, their growth is remarkable, and they form one of the most profitable of fruit crops. There are many hundreds of acres planted with currants within a few days' ride from San Francisco. In the Eastern or Atlantic States they are also grown largely near all the large cities, seldom bringing less than \$2 per bushel. Ten cents per pound is regarded as an average price, and at this figure the net product is about \$600 per acre, calculating $2\frac{1}{2}$ pounds to a plant. The best cultivators renew the plants every five years, though with care they last much longer. The fruit is among the most popular for jelly, and a large portion of the crop is now used in this way. The juice is condensed by the same process used with milk; and, as with jelly, has become a prominent article of commerce. Two European insects have followed the plant to the new world, and are very destructive. One is the *Nematus ventricosus*, the caterpillars of which will soon strip a plant of its leaves; and *Ageria tipuliformis*, called also *Trochilium tipuliforme* by some authors, which bores into the stems, weakening and finally destroying them.

There are a number of American species of currant introduced into gardens for ornament, some of which have fruit palatable to the Indians, and may be the parents of improved races. *Ribes aureum*, known to cultivators as the "Missouri currant," and highly prized for its early and odoriferous flowers, produces varieties which in the dryer portions of the continent have very large and palatable fruit. In Utah they are grown in gardens, and have fruit sometimes three inches in circumference. They are known to fruit-growers as "Utah currants," and are of many shades of color from black to amber. In moister regions the plants grow with enormous vigor, and the fruit is smaller and less agreeable to the palate. In the Rocky Mountains, and farther west, *Ribes cereum* is the prevailing species, affording grateful food to numerous living things. This is probably the species referred to in the *Report of the United States Department of Agriculture* for 1870 as being called *Samita* by the Indians of New Mexico, although the additional statement that "in Colorado several settlers came near losing their lives by eating this berry" is probably apocryphal. No species of the genus is likely to be poisonous. In Alaska the Indians call the fruit of *Ribes bracteosum* "Schaum," and dry the berries in fat, and press the mixture into cakes. Pieces are broken off and whipped in liquid, till the whole looks like cream, when required for use. This species belongs to the black currant section. The plant is sometimes six feet high, has leaves as large as an average grape, and the racemes of fruit are often nearly a foot long. Another species resembling this, the fruit of which is

also used by the Indians of British Columbia and Alaska, is *Ribes Hudsonianum*, but is not estimated quite so highly. It is dwarfer, and usually grows on rotten trunks or around the stumps of dead trees. *Ribes prostratum* is also of the black currant section. The odor of the leaves is stronger than that of any other species, and so disagreeable to many as to have obtained the common name of "fetid currant." *Ribes floridum* is the black currant of the Eastern States, and highly appreciated in ornamental gardening for the delightful color of its autumn leaves. *Ribes speciosum* and others from the Pacific have beautiful flowers, but have not submitted gracefully to culture in American gardens.

The currant of commerce has, in common with other varieties of the *Vitis vinifera*, been introduced into cultivation in California; but its dried fruit has not as yet been found so profitable an article of production in California as has the ordinary raisin. (T. M.)

CURRENCY. See MONEY.

CURRENTS, OCEAN. The material of the earth's surface exists in three separate states, known, respectively, as solid, liquid, and gas; the first motionless, the two others in continuous motion. These motions have for their primary cause the differential action of the sun's heat upon the earth's surface, while their direction in any locality is largely influenced by the rotating motion of the earth. The land surface also, while motionless in itself, exerts a powerful influence upon the motions of air and ocean, and greatly affects the direction of these motions. Finally, the currents of the air impinge vigorously upon the waters of the ocean, and give rise to those great oceanic rivers with which we have here mainly to deal.

The atmospheric and oceanic motions caused directly by the action of solar heat may be briefly described as preliminary to the consideration of the currents of the ocean. In both air and ocean there is produced a vertical circulation. The air expands and rises in the tropics, flows towards the poles in the upper atmosphere, descends to the surface in the temperate zones, and thence partly returns to the equator, partly continues to flow towards the poles. These air currents, deflected by the rotating movement of the earth, become the easterly trade-winds in the tropics, and the westerly anti-trades in the north and south temperate zones. They are greatly disturbed, particularly in the northern hemisphere, by the influence of the land surface, which acts to produce monsoons, or steady winds to and from the centres of the continents. In the southern hemisphere they are more persistent, and particularly in the south temperate zone, whose broad expanse of ocean permits the westerly winds to blow steadily and strongly throughout the year.

A similar vertical circulation exists in the oceans, arising from the same cause. The heated waters of the tropics expand and rise. The chilled waters of the frigid zones contract and sink. Thus the surface level is disturbed, and there is a steady set of the equatorial waters north and south to reproduce a surface equilibrium. But, in consequence of this movement, the downward pressure of the ocean waters in the polar regions becomes in excess of that at the equator, and a reverse flow takes place along the bottom to restore the equilibrium of pressure. Thus, through the differential action of the solar heat, there is a steady vertical circulation both in the atmosphere and the ocean. That of the latter is not sufficiently vigorous to indicate itself by a decided surface flow, but its presence has been recently proved by deep-sea thermometrical observations widely extended over the oceans. To it is undoubtedly due much of that special warming of the western coasts of the continents, which was formerly ascribed solely to the influence of the Gulf Stream and the other great surface currents.

The surface currents, or, as they have been called, "the rivers of the ocean," next claim our consideration. There are five of these great currents which flow in vast curves between the equatorial and the tem-

perate zones, with several others, whose cause and character are less evident, which flow from the frigid zones. In regard to the equatorial currents several theories as to their cause have been promulgated, but meteorologists have finally settled on one of these as the only satisfactory explanation. It is decided that they are due to the trade-winds, whose steady push upon the tropical waters keeps them in continuous motion westwardly around the earth.

But these oceanic currents, thus primarily due to the currents of the atmosphere, are remarkably influenced in their direction and consequences by the land surface of the earth. If the ocean were continuous in the tropical zone the currents produced by the trade-winds would flow around the earth in this zone, without deflection north or south. But the continents stand in the way. The westward setting tropical waters of the Atlantic, for instance, are checked in their course by the South American coast, and turned north and south towards the temperate zones, into which they flow as great currents of warm water, to mitigate the climates, and exert an important influence upon the rainfall of these regions. In the Pacific the same result occurs. The western flowing waters impinge upon the coast of Asia and the Indian archipelago, and are deflected in great curves to the north and south. A similar effect is produced in the Indian Ocean. But the northern section of this ocean is so land-locked, and the winds so irregular, as to prevent the formation of a fixed current, and the only decided flow here is to the south, along the east African coast. The currents here briefly indicated are known respectively as the Gulf Stream and the Brazilian Current, of the Atlantic; the Kuro-Siwo, or "Black Stream," of the North Pacific; the East Australian Current, of the South Pacific; and the Mozambique Current, of the Indian Ocean.

The land surface exerts another important influence upon these currents, which is due to the peculiarities of distribution of land and water. The southern hemisphere contains the great mass of the water, the northern the great mass of the land surface of the earth, there being thirteen times as much land north as south of the equator. There results an important influence upon the heat distribution, in consequence of which the trade winds are greatly deflected to the north. In the Atlantic, in March, the zone of calms between the trades extends from the equator to 3° N. latitude. In September it extends from 3° N. to 11° N. latitude, the southern trade crossing the equator. In the Pacific the zone of the trades is still farther north. Important consequences arise from this, particularly in the Atlantic. In consequence of the separation of the northern and southern trades by the zone of calms, which varies from 3 to 8 degrees in width, there are two westerly currents from the African coast across the Atlantic. On reaching the South American coast these are partly deflected back into the zone of calms, where they form an easterly equatorial current, and partly deflected north and south. The current of the northern trade flows northward along and through the archipelago of the West Indies. That of the southern trade strikes on the protruding South American coast, and is divided by Cape St. Roque, part of it flowing south as the Brazilian current, part north along the westward sloping coast into the Caribbean sea, where, in combination with some portion of the northern current, it circulates around the Gulf of Mexico, and finally rushes through the narrow channel between Cuba and Florida, as a mighty stream of hot water, which, according to Colding, passes the Straits of Bimini with a width of 30 miles, and a discharge volume of about 40 cubic miles per hour. Its width is variously estimated by the several authorities at from 30 to 60 miles, its depth from 600 to 2200 feet, and its speed from 3 to 5 miles per hour; these estimates being probably made at different points, and by different methods.

Flowing north along the American coast it steadily widens and shallows, while its heat is gradually lost to the air. At Newfoundland it is 320 miles wide, and has lost two-thirds of its speed; while its depth has been greatly reduced, and it has lost much of its high temperature. From this point its easterly deflection, under the influence of the earth's rotation, becomes decided, and it flows towards the European coast, steadily widening, shallowing, and cooling. At 47° N. latitude, and 25° W. longitude, it has become a vast sheet of warm water, 800 miles wide. At this point it divides into two branches. One of these continues to flow to the north-east, along the coasts of Ireland, Scotland, and Norway, and probably extends beyond Spitzbergen, where its influence is entirely lost. The other moves to the south-east, flows along the coasts of Spain and Africa, and eventually rejoins the north equatorial current, thus completing a great oval whirl through the North Atlantic. In the centre of this whirl is a vast extent of comparatively calm water, known as the Sargasso sea, from the great quantities of *sargassum*, or floating sea-weed, which covers many square leagues of its surface, and affords a home for innumerable forms of life. It has been estimated that the Gulf stream conveys into the North Atlantic one-twelfth of the whole amount of solar heat received by the torrid zone. It thus must greatly mitigate the chill of the northern zones.

In the region of Newfoundland the Gulf stream meets an Arctic current of cold water, which flows from Baffin's Bay and along the east coast of Greenland, southward along the American continent, upon whose shores it is thrown by the action of the earth's rotation. The influence of this cold stream is felt as far south as Cape Cod, and it probably extends much farther south, between the Gulf stream and the coast. It probably partly underflows the Gulf stream, and forms the cold bottom of this warm ocean river. It also seems to interlace with it, as strands of cold and warm water can be traced. Finally a great portion of the polar current seems to be deflected and to unite with the Gulf stream at Newfoundland, since the volume of the latter is estimated to be doubled from this point eastward. Its total volume is estimated by Haughton as four-fifths of that of the Gulf stream.

The Brazilian current is much smaller in volume, and of much less importance than that of the North Atlantic. It flows southward along the South American coast to the mouth of the La Plata, about 35° S. Here it is met and deflected by a cold current from the south, which comes up past Cape Horn. The united streams move easterly with great variations of temperature at their points of junction, and in consequence deep fogs and severe gales. The eastward flow continues to the Cape of Good Hope, where some of the water turns up the African coast towards the equator to complete the South Atlantic whirl, while the remainder flows on easterly beyond the cape as part of the great polar flow, which makes the circuit of the earth in the ocean to the south of the continents.

This south polar current is more decided than that of the north polar region. The latter is land-locked, and the movements of its winds and waters greatly hindered. But south of the continents a zone of continuous ocean encircles the globe, over whose surface the anti-trade winds blow in a steady and strong current. It is probably to this that we must impute the continuous easterly polar current of the southern zone, which has an important effect in chilling the southern seas, and has been known to bring up icebergs into the South Atlantic as far as the latitude of the Cape of Good Hope. It chills the southern branches of the equatorial currents, and appears on the western coasts of America, Africa, and Australia as cold northerly currents, of which the best known is the Peruvian or Humboldt's current, on the South American coast. Its influence on the coast of Africa is to sometimes depress the ocean temperature near Cape Town 20°

lower than in the same latitude on the eastern side of the continent.

The Pacific currents are not nearly so well known as those of the Atlantic. The North Pacific drift current is deflected northward by the islands north of New Guinea, and becomes a strong north-east stream of warm water, estimated by Dr. Haughton to be nearly three times the volume of the Gulf stream, though of less velocity, since its waters are never, like those of the latter, confined within a narrow channel. This flows past the Japanese islands, where it is known as the Kuro-Siwo, or "Black Stream." Thence its waters move eastwardly to the American coast, and southwardly along this coast, whose temperature it greatly mitigates, so that the shores of Southern Alaska and British Columbia are free from the ice that besets the Asiatic coasts of the same latitudes. The narrowness and shallowness of Behring Straits hinders any strong deflection of the waters of this current northward into the polar seas, and the Arctic current which flows through this channel is much less important than that which flows into the Atlantic; yet its influence is strongly indicated during the summer melting of the polar ice by the decided southward curving of the isothermal lines. No Sargasso sea has yet been found in the North Pacific, though it may exist in some part of this vast and little traversed space.

In the South Pacific there is no such strongly marked current as in the north. The equatorial stream is partly turned back by some of the numerous islands of these seas, but mainly makes its way to the East Australian coast, where it meets the Antarctic current from Bass's Straits. The combined currents flow easterly, and sometimes attain the great velocity of 100 miles a day, between Australia and the northern island of New Zealand. There is a strong easterly current also to the south of New Zealand. Eastward still the course of the combined polar and equatorial currents is not well known, until they reach the South American coast, where they become marked as the cold Humboldt's current, which brings fogs and chill airs to the shores of Chili and Peru.

In the northern portion of the Indian Ocean the varying monsoons cause variations in the currents. During the winter, the season of the north-east monsoon, the waters flow westward around the coasts of the Arabian Gulf. But they pursue the opposite direction during the summer half the year, the season of the south-west monsoon. In the Southern Indian Ocean the trade winds set up a strong westerly current, which is turned to the south by the African coast, and by that of the Island of Madagascar. It is here divided into two branches, one of which moves along the eastern shores of Madagascar, and flows south till it meets the Antarctic drift current. Thence it runs to the east, a small portion of it flowing up the West Australian coast, but the great body of the stream passing south of Australia, and joining the South Pacific flow. The other branch of the Indian Ocean current flows through the Mozambique channel, and continues southward until it reaches the Agulhas bank, which extends to the southward of Africa. Here it receives its most usual name, that of the Agulhas current. This stream is the most important of the three southern systems, and in the neighborhood of Cape Corrientes has been observed to have a velocity of nearly 6 miles per hour, and a volume exceeding that of the Gulf stream. It is a warm water stream, and at its region of junction with the cold Antarctic current changes of temperature of 20° in a day occur, with the necessary consequence of violent storms and heavy seas. Dr. Haughton estimates the total volume of the five equatorial currents at 6½ times that of the Gulf stream, and that they carry away more than half the total solar heat of the tropics, to redistribute it in the temperate zones. An opposite effect is produced by the Polar currents, which bring much of the polar chill to the temperate zones, so that the eventual effect of these

streams is to render the earth more habitable by their vigorous influence in the equalization of terrestrial temperatures.

In addition to the currents named there is a counter drift current between the trades in the Pacific, like that spoken of as occurring in the Atlantic, flowing eastward through the equatorial zone of calms. These currents of warm water are marked by their intensely blue color, which in the Gulf stream and the Kuro-Siwo sharply distinguish them from the bounding sea. The Gulf stream, indeed, is as clearly marked in color and temperature from its bounding water-wall as is a river from its banks. They are also noted for their intense saltness, as compared with the neighboring waters. This results from the tropical evaporation and the consequent concentration of salt in the remaining water. Maury describes the Gulf stream as having a convex surface, from the expansive action of its heat, so that its water tends to clean itself of drift material, by a constant flow off to the right and left into the lower level of the bounding waters. (C. M.)

CURRY, DANIEL, an American Methodist minister and editor, was born near Peekskill on the Hudson, N. Y., Nov. 26, 1809. He attended the public school of the neighborhood, and worked on his father's farm. In 1833, having determined to enter the ministry, he commenced a course of academical training, and graduated from Wesleyan University, Middletown, Conn., in 1837. The next two years were devoted to teaching, and in 1839 he removed to Georgia, where he entered the itinerant ministry of the Methodist Episcopal Church, and was stationed successively at Athens, Savannah, and Columbus in that State. In 1844, on account of the threatened disruption of the Methodist Church, he returned to New York, and was appointed to churches in New York and Brooklyn, New Haven, and Hartford. In 1854 he was elected president of Asbury University at Greencastle, Ind., which office he filled for three years, and then, returning to New York, resumed the pastorate at Middletown, Conn., and in New York and vicinity. At the General Conference of 1864, in Philadelphia, he was chosen editor of the *Christian Advocate* of New York, the principal newspaper organ of his denomination, and by successive re-elections held that place till 1876, when he was transferred to the editorship of the *National Repository*, the monthly Church magazine, which place he held till 1881. He was afterwards engaged as associate editor of the *Methodist*, a non-official religious weekly in New York. After his return from the South he took an active part in the anti-slavery movements of the times, which he aided with his voice and pen. He has been eight times chosen as delegate to the quadrennial General Conference of his Church. In 1852 he received the degree of D. D. from his alma mater, and in 1879 that of LL.D. from Syracuse University. In 1884 he was appointed editor of the *Methodist Quarterly Review*. Two volumes of his contributions to periodical literature have been compiled and published.

CURTESY, the life-estate to which a man was at common law entitled in the lands and tenements of his wife. Curtesy is either initiate or consummate—initiate prior to the death of the wife, consummate after her death.

At common law there were four essential requisites of curtesy consummate: (1) there must have been a binding and valid marriage; (2) the wife must have had actual seisin during the coverture of the lands wherein curtesy is claimed; (3) there must have been issue of the marriage born alive who might by possibility have inherited the estate; (4) there must have been an actual death of the wife. The strictness of the common-law rule requiring actual seisin on the part of the wife is now disregarded in the United States, a right of entry of constructive seisin being held sufficient in cases where there is no actual adverse possession. In some States the necessity of issue being born has also been abrogated by statute.

The occurrence of a tenancy by the curtesy is in modern days not very common either in England or the United States—in England, on account of the almost universal prevalence of family settlements; in the United States, on account of the passage of statutes defining the husband's rights in his wife's estate. (L. L., JR.)

CURTILAGE, in law, the enclosed space immediately surrounding a dwelling-house and contained within the same enclosure. This enclosure may consist either of a separate fence or partly of a fence and partly of the exterior buildings within the enclosure. The word "curtilage" has come down to us from feudal times. It originally signified the land with the feudal castle and outhouses, enclosed often within high stone walls.

The breaking and entering by night of any part of the curtilage, with intent to commit felony, constitutes burglary. In Michigan a somewhat broader signification seems to be attached to the term "curtilage" than is elsewhere accorded to it. (L. L., JR.)

CURTIN, ANDREW GREGG, an American statesman, was born at Bellefonte, Pa., April 22, 1817. His father was a native of Ireland, but emigrated to Pennsylvania in 1793, and engaged in the manufacture of iron. Andrew, after receiving an academic training, studied law in Dickinson College, and was admitted to the bar at Bellefonte, in 1837. He was soon actively engaged in political, as well as professional, labors, and was an effective speaker in behalf of the Whig party. In 1848 he was one of the presidential electors for his State, and in 1854 he was appointed by Gov. James Pollock secretary of the commonwealth, having also the superintendence of the common schools. In 1860 he was the candidate of the Republican party for governor, and after an exciting campaign was elected. The outbreak of the Civil War immensely increased the responsibilities of this office, but Gov. Curtin discharged them well. In April, 1861, Pres. Lincoln called upon the States for 75,000 men for a three months' campaign; the little quota of Pennsylvania was soon filled, while thousands of volunteers sought the opportunity to testify their devotion to the Union. As the authorities at Washington refused to receive these, Gov. Curtin recommended to the legislature the formation of a corps of 13 regiments of infantry, with 1 of cavalry and 1 of artillery, to be in readiness for any emergency.

When the defeat of Bull Run, in July, compelled the National Government to summon more troops, this Pennsylvania Reserve Corps entered upon its memorable career. Throughout the war Gov. Curtin diligently promoted the Union cause, and was frequently called "the soldiers' friend." In 1863 he inaugurated a movement to establish schools for soldiers' orphans, and this was afterwards effectually carried out under the superintendency of Thomas H. Burrowes. In 1867 Gov. Curtin retired from office, at the close of his second term, but later he was appointed by Pres. Grant Minister to Russia. On his return to America, in 1872, he gave his adhesion to the "Liberal Republican" movement, and afterwards passed into the Democratic party. Being nominated by that party for Congress, in 1878, he contested his district, but was defeated by a small majority. In 1880, however, he was elected, and in 1882 re-elected, serving in his second term as Chairman of the Committee on Foreign Affairs.

CURTIS, BENJAMIN ROBBINS (1809–1874), an American jurist, was born at Watertown, Mass., Nov. 4, 1809. He graduated at Harvard in 1829, and, having entered on the study of law, was admitted to the bar in 1832. He practised his profession first at Northfield, but soon removed to Boston, where his practice became large and lucrative. He was noted for his clear statements and extensive learning. He served two years in the Massachusetts legislature, and in 1851 he was appointed by Pres. Fillmore an associate justice of the United States Supreme Court. In 1857 he resigned his seat on the bench, and resumed

his practice as a lawyer in Boston. In March, 1868, he was one of the counsel for Pres. Johnson before the court of impeachment, and his argument was highly approved for its correct application of the law. He died at Newport, R. I., Sept. 15, 1874. He published *Reports of Cases in the Circuit Courts of the United States* (2 vols., 1854); *Decisions of the Supreme Court of the United States* (22 vols.); and a *Digest* of the same to 1854.

CURTIS, GEORGE TICKNOR, an American lawyer and author, brother of the preceding, was born at Watertown, Mass., Nov. 28, 1812. After graduating at Harvard College, in 1832, he studied law, and was admitted to the bar in 1836. He was a member of the Massachusetts legislature from 1840 to 1844, and was appointed United States Commissioner for Massachusetts. While he held this position the Fugitive Slave Law of 1851 was passed, and he was soon called upon to execute it by remanding to his master a fugitive from Virginia named Thomas Sims. In spite of the popular odium thus incurred he carried out the law. In 1862 he removed to New York, where his professional ability has secured for him an extensive practice. Throughout his career he has been a diligent author, and his works on various departments of law have secured the highest approval. Among them are *Rights and Duties of Merchant Seamen* (1844); *Law of Copyright* (1847); *Law of Patents* (1849; 4th ed., 1873); *American Conveyancer* (2d ed., 1871); *Equity Precedents* (4th ed., 1869); *Digest of Decisions of Courts of Common Law and Admiralty*. He also published *Commentaries on the Jurisprudence, Practice, and Peculiar Jurisdiction of the Courts of the United States* (2 vols., 1854-58). Besides these strictly professional works he has published a valuable *History of the Origin, Formation, and Adoption of the Constitution of the United States* (2 vols., 1855-58), and a *Life of Daniel Webster* (2 vols., 1870).

CURTIS, GEORGE WILLIAM, LL.D., an American author and editor, was born in Providence, R. I., Feb. 24, 1824. He removed with his father to New York in 1839, and in 1842 joined the Brook Farm Association at West Roxbury, Mass. In 1846 he went to Europe, and passed four years in travel and study, being a student in the University of Berlin during the Revolution of 1848. Returning home in 1850, he published *Nile Notes of a Howadji*, which was soon followed by the *Howadji in Syria*. He was for some time connected with the *New York Tribune* as an editorial writer and art-critic, and for many years he was a lyceum lecturer. Mr. Curtis was one of the original editors of *Putnam's Monthly*, which was begun in 1853, and he was involved in the failure of the publishers of that magazine in 1857. Since that time he has had an unbroken literary connection with the publishers of his books, Messrs. Harper & Brothers. Since 1858 he has written the "Easy Chair" for *Harper's Magazine*, and since 1863 he has been the political editor of *Harper's Weekly*. In 1863, Pres. Lincoln offered him the post of consul-general in Egypt. In 1867 he was a delegate at large in the constitutional convention of New York. He was elected one of the regents of the University of New York in 1864, and was nominated as secretary of state of New York in 1870, but declined. In 1871 he was appointed by Pres. Grant upon the commission of inquiry into the civil service, and was made chairman of the commission. In 1877, Pres. Hayes offered him the mission to England, and in 1878 that to Germany, both of which he declined. His works are—*Nile Notes of a Howadji* (1850); *The Howadji in Syria* (1851); *Lotus-Eating* (1852); *Potiphar Papers* (1852); *Prue and I* (1853); *Trumps* (1856). Mr. Curtis has received the degree of A. M. from Brown University, and that of LL.D. from Harvard, Madison, and Brown universities. He has been for years a prominent advocate of civil-service reform in the United States. His editorials are clear, crisp, and brilliant, and he is especially distinguished as a writer on the usages of society, man-

ners, and minor morals. In politics he has been a radical Republican, and labored to maintain a healthy moral tone in his party. Although a delegate to the Republican National Convention in 1884, he afterwards refused to support the party nominees.

CURTIUS, ERNST, a German historian and Hellenist, was born at Lübeck, Sept. 2, 1814. He studied in the College of Lübeck, and afterwards at the Universities of Bonn, Göttingen, and Berlin. In 1837 he proceeded to Athens to prosecute his researches into Hellenic antiquities. He afterwards accompanied the celebrated Ottfried Müller on his expedition of archaeological research into the Peloponnesus, and on the death of the latter, at Athens, in August, 1840, Curtius returned to Germany. In 1841 he graduated as doctor from the University of Halle, and taught for some years in the colleges of Berlin, where he became Professor Extraordinary in 1844, and was appointed tutor to Prince Frederick William, son of the present Emperor of Germany, which post he retained until 1850. In 1856 he succeeded Hermann as professor of archaeology and classical philology at Göttingen, and in 1868 became professor in Berlin. Since that date he has resided in the latter city, where he has been elected a member of the Academy of Sciences. In 1875 he was sent to Greece by the German government, where he concluded the convention which secured to Germany the sole right to make archaeological excavations at Olympia. These have been conducted under his supervision.

The works of Prof. Curtius all relate to Greek antiquity. The most important of these are *The Peloponnesus*, which includes a description of Greece, its myths, its history, and its monuments; *De Portibus Athenarum* (Halle, 1842); *Anecdota Delphica* (Berlin, 1843); *Inscriptiones Atticæ Duodecim* (1843); *Zur Geschichte des Wegbaus bei den Griechen* (1855); *Die Ionier vor der Ionischen Wanderung* (1855); *Ephesos* (1874); *Alterthum und Gegenwart gesamm* (1875); *Die Ausgrabungen zu Olympia* (1876-7), in conjunction with others; *The Acropolis of Athens*; *The Topography of Asia Minor*; *The Inscriptions on Grecian Springs and Fountains*; and a *History of Greece* (1857-66), his best known work in this country.

CURTIUS, GEORG, a German philologist, was born at Lübeck, April 16, 1820. Having studied philology at Berlin and Bonn Universities, he obtained the doctor's degree in 1842, and began to teach in Dresden. In 1845 he returned to Berlin, but in 1849 he was called to Prague as professor extraordinary, and two years later was advanced to a full professorship. In 1854 he removed to Kiel to take a similar position, and in 1862 he was made professor of classical philology in the University of Leipsic, which position he still holds. Prof. Curtius has strenuously endeavored to preserve the union between the old philology, founded on the classics, and the more recent, founded on comparative linguistics. In his publications he has explained and illustrated the Greek and Latin languages with the aid of comparative grammar. Among his works are *Sprachvergleichenden Beiträge zur Griechischen und Lateinischen Grammatik* (1846); *Grundzüge der Griechischen Etymologie* (5th ed. 1879); and *Das Verbum der Griechischen Sprache* (2d ed. 1877-80.) His *School Grammar of the Greek Language* (1852) has passed through numerous editions, and has been translated into several languages.

CURWEN, JOHN (1816-1880), an English teacher of chorus singing, was born at Heckmondwike, Yorkshire, Nov. 14, 1816. He belonged to an old Cumberland family, and was son of Rev. Spedding Curwen. After a course of study at Coward College and in London he began to consider seriously the art of teaching. While assistant-minister at the Independent Church of Basing Stoke, Hants, and afterwards, when co-pastor at Stowmarket, in Suffolk, he studied many educational methods.

On becoming acquainted with the method of teach-

ing singing, as practised by the two Misses Glover, of Norwich, he became convinced of its superiority, and immediately tested it. Being elected pastor at Plais-tow, Essex, in 1844, he was able to realize the advantages of the system by teaching it to large classes. When, in 1867, he resigned this position from ill health, Curwen became a printer and publisher in order to produce books for the benefit of students of the Glover method, which was called "The Tonic Sol Fa" system, being then most thoroughly convinced that it was the best-known system for instructing the masses of the people in choral and church music.

He delivered courses of lectures at the Andersonian University, Glasgow, reprinted very many musical compositions in the peculiar notation employed in the "Tonic Sol Fa" method, and published original works also in these characters; he put forth treatises on *Musical Statics, Harmony and Musical Composition*, in which were elaborated and developed the ideas of the "Tonic Sol Fa" system, and issued a bi-monthly paper, *The Tonic Sol Fa Reporter*, which was the chief organ of the movement. In 1853 he formed a "Tonic Sol Fa" association, and subsequently instituted examinations in music to honor successful students. He died May 26, 1880, at Heaton Mersey, near Manchester.

The chief distinguishing peculiarity of Curwen's system of teaching consists in imparting to the pupil, at the very first lesson, some knowledge of the signification of artistic materials. Instead, therefore, of the dry and mechanical method, by which the students were taught to measure intervals by counting so many notes in order to gain a sort of mathematical safeguard or guide, an artistic initiation took place. The pupils were fascinated with the poetic nature of the study, and learned to identify the various notes by the knowledge and remembrance of their inner signification, and not by actual measurements, but by intelligent perception. (S. A. P.)

CUSHING, CALEB, LL.D. (1800-1879), an American jurist and statesman, was born at Salisbury, Mass., Jan. 17, 1800. He graduated at Harvard College in 1817, and began the study of law. Being made tutor of mathematics and natural philosophy in his college in 1819, he held the position for two years. He was admitted to the bar in 1822, and commenced practice in Newburyport. Several popular addresses had already given him local fame as an orator, and he soon became eminent in his profession. In 1824 he married the daughter of Hon. John Wilde of Boston. His political career began when, in 1825, he was elected to the Massachusetts legislature. In the following year he entered the State senate, but was afterwards defeated when a candidate for Congress. In 1829 he went to Europe, where he spent two years in travel. On his return he published *Reminiscences of Spain: the Country, its People, History, and Monuments* (1833). This work showed an extensive acquaintance with Spanish literature, and he ever after retained a warm regard for that nation. In the same year appeared his *Historical and Political Review of the Late Revolution in France*. His wife also published two volumes of *Letters descriptive of Public Monuments, Scenery, and Manners in France and Spain* (1832). After serving in the Massachusetts legislature for two years more, Mr. Cushing was elected to Congress in 1835, and re-elected till 1843. In this period he also made frequent contributions to the *North American Review* on historical, legal, and social subjects. His public addresses were admired for their purity of style and beauty of sentiment, and his speeches in Congress were vigorous and effective. In politics he belonged originally to the Jeffersonian Republican party, but had now become a Whig, supporting John Quincy Adams for the Presidency, and afterwards writing a campaign biography of Gen. W. H. Harrison in 1840. He was one of the few Northern Whigs who on Tyler's accession to the Presidency followed him in his separation from that

party. Cushing was thrice nominated by Tyler as Secretary of the Treasury, but was rejected by the Senate. In July, 1843, he was sent to China as United States commissioner, and though the frigate in which he sailed was burnt off Gibraltar, the official papers were saved. Without waiting for instructions, he proceeded to his destination by way of Egypt and India. He was the first representative of Western civilization that negotiated with the emperor of China on equal terms. The treaty between the United States and that country was signed July 3, 1844, and finally ratified Dec. 31, 1845. Mr. Cushing returned to Washington by way of Mexico, having journeyed round the world in less than a year. This country was just about to plunge into war with Mexico, and in 1846 he was elected to the Massachusetts legislature, where he was a prominent advocate of the war in the face of a stormy opposition from the people of that State. When the legislature refused to appropriate funds to equip a regiment of volunteers, he advanced the requisite amount himself. He was then appointed colonel of the regiment, and went with it to Mexico in the spring of 1847, joining the army of Gen. Taylor. He was appointed brigadier-general April 14, 1847, and took part in the battle of Buena Vista. He was afterwards transferred to the army of Gen. Scott, and served till the close of the war. While in Mexico he had been nominated by the Democrats as governor of Massachusetts, but was defeated. In 1850 he was elected for the sixth time to the State legislature, and opposed the coalition by which Charles Sumner was made United States Senator. Newburyport having been incorporated as a city in 1850, Mr. Cushing was elected its first mayor, and re-elected in the year following. In 1852 he was appointed by Gov. Boutwell an associate justice of the supreme court of Massachusetts, and in the same year received the degree of LL.D. from Harvard College. He was at this time member of the board of overseers of the college and of the American Academy of Arts and Sciences. In 1853, Pres. Pierce appointed him Attorney-General of the United States. At the close of Pierce's administration he again became a member of the Massachusetts legislature, and served till 1860. In April of that year he was president of the Democratic national convention at Charleston, S. C. The extreme Southern delegates refused to be bound by the platform adopted by the majority of the convention. Mr. Cushing went with them, and was afterwards president of the convention at Baltimore by which John C. Breckinridge was nominated for President. Upon the election of Abraham Lincoln the Southern States seceded, South Carolina leading the way. In Dec., 1860, after Major Anderson removed the United States troops at Charleston from the defenceless Fort Moultrie to the strong though unfinished Fort Sumter, the rage of the Secessionists knew no bounds. Mr. Cushing was sent as a confidential agent of Pres. Buchanan to Charleston to induce them at least to defer the attack on Fort Sumter till after the close of Buchanan's administration. But the embassy was useless, and Mr. Cushing, after a brief visit, so reported. In April, 1861, he offered his services to Gov. Andrew of Massachusetts, but received no response. Until the close of the Civil War he confined his attention to his professional duties, being often employed by the departments at Washington, and in July, 1866, he was appointed with two other jurists to revise and codify the laws of the United States. This work occupied years, and during the prosecution of it he was also frequently consulted by the Government on international questions. He assisted in the negotiations for the annexation of San Domingo under Pres. Grant's administration, but the scheme was rejected by the Senate. In 1868 he was sent to the United States of Colombia on a special diplomatic errand. In 1870 he was largely concerned in preparing the protocol of the Treaty of Washington, and afterwards in the statement of the case of the United States to be laid before the tribunal

of arbitration at Geneva. He was also one of the counsel before the tribunal, and afterwards published an interesting sketch of its proceedings in *The Treaty of Washington* (1873). On the death of Chief-Justice Chase, in 1873, Pres. Grant nominated Mr. Cushing to fill the vacancy, but on account of the reluctance of the Senate to confirm him the nomination was afterwards withdrawn. He was, however, nominated and confirmed as minister to Spain in December of that year, and was successful in allaying the troubles that had arisen from the Cuban insurrection. He returned to the United States in April, 1877, and died at Newburyport, Jan. 2, 1879. Always ambitious and universally acknowledged to be a man of great ability, he was, however, unable to inspire thorough confidence in the parties with which he acted, and hence was generally regarded as too much a seeker of public position.

CUSHING, LUTHER STEARNS (1803-1856), a Massachusetts lawyer, was born at Lunenburg, Mass., June 22, 1803. He was appointed clerk of the Massachusetts Assembly in 1832, judge of the court of common pleas in 1844, and in 1848 reporter of the supreme court of the State. He published eight volumes of reports. His *Rules of Proceedings and Debates in Deliberative Assemblies*, well known as *Cushing's Manual*, is the standard text-book on the subject. He published also an *Introduction to the Study of Roman Law*, 1854, and *The Law and Practice of Legislative Assemblies in the United States*, 1855. He was also editor for some years of *The Jurist and Law Magazine*. He died at Boston, June 22, 1856.

CUSHING, THOMAS, LL.D. (1725-1788), a Massachusetts statesman, was born at Boston, Mass., March 24, 1725. His father, of the same name, was a prominent citizen. The son graduated at Harvard College in 1744, and was elected in 1762 a member of the general court, and in 1763 became Speaker. His name being attached to the public documents, he was regarded in England as the instigator of rebellion, and Dr. Johnson in his *Taxation no Tyranny* observed, "One object of the Americans is said to be to adorn the brows of Mr. Cushing with a diadem." In 1774 he became a member of the provincial congress, and afterwards of the Continental Congress. He was made commissary-general of Massachusetts in 1775, became judge of probate in 1777, and two years later lieutenant-governor of the State, in which office he remained till his death, Feb. 28, 1788.

CUSHING, WILLIAM B. (1842-1874), an American naval officer, was born in Wisconsin, Nov. 24, 1842. Having studied for a time in the Naval Academy (1857-58) he entered the naval service in 1861 as a volunteer officer, and on the first day of his service captured a schooner, the first prize taken by the navy during the civil war. In November, 1862, he distinguished himself in leading a bold attack on the town of Jacksonville, N. C. On Oct. 27, 1864, he blew up the iron-clad ram Albemarle at Plymouth, N. C., sinking his own torpedo-boat, and barely escaping with his life, after a night and day of most perilous adventure. Throughout the war, and after its close, his bravery, ability, and coolness of judgment were very conspicuous. He died of brain fever at Washington, D. C., Dec. 17, 1874.

CUSHMAN, CHARLOTTE SAUNDERS (1816-1876), a distinguished American actress, was born at Boston, July 23, 1816. She was descended from Robert Cushman, one of the founders of Plymouth Colony. On account of her father's failure in business, she was obliged at the age of thirteen to assist in supporting the family. She sang in a church choir, and through the favor of a friend studied music in a piano-factory, though she soon had the advantage of the best instruction of the time. Having a fine contralto voice, she was called to sing in a concert with Mrs. Wood, an English operatic singer. By this lady's advice she began to practise for the opera, and appeared with her in the *Marriage of Figaro* in Boston in 1835. Miss Cushman

was then apprenticed for three years to J. G. Maeder who for a time carefully trained her, but afterwards forced her to sing soprano parts, until at New Orleans her voice completely failed her. But Mr. Caldwell, the manager who had engaged her, having observed her dramatic power, urged her to become an actress, and she made her début in his theatre as Lady Macbeth. When she returned North she made a three-years' engagement with Mr. Hamblin of the Bowery Theatre, New York, but was delayed in commencing on account of a rheumatic fever. She had acted only one week when the theatre, with her wardrobe, for which she had gone deeply in debt, was destroyed by fire. She resumed playing, however, at Albany, and the next season became a stock-actress in the Park Theatre, New York. Her sister Susan had made an unfortunate marriage, and now Charlotte induced her to appear on the stage. When the manager demurred at the increased expense, they went to Philadelphia, but were soon recalled. Miss Cushman next became a manager in Philadelphia, and when Mr. Macready came to the United States in 1843 she gave him such cordial, intelligent support in leading tragic parts, that he persuaded her to join him in his tour. Having saved some money, she resolved to go to England the next year. Mr. Macready requested her to come to Paris, where he was playing, but as he offered her only second parts, she refused unless allowed to appear at least once as Lady Macbeth. She journeyed through Scotch and English towns to London, and finally to Paris, carefully observing the style of acting as she went. A London manager met Edwin Forrest in Paris the day after Miss Cushman had left, and engaged him to appear in London with her as support. Returning to London, he secured her consent only on condition that she should appear as Bianca in Milman's tragedy of *Fazio* before the engagement with Mr. Forrest should commence. Her first appearance took place Feb. 14, 1845. Though totally unknown, she secured in this part a magnificent triumph, and for eighty-eight successive nights she appeared before the most highly cultivated audiences of England in a great variety of characters. She sent for her sister Susan, and together they spent four years in Great Britain and Ireland. That her sister might play leading parts, Charlotte assumed the chief male parts, especially playing Romeo to her Juliet. In March, 1848, Susan was married to Dr. James S. Muspratt of Liverpool, and Charlotte returned to the United States in 1849. Her first appearance after her return was in her memorable personation of Meg Merrilies in the play of *Guy Rannering*. Besides the characters already mentioned, she achieved success as Queen Catharine, Rosalind, Beatrice, Mrs. Haller, Julia in the *Hunchback*, Nancy Sykes, and Lady Teazle. She visited England again in 1852, and continued acting there till 1857. She then made a farewell tour in the United States, and went to reside in Rome with her friend Miss Emma Stebbins, the American sculptor. She was, however, induced to resume the practice of her profession occasionally, and during the American civil war acted several times for the benefit of the Sanitary Commission. The proceeds of these performances exceeded \$8000. While still residing at Rome in the spring of 1869, she began to be afflicted with a tumor, and, though she twice submitted to severe operations, it was found incurable. She then returned to America, and in 1871 resumed her professional career, appearing both as a reader and as an actor. In 1874 and 1875 she visited all the principal American cities in a farewell tour, and was honored with special demonstrations by the most cultivated citizens. Her last appearance was at the Globe Theatre, Boston, May 15, 1875. She died at Boston, Feb. 18, 1876. Miss Cushman's eminent success in her profession was due not less to her conscientious labor, her unconquerable will, than to her intellectual ability. The unique character of Meg Merrilies, first assigned to her by accident in 1840, was con-

stantly improved till it became a gem of dramatic art. The remarks of the *Times* on her first appearance in London remained true to the last: "The great characteristics of Miss Cushman are her earnestness, her intensity, her quick apprehension of readings, her power to dart from emotion to emotion with the greatest rapidity." Yet this does not express the quality which most impressed the later years of her career—the majesty of her own character, seen and felt in her personations. Her queenly nature found ample room for its proper display and highest manifestations in Shakespeare's grand characters, the pathetic Queen Katherine, the terrible Lady Macbeth. Another quality was but little known till she appeared as a professional reader—her exquisite sense of humor, and this, as is seen in the record of her life, was revealed when she was engaged in a constant struggle with an incurable malady. Her whole life was full of generous enthusiasm and self-sacrifice, and the splendid tributes that were presented to her on her retirement from the stage were a testimonial to the nobility of her private character not less than to her professional achievements. Her friend, Miss Emma Stebbins, has edited *Charlotte Cushman, her Letters and Memories of her Life*, Boston, 1878, and a brief biography by C. E. Clement appeared in 1882.

CUSTER, GEORGE ARMSTRONG (1839–1876), an American general, was born at New Rumley, Ohio, Dec. 5, 1839. He graduated at West Point in 1861, and at once entered active service, taking part in the battle of Bull Run. When Manassas was evacuated by the Confederate troops in March, 1862, he made his first cavalry charge. At Yorktown he acted as assistant engineer in constructing earthworks, and when the enemy retreated he went with Gen. Hancock in pursuit. He was the first to cross the Chickahominy, and was made captain and aide to Gen. McClellan, and continued on his staff as long as he was in command. In 1863, Custer was engaged at the battle of Chancellorsville, and became aide to Gen. A. Pleasonton, who commanded a brigade of cavalry. He became distinguished as a dashing cavalry leader, and was made brigadier-general. At the battle of Gettysburg he routed Hampton's Black Horse cavalry. In 1864 he was with Grant in the Wilderness, and later with Sheridan in the Shenandoah Valley, distinguishing himself especially at Winchester and Cedar Creek. In February, 1865, he led the column in the raid under Sheridan, and commanded a cavalry division in the pursuit of Lee after the evacuation of Richmond. Throughout the war he never lost a gun or a flag, and captured more guns, flags, and prisoners than any other officer not commanding an army. At the close of the war he was made lieutenant-colonel with brevet rank as major-general, and was assigned to the Seventh U. S. cavalry. In 1867 he served on Gen. Hancock's expedition against the Cheyennes and Sioux, but was tried by court-martial and suspended for a year on charges of cruelty to his men and leaving his command without permission. In Sept., 1868, at the special request of Gen. Sheridan, he rejoined his regiment and took part in the winter campaign against the Cheyennes, surprising and capturing a large Indian village on the Washita. Two years were then spent in comparative quiet on the Plains, and two at Elizabethtown, Ky., his military duties being varied with travelling and writing a series of magazine articles called *My Life on the Plains*. In 1873, when his regiment was ordered to Dakota, he served in the Yellowstone expedition, and in the following year was sent to explore the Black Hills. The reports he brought back of the fertility and mineral wealth of that region greatly stimulated white immigration, and the encroachments on the Indian reservation led to trouble with the hostile Sioux under Sitting Bull. In 1876, Gen. Sheridan ordered an expedition in three columns from distant points under Gens. Terry, Gibbon, and Crook to march against them. Custer, while leading Gen. Terry's column, coming near a large Indian

encampment on the Little Big Horn River, divided his regiment into three bodies, and pushed on with five companies. Major Reno, with a detachment, crossed the river some miles above, and when he was driven back the Indians concentrated on the main body in the opposite direction. Gen. Custer and all his men were killed on June 25, 1876. His body was afterwards found, not scalped. A serious dispute has arisen as to the responsibility for this massacre, some asserting that he was not properly supported or obeyed, while others lay the blame on Custer himself. The *Complete Life of Gen. G. A. Custer*, by Capt. Frederick Whittaker, was published in New York, 1876. In 1879 a statue of Gen. Custer was erected at West Point.

CUTHBERT, a town of Georgia, county-seat of Randolph co., is 18 miles E. of the Chattahoochee River, and 119 miles S. W. of Macon, on the South-western Railroad, at the junction of the Fort Gaines branch road. It has a court-house, a hotel, 2 weekly newspapers, 5 churches, 2 schools, and a male and female college. Population, 2129.

CUTHBERTSON, JOHN, the founder of the Covenantan Church in America, was born April 3, 1718, in Scotland, and studied theology with the Rev. John McMillan. He was ordained in 1747, and soon afterwards went to Ireland and preached to the little societies of Old Dissenters or Covenanters, who had taken refuge there during the Scottish persecutions, and were scattered throughout the northern counties of the island. In the summer of 1751 he came to America to minister to the Covenanters, who had sought liberty of worship and better worldly prospects in the new world. He found not less than five hundred of this faith scattered through the country bordering upon the Susquehanna River and in the Cumberland Valley. He visited these people, and during the first month preached at eleven different stations. He held an annual communion in some central place, to which great numbers came. He went over this circuit at least once a year until the arrival of the Rev. Messrs. Dobbin and Lind in December, 1773, after which he confined his labors to parts of Chester, Lancaster, and York counties in Pennsylvania, although he was probably never installed anywhere, for he sustained a paternal rather than a pastoral relation to all the congregations which he served. He went into "the Union of 1782," which formed the Associate Reformed Church, and died March 10, 1791. He kept an accurate diary, which is still in existence, which shows that he preached on 2452 days, baptized 1806 children, married 204 couples, and rode on horseback over 70,000 miles. (J. B. S.)

CUTLER, MANASSEH, LL.D. (1742–1823), an American Congregationalist minister, was born at Killingly, Conn., May 3, 1742. He graduated at Yale College in 1765, and after spending some time in the whaling business opened a store at Edgartown, on Martha's Vineyard. He was admitted to the bar in 1767, and then removed to Dedham, where he studied theology, and in 1770 was licensed to preach. He was ordained Sept. 11, 1771, as pastor of Hamlet parish, which afterwards was incorporated as Hamilton. He entered heartily into the movements which led to the Revolution, and being made chaplain of a regiment in September, 1776, saw some service. Yet as he remained chiefly in his parish he studied medicine for the good of his people, and soon became noted for his scientific attainments. In 1781 he was made a member of the American Academy, and contributed some papers on astronomy and botany to its *Memoirs* for 1785. His botanical paper was the first scientific treatise on the plants of New England. In 1784 he, with six others, ascended the White Mountains, and they are said to have been the first white men to reach the summit. In 1786 several officers of the Revolutionary army residing in Massachusetts formed the Ohio Company to purchase public lands with the government certificates with which they had been paid. Dr. Cutler was a di-

rector of the company, and in the following year went to New York, where Congress was in session, to effect the purchase. He found that an ordinance had already been proposed for the government of the territory northwest of the Ohio, and had reached a third reading. By judicious management he secured the reference of the subject to a new committee, the majority of which were Southern men, Col. Carrington, of Virginia, being chairman. On July 11, 1787, this committee reported a new ordinance, which is now known as the "Ordinance of 1787," and the main features of which were taken from the Constitution of Massachusetts adopted in 1780. These were evidently suggested by Dr. Cutler, and had been insisted upon as a condition of his purchase of public lands on the Ohio. The anti-slavery article was added on July 12, by Nathan Dane, the member for the Essex district of Massachusetts, in which Dr. Cutler resided. It seems to have been already approved by the committee, but to have been held back lest its insertion might endanger the passage of the act. In the plan of government proposed by Jefferson, and adopted in 1784, a similar article had been lost; but as no settlement had been made under that plan, and anti-slavery ideas were then favored by many Southern men, Congress passed the ordinance by a unanimous vote of the States represented, July 13, 1787. Two weeks later the bill authorizing the Ohio Company's purchase was passed. Dr. Cutler had secured the insertion of a proviso by which one section of every township should be reserved for the support of an educated ministry, and two townships for the establishment of a university, in addition to the proviso of the general land law of 1785 that one section should be reserved for the support of common schools. Dr. Cutler's purchase amounted to 1,500,000 acres for the Ohio Company, and 4,000,000 acres on account of other companies which were formed in imitation of it. On his return to Massachusetts the expedition to the Ohio was fitted out and started in December with a large wagon covered with black canvas, on which appeared in white letters, "Ohio, for Marietta on the Muskingum." Forty-five men went with it under engagement to settle and defend the country for three years; when they reached their destination their number had been increased to 60. Under the command of Gen. Rufus Putnam they founded Marietta, April 7, 1788. Dr. Cutler set out in the summer, and travelling in a sulky reached the Ohio, a distance of 750 miles, in 29 days. After examining the neighborhood he returned to Massachusetts, and though in 1795 offered by Washington a commission as judge of the supreme court of the Ohio Territory declined the appointment. He was subsequently a member of the legislature of Massachusetts, and in 1800 was elected to Congress, where he served two terms. Then declining a re-election he devoted himself to his pastoral duties. He died at Hamilton, Mass., July 28, 1823. Three of his sons went to Ohio and were prominent in its settlement. His eldest son, Judge Ephraim Cutler, was a member of the convention which framed the first Constitution of Ohio, and effectually resisted the scheme of annulling the anti-slavery provision of the ordinance. He also drafted the judicial system of the State, and afterwards the common school system. Another son, Jervis Cutler, was the first emigrant that landed at Marietta, and was the author of a *Topographical Description of the States of Ohio, Indiana Territory, and Louisiana, comprising the Ohio and the Mississippi Rivers* (1812).

CUTLERY. Cutlery, in the United States, appears to be divided into two classes—table cutlery and pocket cutlery. The term includes all kinds of table, hunting, butchers', and cooks' knives, forks, razors, pocket-knives, scissors, and shears. Surgical, dissecting, and dental instruments are sometimes regarded as cutlery, but they more properly make a class by themselves. Nut-picks, steels, and

nut-breakers for the table, artists' and shoemakers' knives, are also included in cutlery, together with some smaller cutting tools. Scissors and shears, on the other hand, are sometimes included with other cutting tools under the more general name of "hardware." Spoons and steels are often sold as table cutlery, but these, with metal-ware of all kinds, knife-rests, napkin-rings, urns, pitchers, etc., are more properly included under the general name of "table-ware."

The cutler's art is practically a refinement of the blacksmith's or forger's art. It is based on forging and shaping upon the anvil, but adds to this art the arts of the turner and the electro-plater. While it is still carried on as a handicraft, it is in this country almost wholly a manufacture. The raw materials used in cutlery include steel for the cutting portion, or the blade, and steel, iron, brass, wood, ivory, horn, rubber, bone, shell, and celluloid for the handles. Silver, nickel, and a number of alloys are also used in ornamenting and finishing the handles of cutlery. The art of making table cutlery may be divided into three steps or stages: forging, or the heating and rough-shaping upon the anvil; tempering, to obtain hardness in the steel; grinding, to get the final shape and edge or point, and the finishing, polishing, putting on the handles, and ornamenting the blade. All of this work has for a long time been done by hand, but it is a laborious, expensive, and dangerous operation, and is very properly being superseded by manufacturing, which benefits both the workman and the buyer, giving the latter better goods for his money, and saving the former from much heavy and dangerous toil.

In American practice all the work is done in one building and at the same time, the division of labor being exceedingly minute. In the manufacture of knives and forks the steel is received in the shape of rods and bars. This is cut into lengths suitable for different knives or forks, and is sent to the forge. The forge-fires are ranged in rows and convenient to the steam-hammers and rolls, all the fires being urged by a blast brought in pipes, thus relieving the workman of all labor at the bellows. Having brought a length of steel to the proper heat in the fire, the workman places it under the hammer or in the rolls, where it is quickly brought down to the required shape. Each hammer or roll is designed to produce a certain form of blank from which one or more blades are to be formed. For instance, if the blades of a table-knife are to be made, the blank may be thin at the edges on two sides and taper regularly towards each end. Out of such a blank four blades may be cut, the longer axis forming the backs of the blades and the shorter axis the ends next the handles. Knives having steel handles may be forged under the hammer to form the blade, and more roughly shaped to make the handle. All this labor is subdivided as far as possible, one man beating and shaping one kind of blank only. After the rough-shaping comes the drop-forging, the forging into shape under the sudden blows of a drop-hammer. This brings the blank to its shape as a knife or knife-blade or fork—if a fork, the tines being as yet uncut. These forgings have the shape of the future knife or fork, but with "wings" or "fins," rough or ragged bits of metal, still clinging to the edges. These wings are removed by the next process in the die-pressing department. The presses are fitted with hardened steel dies, and cut or press the knife cold at a single blow, leaving it almost completely finished as far as shape is concerned. In shaping forks the curve given to the tines is obtained in a drop-press and with a die having a much greater curve than that required. The elasticity of the steel causes it to return in part to its original shape, but the blow being excessive the return is only partial, and in this way the right curve is obtained without heating the blank.

The tempering of the steel is and must be performed by hand. Twenty or thirty blades are heated at once and plunged into a bath of cotton-seed oil, the oil being kept cool by a water-jacketed kettle. Knife-grind-

ing has long been known as a most laborious and dangerous trade. Each knife and fork must be pressed against a grindstone revolving at very high speed. The operation necessitates a stooping posture over the stone and the free use of water. There is also great danger from the bursting of the stones. Fortunately, this work can now be done by machinery. Much larger stones are used, and they are driven at a safer and slower speed. The blades are placed in a brass frame and put in the machine in front of the stone. They receive a rapid sideways motion combined with a slower vertical motion, and are steadily pressed against the face of the stone. One machine will grind six or more knives at once, and do the work of thirty men in a day. The final finishing of the steel parts of the knife or fork is done upon emery-wheels and wheels of felt and cloth covered with rouge. This work, which is all done by hand, was formerly exceedingly unhealthful by reason of the dust from the wheels, but now air-pipes are laid to each wheel, with a hood partly covering the wheel, and all the sparks and dust are drawn by exhaust-fans into the pipe and blown into a large settling-room. The dust contains a large proportion of metals, and these are easily recovered and may be used again.

Many of the table-knives and forks made in this country are forged in one piece, the handle being of steel. As the whole knife or fork is to be silver-plated, this gives a firm and solid handle free from cracks or holes, and consequently more easily kept clean. For a cheaper class of table cutlery the handles are of cast iron, and may be japanned or nickel-plated. Wooden handles are always put on in two parts and secured by brass rivets. Horn, ivory, bone, shell, rubber, and celluloid handles are in one piece, and are secured to the blade in various ways. Wooden handles are sometimes ornamented with bands of white metal, and all the finer qualities of handles are carved and ornamented in various ways. The solid steel knives and forks are always silver-plated, and make the most generally useful of all cutlery. All the table-knives of whatever quality are balanced, so that the blade will not touch the cloth when they are laid upon the table.

The manufacture of pocket cutlery is essentially the same as that of table cutlery. The blades for the knives are cut from sheet steel in powerful presses. The blanks, cut to shape, are then put through drop-presses to cut the nail-mark and to straighten the blade. They are then shaped by forging and given the first grinding, which is done on large stones and by machinery. Then follows the first hand-grinding to shape the blade to a cutting edge.

The partly sharpened blades are then taken to the handle department and riveted to the handles. The steel and brass parts of the handles are cut from sheet metals, and are ground upon emery-wheels to give both the final shape and polish. The materials for pocket cutlery handles are chiefly coccoloba (a species of red wood) and cocoa-wood, horn, bone, iron, and alloys. Imitation of stag-horn is made by dyeing bone and cutting it to a roughened surface upon a lathe. After the handles are put in the blade receives a second grinding by hand to give it a cutting edge. The finishing and polishing of the metal parts of the handle and the fixing of ornaments, if they are used, and the final setting of the edge, complete the work. Machinery is used in every stage, from the stamping of the blank to the final polishing, wherever it is possible.

While the general shapes of the blades of pocket cutlery remain unchanged from year to year, the shape and ornamentation of the handles frequently change to meet the demands of a supposed taste or fashion. New styles are introduced almost every season, and there is a steady improvement in the artistic quality of the best cutlery. The designs are less conventional, and it has been found that the better the design the better the price and the more active the demand. (C. B.)

CUYAHOGA FALLS, an incorporated village of Summit co., Ohio, is on the Cuyahoga River, 32 miles

south of Cleveland, on the Cleveland and Columbus Railroad. It has a town-hall, 3 hotels, a bank, a weekly newspaper, 4 churches, and 2 schools. There are also 2 foundries, a machine-shop, paper-mills, flour-mills, saw-mills, rivet-works, a tannery, potteries, and other industries. The river is here enclosed between high rocky walls and furnishes abundant water-power. It was settled in 1810, and incorporated in 1875. Its property is valued at \$1,000,000, and it is free of debt. Population, 2294.

CUYLER, THEODORE LEDYARD, D. D., an American Presbyterian minister and author, was born at Aurora, Cayuga co., N. Y., Jan. 10, 1822. His father, Benjamin Ledyard Cuyler, was a lawyer in Aurora, and was descended from Hendrick Cuyler, who came from Holland to Albany in 1667. His mother was of Huguenot descent. He graduated at Princeton College in 1841, and at Princeton Theological Seminary in 1846. For three years he was the stated supply of the Presbyterian church in Burlington, N. J. In 1849 he became the first pastor of the Third Presbyterian church in Trenton, N. J. In 1853 he was called to the charge of the Reformed Dutch church in Market Street, New York, which he served for seven years. He removed to Brooklyn in 1860, and became the founder of the large and influential Lafayette Avenue Presbyterian Church, of which he is still the pastor. His doctorate of divinity he received from Princeton College. Dr. Cuyler is the author of the *Cedar Christian* (1859); *Heart-Life, The Empty Crib* (1868); *Thought-Hives* (1872); *Pointed Papers for the Christian Life* (1880); *God's Light on Dark Clouds* (1882); and *Nile to Norway* (1881); a volume of foreign travel, as well as a large number of tracts and published discourses. He has contributed over 2000 articles to leading religious journals, which have had a wide circulation in this country and in Europe, and many have been translated into French, German, and other languages. They are characterized by good-nature, earnest sympathy, and Christian zeal.

CYNTHIANA, a town of Kentucky, the county-seat of Harrison co., is on the South Licking River, and on the Kentucky Central Railroad, 66 miles S. of Cincinnati. It has a court-house, 2 national banks, 3 hotels, 2 newspapers, 6 churches, a female college, and several schools. In the vicinity is a noted race-course. The county is largely engaged in distilling Bourbon whiskey, and the town is the headquarters of this business. It has also 2 carriage-factories, 2 flour-mills, and a barrel-factory. It was settled in 1793, and was named from Cynthia and Anna, two daughters of William Harrison, the first settler, who gave his name to the county. It was incorporated as a town in 1802, and as a city in 1860. On July 17, 1862, the Confederate Gen. John H. Morgan, with a force of 800 men, attacked a Union force of 500 men, chiefly State militia, and after a fierce fight captured the town, destroyed a large amount of government stores and then returned to Tennessee. On June 11, 1864, Gen. Morgan, with 1200 men, again advanced on the town, then occupied by Gen. Hobson with some Ohio regiments. The Union troops were captured and a large part of the town burnt, but in a few days the Confederates were driven out and routed by a superior force under Gen. Burbridge. After the war the town recovered its prosperity. The surrounding country is fertile and highly cultivated. Population, 2101.

CY PRÈS, in law the doctrine by which, when a gift for charitable uses cannot be applied according to the exact intention of the donor, courts of chancery apply the gift as nearly as possible (*cy près*) in conformity with the presumed general intention of the donor.

The doctrine of judicial *cy près* is as follows: Where a gift is made to trustees for a charitable purpose, the general nature of which is pointed out and which is lawful and valid at the time of the death of the testator,

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and no intention is expressed to limit it to a particular institution or mode of application, and afterwards either by change of circumstances the scheme becomes impracticable, or by change of law illegal, the fund having once vested in the charity will be applied as near the testator's particular directions as possible, to carry out his general charitable intent. Thus where a sum of money was bequeathed to aid in the publication of books, etc., to create a public sentiment in favor of the abolition of slavery in this country and to aid fugitive slaves, and after the testator's death slavery was abolished, whereby testator's immediate purpose failed, it was decreed on application to a court of chancery that the fund should be applied in aid of freedmen.

In England the doctrine of the judicial *cy près* is firmly established. In this country it is approved in some States, discarded in others, and in some has not been passed upon. In Massachusetts, Missouri, and Illinois it is regarded as in force. In New York, Connecticut, Maryland, Virginia, North Carolina, South Carolina, Alabama, Indiana, and Iowa it has been repudiated. In Maine, Vermont, New Hampshire, and Rhode Island, the question is not positively determined, but the indications are that the doctrine is in force. In New Jersey and in the courts of the United States the question is still an open one, though the tendency is against the doctrine. In Pennsylvania the whole *cy près* doctrine has been declared to have been rejected. It has, however, since been introduced to a limited extent by statute. (L. L., JR.)

CYPRESS. This is the English name of a tree known botanically as *Cupressus*, which is again but a Latinized form of its ancient Greek name, the particular species of the Greek being *Cupressus horizontalis*. The name has been taken to represent a section of the coniferous tribe of plants known as *Cupressineæ*. In this section are placed the juniper, cypress, arbor vitæ, *Cryptomeria*, or Japan cedar, *Retinispora*, *Taxodium*, or the Southern Cypress, *Callitris*, an Australian genus, and a few others of lesser note. These divisions of *Coniferae* appear to the casual observer as well characterized, but the botanist has difficulty in expressing the differences in a manner satisfactory to himself. In the common pine there are many scales to form a cone, but in the *Cupressineæ* there are but few—sometimes not more than four—and these are arranged in opposite pairs, instead of being spirally twisted. The ovules are two, erect, and not adherent, as in the pine, to the inner face of the scale. The leaves are decussately opposite, and the branches often flattened and fan-like, while the leaves of the pine are scattered spirally round the branch, and often have the leaves in bundles from the axils of primary leaves. There are some other characters relied on by the critical botanist in careful examinations.

Cupressineæ are found in the northern hemisphere between the 25th and 50th parallels, and between the 30th and 45th in the southern. They do not generally grow together in immense forests, as pines do, but are scattered, and generally in company with other trees. Their value in commerce is very great, though not perhaps to so general an extent as in the case of pines and firs.

The Cypress of the ancient Greeks and Romans had two distinct forms—one, the Italian, and known as *Cupressus fastigiata*; the other, a spreading tree, *C. horizontalis*. Both of these are, however, regarded as forms of one species, *C. sempervirens* of Linnæus. They were popular in ancient gardening, and used freely in cemetery work, and were poetically used as emblems of mourning. The wood was in common use for timber, and famous for its durable quality. The gates of Constantinople, erected in the time of Constantine, were made of this wood, and in the time of Pope Eugene IV., 1100 years after, the wood was sound as when the gates were first erected. Another account says the

doors of St. Peter's Church at Rome were made of this wood and erected in the time of Constantine, and were entirely sound when exchanged for brass doors in the time of Pope Eugene II. The coffins of the Athenians and mummy-cases of the Egyptians are said to have been made of Cypress wood. The tree was dedicated to Pluto and Proserpine, and a statue of Jupiter in Rome made of the wood was perfect in Pliny's time, though then 700 years old. It is probable that its first use in cemeteries was suggested by a belief that the balsamic odor emitted by the leaves was an antidote to the noxious effluvia emitted by dead bodies.

The common name, Cypress, has been transmitted to many other allied plants, though some of them have been taken from *Cupressus* or remanded to other genera by some botanists. In early American botanies the Southern Cypress was *Cupressus disticha*, and the Northern, *Cupressus thuyoides*. The former is a deciduous tree, and was called Bald Cypress, in distinction to the Northern, which is evergreen. The Bald Cypress is now recognized as *Taxodium distichum*, and, though in some botanical works the Northern is still *Cupressus thuyoides*, others style it *Chamaecyparis thuyoides*. The latter's best known common name at the present time is "white cedar" in New Jersey, where it abounds, though farther north "white cedar" is the common name of the arbor vitæ. South of the Potomac River the most common name is "juniper," true junipers being only represented there by *Juniperus Virginiana*, which is, however, popularly known as "red cedar."

The Bald Cyprus, or *Taxodium distichum*, is a well-known American tree. It inhabits swamps near the coast from Delaware to Florida, and west to Eastern Texas. It grows from 100 to 120 feet high, and frequently exceeds 20 feet round four feet from the ground. Near the ground it is often double this size, so that platforms have to be erected when felling to save labor in cutting through the trunk. Like the Old World Cypress, the wood is very durable, posts having been known to last 100 years. It is also very light and strong, and is therefore used to make "dug-outs," or canoes, and for planking the decks of river steamboats. Its most popular use is for shingles for roofing barns and dwellings, as it has little tendency to warp or crack and will last for nearly 50 years. Squared logs are not unfrequently floated down the Mobile between 3 and 4 feet in diameter. The yield of a Cypress swamp is enormous, 200,000 feet of lumber being nothing unusual. In commerce there are three kinds—Red, Black, and White Cypress, from the color of the wood. No difference can be detected in the growing trees, and the difference is believed to result from the age of the wood or the conditions of growth. It is remarkable that while the White and Red Cypress wood is very light, the Black Cypress will not float in water. The Red Cypress is held in the highest estimation. The richer the swamp the larger the timber. In wet places the tree throws up from the roots peculiar protuberances known as "knees." These are often three or four feet high, and nearly as much in diameter. They are hollow, and have been used as bee-hives. They are generally narrow—not more than six or eight inches wide and two or three feet high, in the experience of the writer, and are produced with less freedom when the tree is growing in dry ground, and often under these circumstances are not produced at all. Cypress has less resin than the ordinary pine, but a balsam famous for healing wounds is obtained from the tree, especially from the nut-like cone. The leaves, boiled several hours, yield a cinnamon dye. In the delta of the Mississippi there are buried forests of Cypress: it is said as many as ten distinct forest-growths, with intervals of river-mud between them, have been traced one above another, which seems to indicate a great antiquity for the alluvial deposit. It is said that some of these trees have been found 25 feet in circumference, and one which contained over 5000 annual rings. Based on these figures, some geologists

have calculated the age of the deposits to be about 100,000 years. But there is probably some error in the calculations. A cultivated tree in the Bartram Garden near Philadelphia, measured in 1853, was 125 feet high and 20 feet in circumference four feet from the ground, and was certainly not over 100 years old. A form described in botanical works as *Taxodium Mexicanum* is found in Mexico, but is not probably distinct from the species found in the United States. It was cultivated by the ancient inhabitants of Mexico, as a famous one is recorded as being in the garden of Chapultepec, under which Cortes took shelter when, by the insurrection of the conquered, he was temporarily forced to fly from the City of Mexico with his Spanish adherents. It is known as "the Cypress of Montezuma," the king whose dynasty held sway for about three centuries before the arrival of the Spanish adventurers.

The Northern Cypress, *Cupressus thuyoides*, or "juniper" of the South, "white cedar" farther north, or with other local names, is a famous timber-tree, especially in New Jersey, where it has given rise to a distinct branch of trade known as cedar-coopering. The wood is soft, light, easily worked, and capable of a high polish, and a great variety of wooden-ware is made from it. It is also made into roofing-shingles, and serves much the same purposes as the Bald Cypress does. But it is a much smaller tree. It rarely grows more than 70 or 80 feet high. How long the Cypress will live is not exactly known; 277 circles of wood have been counted in some logs. It is believed that sometimes more than one circle of wood will be made annually in trees, but a case is recorded where a tree known to be not 50 years old had, when cut down, 47 woody circles. The tree is of comparatively rapid growth, and in New Jersey swamps they grow so thickly together that it is only with difficulty one can thread his way through them. As in the case of the Bald Cypress, there are submerged forests of these trees, and it is in some cases a profitable business to search for them and draw them through the marsh to the surface. These white cedar logs, though buried for many hundred years, are just as sound as those recently grown, and for some purposes better.

On the Pacific coast are species of Cypress of great commercial importance. *Cupressus Nutkaensis*, or yellow cedar, grows from 80 to 100 feet high. The wood has a yellowish tint, the foliage and young branchlets are of a yellowish green, and the numerous small male flowers in spring have also a yellowish cast. The wood is light and durable, and has an agreeable fragrance. The most abundant species is *Cupressus Lawsoniana*. This grows about 100 feet high, and is already in great demand for forest-planting in the Old World. The "Frankincense" Cypress of Mexico is *Cupressus thurifera*, and the "Funeral" Cypress of China, *C. funebris*. It is remarkable that this tree is used in China for cemetery purposes, just as the classical Cypress was by the old Greeks and Romans. (T. M.)

CYPRIOTE ART. Our knowledge of the place occupied by Cyprus in the history of art is due to the collection of examples of Cypriote art deposited in the Metropolitan Museum of New York. Mr. Charles T. Newton, of the British Museum, in his *Essays on Art and Archaeology*, remarks, concerning Cyprus, that "the museum of New York has already been created out of its spoils." These words were written before many of its other important acquisitions had been made by the New York museum, but they imply, and justly, that its Cypriote antiquities are sufficient in themselves to constitute a museum of ancient art. And in fact, as regards the mass of objects collected from one limited region, hardly another collection is equal to this. In the variety of classes of objects and of periods represented, the Cesnola collections are also unique. The tribute paid by archaeologists to their importance is due partly to the novelty of aspect and character in many cases, and to the new views of

art history thus promoted; partly to the artistic or archæologic value of objects to which the aspect of pure novelty cannot be ascribed.

In this latter class must be numbered the collection of ancient glass which surpasses in number of pieces any individual collection in existence. As illustrative of the ancient use and combination of color in glass manufacture it contains a number of good examples. Other pieces of a white or greenish thick glass without artificial color and also without the beautiful iridescence of decay peculiar to most, are considered by Frochner (*La Verrerie Antique*) as bearing undeniable signs of primitive Phœnician art. The prejudice which credits the Phœnicians with the origination of glass manufacture is based upon an anecdote of Pliny, and opposed by the now demonstrated antiquity of opaque and colored glass manufacture in Egypt. But the high authority just quoted considers the Phœnicians the earliest manufacturers of transparent glass, and the specimens noted are of great rarity. Most of the Cesnola glass belongs to the Roman time, with some exceptions for the Greek period; but in this department, the minute distinction of dates is in general of no great importance. For although pieces of the early periods of Eastern history are extremely rare, Egypt and Syria remained throughout antiquity important centres of manufacture and of export, and the same methods continued. Thus the Cesnola glass collection is an excellent illustration of an art common to all periods of antiquity and to all countries where ancient civilization reached. Its pieces are uniformly from tombs, whence their excellent preservation. They contained, in most cases at least, the perfumes and ointment used in the funeral rites. Traces of the latter may yet be seen in many of the objects.

From the excavation of tombs, but from a different series, was also derived the large collection of small terra-cotta lamps, belonging mainly to the Roman period. The history of Cyprus explains the conditions by which so many objects from this island belong to Greek or to Roman art. The study of art history has enabled us to view ancient art as the representation of a sequence of ever widening civilizations, which in the time of the Roman empire attained their ultimate limits. From the first century of the Empire to the opening of the Middle Ages similar methods in art and analogous subjects of design are found in Britain and in Greece, in France and in Syria, in South Germany and in Egypt, in Spain and in Asia Minor, in Italy and in North Africa, in Sicily and in Cyprus. This latest period of antiquity derived from the Greeks the preponderance of its subjects in art and its technical methods of execution and design. Thus it happens that a Cypriote collection in New York affords not only in glass and in lamps abundant illustrations of Græco-Roman civilization but also represents in a large number of statues and statuettes the same periods of art.

The works of Roman sculpture—that is, sculpture of the Roman Imperial period found in Cyprus—do not reach the best standard in any sense of the Italian and other European museums, but they belong to the same class of art and subject. The interest in ancient art is now of necessity largely turned to the work of subordinate artisans whose productions are to be judged by comparison with what a workman of the same class would originate now. From this standpoint the illustrations of sculpture of the Roman period in New York are valuable and in their way good, although mainly by inferior workmen. They represent a class of work common to the antiquity of all the countries just mentioned. They are not local but representative in character, hence their value to an American museum.

The acquisition of Cyprus by the Romans took place in the later days of the Roman republic, a little before the acquisition of Egypt and a little later than the establishment of the Roman protectorate in Syria—all events of the first century B. C. Of the other Roman

provinces Asia Minor (in part), Macedonia, and Greece became Roman in the second century B. C.—North Africa and Spain after the close of the third century B. C. The acquisition of Cyprus is about contemporary with that of Gaul, and occurs before that of Britain and South Germany (first century A. D.).

The representative character of Cypriote art for antiquity in general in its Roman period being connected with a general dependence of this time in art, literature, and general culture on Greek civilization, a representative character also holds for Cypriote art in its Alexandrine-Greek period next preceding the Roman. In most respects, for example, Roman sculpture of the empire is simply a continuation of the later Greek. It differs from it only in the use of portraiture, which is rarely found in original Greek art. This dependence is connected with the incorporation under Roman organism of some of the territories just mentioned, which in changing political allegiance not only continued their civilization, but transferred it to other Roman countries. Asia Minor, Syria, and Cyprus were all thoroughly Hellenized at the time of union with Rome. It was mainly the influence of such numerous Hellenized peoples on other Roman countries which determined the Greek tendencies of all in the times of the empire. Thus we must conceive the art of Cyprus in the three centuries preceding the Roman occupation as representative of that of the same time found in Asia Minor, Syria, and Egypt (as far as Alexandria, at least, is concerned), and of the kind known as Alexandrine-Greek. This period of Cypriote art also represents a similar style which prevailed at the same time in the Greek portions of Italy, Sicily, Southern France, around the shores of the Black Sea, and in Cyrene, all territories colonized by Greeks at an early date and subject to the general laws of date and style in Greek art. For the period of Alexandrine-Greek art the Cypriote collection in New York has a number of fair examples of artisan statuary workmanship, and in life-size heads some examples of excellent style. In small terra-cotta statuettes and heads there are many very fine examples of the best work of Greek art in this class. (The changes in the history of Cyprus connected with the contentions of the Eastern Greek dynasties had no influence on its art and civilization, excepting to promote, one and all, its generally Hellenic character.)

Attention has been directed in this sketch first to the later periods of Cypriote art, to Roman or Græco-Roman, and Alexandrine-Greek, because for an American museum the representative aspects of these works are important. They are valuable, not because they belong to Cyprus, but because they are not local in character. Exactly a contrary point of view holds in general for the time preceding Alexander's conquest of the Persian empire, about 330 B. C. Of this empire Cyprus had formed a portion in common with Asia Minor, Syria, the Tigris-Euphrates valley, and countries farther east to the Indus. Although before 330 B. C. back to 550 B. C. (approximately) Cyprus was mainly under the political influence of the Persian empire, it represents for this time interesting and peculiar phases of Greek art. Greek states had existed in Cyprus before B. C. 550. They were not destroyed during the Persian period, although subjected to this foreign political influence.

The growing moral ascendancy of the Greeks, as related to the East, had been gradually developing throughout the Persian empire before its conquest by Alexander the Great.

On the island of Cyprus, where the Persians were only satraps or administrators, the reacting influence of Greek art on the East is illustrated in examples of Phœnician portrait statuary under Greek influence in form and drapery. For the history of the art of sculpture these pieces are unique and denote a phase of it otherwise unknown. Besides two Phœnician sarcophagi, in form of an Egyptian mummy-case, of

great value, which have parallels in the Louvre, two others belonging to this Persian period are so far unique. One of them has been published by the French archæologist, Georges Ceccaldi, and also described by Dr. Birch, of the British Museum. Both are noticed by Mr. Newton, of the British Museum, in *Essays on Art and Archaeology*. The art of the one is dominantly Asiatic in character, with a freedom of action and treatment which implies Greek influence. On the longer sides are represented chariots and processions of oriental type. At one extremity are four figures of the Phœnician Venus, at the other four figures of god Bes. The second sarcophagus represents on the longer sides a hunting-scene and a Greek banquet; at one extremity the myth of Perseus and Medusa, at the other a chariot. The style is dominantly Greek, but exhibits an Asiatic influence. (This piece was valued by Mr. A. S. Murray, of the British Museum, at \$30,000.)

In these two sarcophagi are two modes of art (Eastern under Greek, and Greek under Eastern, influence), to both of which there are many corresponding statues and statuettes; and it is at this point that we distinguish objects in the Cesnola collections belonging to periods and styles otherwise known from those unknown before the Cypriote excavations of recent years. The novelty of aspect is explained by the locality of production. Cyprus, by its position near the Syrian (Phœnician) coast, and not distant from the Greek settlements of Asia Minor and the Ægean, was an important point of contact and of fusion for Greek and Eastern civilization before the time when, following Alexander's conquest, Greek culture became mistress of Western Asia, and then, under Roman organism, of the Western Mediterranean. Between these two aspects of style-fusion in Cypriote art, Eastern acting on the Greek and Greek reacting on the Eastern, it is not always possible to distinguish; but both undoubtedly exist, and instances of both can undoubtedly be specified. Of the two the action of Eastern art upon the Greek is the earliest, and the one to which attention is most important. Its consideration involves special attention to the period before 550 B. C. (beginning of the Persian rule in Cyprus), although this influence continued at least a century after this date.

In the history of Greek art the culminating point in sculpture, as in architecture, is marked by the completion of the Parthenon, at Athens, about 438 B. C. But whereas the Greek temple architecture had lived through a long period of relative perfection before this time, the development of perfection in sculpture belonged to a still living generation. Phidias, the inspirer of the sculpture art of the Parthenon, was born about 490 B. C. But the statues in Munich from the Jupiter Temple in Ægina are dated as late as 470 by high authority (Friedrichs), and they still exhibit traces of the archaic style. The reliefs from the Greek temple of Assos, in Asia Minor, distinctly archaic, are dated by some students as late as 475 B. C., and by none earlier than the 6th century. Exceedingly archaic Greek sculptured metopes from a Sicilian temple at Selinus, in Palermo, are not earlier than the 6th century—a limit fixed by the foundation of the city. The tombstone of Aristion, a warrior who died at Marathon 490 B. C. (date of the birth of Phidias) is still preserved at Athens. It is of thoroughly archaic style. Both according to modern evidence and ancient authorities Greek stone sculpture was not generally attempted until the close of the 7th century B. C., and at the opening of the 5th century was still stiff in attitude and motion. (The prehistoric Lion-gate of Mycenæ is an isolated work which has no parallel in Greek art, and is ascribed to Asiatic—Lycian or Hittite—origin). An analogy offered by the history of Italian art led students to understand in Greek art a similar long process of incubation, a similar rapid development into perfection,

without conceiving its origin as at all related to foreign influences at so late a date. The archaic Greek style so far known was considered decidedly archaic Greek. Against it stood opposed the curiously individualized sculpture arts of Assyria and of Egypt. Historians of art either decidedly opposed the idea of an Eastern origin of Greek sculpture like Lübke, ignored the question like Schnaase, or advanced the hypothesis of an Egyptian influence like Kugler, without ability to point to the connecting links. This ignorance of the now demonstrated Eastern origin of Greek sculpture is well illustrated by reference to the third edition of Schnaase's *History of Art* (1869). In this German author of standard reputation a statuette from Cyprus is quoted as so far resembling early Greek style as to forbid the hypothesis of Phœnician derivation, whereas from the multitude of connecting links offered by the Cypriote excavations the resemblance and even identity of Phœnician art (Egyptian and Assyrian in derivation) with early Greek has been demonstrated conclusively. Prof. Sidney Colvin, in his preface to the *British Museum Photographs of the Cesnola Cypriote sculpture*, says: "It seems to be Greek art dawning under our eyes."

The backwardness of archæology, as regards the origin of Greek art, finds a double explanation in the relative infancy of scientific antiquarian study, especially of the Eastern world, and in the deficiency of excavations. It is only from the last half of the 18th century that a conception of the existence of a Greek art originated with the German Winckelmann. At the opening of the 19th century the Elgin Marbles, from the Parthenon, were stored for fourteen years in London before the British government would consent to purchase them. For this length of time the painter Haydon was the only appreciator of the school of Phidias in England. Before the time of Winckelmann the works of sculpture now termed Greek were considered Roman, and this misconception sprang from the fact that, then as now, most of the ancient statues were of Italian origin, and mainly from the city of Rome. Italian patriotism and the exclusive devotion of the 17th and 18th centuries to Latin studies had, in the absence of a critical historic science, easily fallen into this mistake. Winckelmann overthrew the methods of study which had derived the interpretations in ancient art from the Latin authors and from Roman history. He showed the existence of Greek art, by asserting and proving by new interpretations that the Roman works of sculpture were Greek copies; but he confessed himself unable to point out more than two or three original Greek works in Rome. In the absence of Greek originals the early periods of Greek sculpture could not be scientifically studied. Winckelmann himself fell into the mistake of considering the few archaic Greek works in Italy Etruscan. Of an Egyptian or Assyrian influence in early Greek sculpture he is entirely ignorant, so that the first portion of his famous Art-history is now entirely valueless. In the 19th century the vast majority of Greek statues known (nearly all of the museum statues of Europe) still date from the Roman imperial period in execution, and have been found in Italy. Excavations in Greece or in Greek countries have been fragmentary and insufficient. Original Greek works of sculpture for any period are relatively rare, and therefore have been rare also for the time of origins and first development. It is thus explained how the multitude of archaic Greek works from the Island of Cyprus has been the revelation to antiquarian students of an eastern origin for Greek sculpture, which, suspected by few, had never before been demonstrated to any.

Undoubtedly at two other points Greek contact with Eastern civilization was of at least equal importance, namely, in the colonies on the shore of Asia Minor, connected by the adjacent empire of Lydia with Assyrian civilization (now conceived as having been modified by a Hittite influence and transmission cen-

tring on the upper Euphrates); and, secondly, the direct contact with Egypt through the Greek colonies in the Nile Delta after 664 B.C., as well as earlier direct contact by commerce. No remains of the Delta colonies have, however, ever been discovered; those of a connecting period in Asia Minor are rare. In Cyprus only could the direct influence of a mixture of Egyptian and Assyrian art be expected. From Cypriote art only could we argue to the enormous significance of Phœnician contact for the history of Greek art as transmitting medium for Egyptian and Assyrian influences combined. "For evidence of the early and fertilizing influence of Phœnician, and through the Phœnicians of Egyptian and Assyrian ideas upon the Hellenic mind, as well as for the subsequent perpetuation and embodiment of ideas in which these elements continued in fusion as they continued nowhere else, there was likely to be no place like Cyprus. Get, if got, there were to be, a sufficient number of ancient monuments from Cyprus, and therein you must have the best visible and tangible testimonies in aid of that obscure literary testimony which scholarship has so laboriously sought for, sifted, pored over and conjectured over, you must have the best clue to the primitive modes and forms in which Semitic and Egyptian ideas and arts and types of worship, as conveyed and modified through the Phœnician channels of communication, penetrated and impregnated the receptive faculties of the Greeks. Now such monuments in any bulk were long wanting; they are wanting no longer" (Sidney Colvin, *Preface to the British Museum Photographs of the Cesnola Collection*). The Greek archaic art, as previously known, is now joined by a series of connecting links as remarkable for number as for gradations of style with the art of Egypt and of Assyria.

The peculiar aspects of the Cypriote art of the 6th century B.C. and earlier are determined, then, first, by the existence in the island of a number of Phœnician colonies and settlements; second, by the existence on the island of Greek colonies and settlements (both to be conceived as partly mixing with, absorbing, or acting on a native Cypriote population allied to the Greek blood); third, by the peculiar relations of the Phœnicians on the Syrian coast to Egypt on the one hand, to the valley of the Euphrates and Tigris (Chaldea, Assyria, Babylonia) on the other.

At the time immediately preceding the rise of the Persian empire, about 550 B.C., the Tigris-Euphrates valley and the country of Syria were included in the empire of Babylonia, a name coextensive, as far as the Babylonian province is concerned, with that of Chaldea. Before 600 B.C. these Babylonian countries had been a portion of the Assyrian empire, overthrown about that time. The territorial spread of this Assyrian empire from the province of Assyria became marked after B.C. 1200. Before this time had existed an earlier empire of Babylonia, or, as it is generally called to distinguish it from the later empire, the empire of Chaldea. These political changes in the Tigris-Euphrates valley imply only modifications of minor importance in its art, which may be conceived at any time, as far as external influence is concerned, under the name of Assyrian or Assyro-Chaldean art. The interposition of the Arabian desert between the valley of the Nile and the valley of the Tigris and Euphrates made Syria the highway of intercourse and commerce between them. Especially were the coast Phœnicians of Syria, by geographical relations, directed to the mission of trading between Egypt and Assyria, and bringing to either the raw products of the other Mediterranean countries. Hence the peculiar aspects of Phœnician art, sometimes Egyptian, sometimes Assyrian in tendency, sometimes a mixture of the two. Direct control of Cyprus by Egypt after 1600, and subsequently by Assyria (demonstrably in the 8th century B.C.) must have assisted the foreign influences under Phœnician transmission.

Although stress has been laid on the importance for

Greek art-history of the Cypriote remains, it is also to be remembered that Phœnician art itself is now for the first time illustrated. Reference to standard authors like Kugler (*Kunst geschichte*) or Schnaase (*Kunst geschichte*) will reveal the almost absolute dearth of Phœnician art down to the time of the Cypriote excavations. The Ægean Islands in general have already supplemented, and will certainly in the future still further supplement, the knowledge of Phœnician art and its influence on the Greek, but on account of the near connection of Cyprus with the Syrian coast, on account of the superior importance and longer duration of its Phœnician settlements, the results obtained here must always remain unrivalled.

As implied in the foregoing matter the sculpture art of Cyprus belonging to the 6th century B. C. or earlier times exhibits all grades of mixture between Egyptian and Assyro-Chaldæan art as well as independent types of either. As to the antiquity of individual pieces of sculpture, no computations back of the 6th century have as yet been made with definite certainty, although the 14th or 15th century B. C. is not considered too early a date for some pieces. The peculiar qualities of Eastern art, which as far as it can be traced back exhibits no gradual development, but in the earliest works known exhibits the highest qualities of its peculiar excellence, make the computation of dates by evidence of style alone a matter of great difficulty. On this point Mr. Sidney Colvin says: "It is impossible to be sure of the actual comparative age of some of these objects, however old and primitive they may look. Of the vast antiquity of the types to which they belong there can be no doubt whatever." (This remark applies to *sculptures* of dates earlier than the 6th century B. C.) Dr. Birch, of the British Museum, considers the 14th century B. C. not too early a date for certain figures of Egyptian type, and there is no doubt that art similar to that of the Cesnola collections existed on Cyprus at least as early as B. C. 2500.

A scarcely less important contribution to the history of civilization is offered by the immense quantities of pottery of early Greek and Phœnician manufacture which the Cesnola collections contain—"vases which represent entirely new features in the history of ancient pottery" (Mr. A. S. Murray, of the British Museum). Most of these pieces are related to Greek pottery already known, as the earlier Cypriote types of sculpture are related to Greek statues previously known. And once more the independent value for knowledge of Phœnician history of this immense mass of objects must be emphasized as well as its bearing on Greek history. Some of the forms found by Dr. Schliemann at Troy already had their counterparts in vase forms of very early but indefinite date among the Cypriote objects. Certain curious idols found by Dr. Schliemann at Mycenæ have also counterparts in the Cypriote terra-cottas. Of the rare terra-cotta figures from Syria in the Louvre, six out of fifteen published by Longperier (*Musée Napoleon III.*) have counterparts in New York. The recent excavations at Assos, Asia Minor, have drawn attention to an early form of Greek Centaur with human fore-legs found on the Assos temple reliefs and on Greek vases, but otherwise known only in four statuettes.

To the objects thus far mentioned must be added an important collection of ancient gold jewelry, dating in part at least as early as the 7th century B. C., and of engraved gems—"a true revelation of the history of Glyptic art" (Rev. C. W. King, of Trinity College, Cambridge). The gem collection is absolutely unique and carries back the development of Greek gem engraving to an Eastern source (Chaldæan-Assyrian) in a series of connecting specimens.

In 1869 Mr. Lang discovered at Daly (Idalium) an oblong stone with a bilingual inscription (Phœnician-Cypriote) which gave the key to the Cypriote inscriptions. In this department "Gen. di Cesnola added

a great abundance of new material" (Appendix to Schliemann's *Ilios* by Prof. A. H. Sayce, Queen's College, Oxford.) The deciphering of the Cypriote inscriptions was first begun by the lately deceased Assyriologist, George Smith, of the British Museum, in 1871. Dr. S. Birch and John Brandis pushed the discovery much further (1872-73), and the inscriptions were finally made legible by the simultaneous efforts of Moriz Schmidt, W. Deecke, Justus Siegismund, and Isaac H. Hall, in 1874. The inscriptions show that the native Cypriote language is a form of the Greek, and therefore that the native Cypriote population belongs to the Aryan stock. Prof. Sayce connects the Cypriote inscriptions with an ancient syllabary once common to the whole of Asia Minor, but of which only scanty remains have been rescued by the excavations of Dr. Schliemann at Troy.

The total number of tombs opened by Gen. di Cesnola amounted to 60,932, and the sites of 15 ancient temples were explored by him, but the two specially important and unique finds were those of Golgos and Curium—the one of the entire contents in statuary of an ancient temple (Golgos); the other of an entire temple treasure, from its underground vaults (Curium). It is from the single temple of Golgos and a find in an adjoining field that nearly all the stone statues and statuettes in New York are derived. Considering their number, over 400, the variety of periods to which they belong, and the lapse of time involved—not less than a thousand years if we compute only from the 7th century B. C. to the late Roman examples—this discovery has no parallel, and yet it corresponds exactly to the conditions under which the ancient temples, from century to century, continued to increase their store of works of art. A temple was of necessity a chronological art museum; an exhibition of all the schools and periods of ancient art to which its locality rendered it accessible, and the locality of Cyprus rendered it accessible to all. As successive centuries added to its votive statues—the portraits of its priests and patrons, the figures of its deities or votive images of their worshippers—its collection became an embodied chronicle of the history of art. From various descriptions of ancient temples this character is abundantly demonstrated, as it was more or less repeated in the Cathedrals of the Middle Ages. "Thus it came to pass that in the course of ages an ancient temple became a museum of art and archæology, where in the later days of Paganism the palæographer might trace the progress of the art of writing from the earliest Cadmean specimens; the historian of art might gather materials for the classification of sculptors and painters according to schools, and the cultivated tourist might gratify his curiosity by examining relics which local tradition attributed to the heroic age; even the progress of the industrial arts from century to century might be traced by examining minutely the implements and objects fashioned by the hand of man in a range of time which in the case of some temples may be calculated at not less than a thousand years" (C. T. Newton).

Of the Artemision or temple of Diana at Ephesus the same author says: "Like other ancient temples whose worship had attained a certain celebrity during many centuries, the Artemision had in Roman times become a museum, so great was the number of works of art which had been dedicated in the temple itself and its surrounding *hieron*." Golgos is said to have been originally a Greek settlement, but the same fusion of art, of civilization, and of religion, which its statues bear to view, would explain the continued existence of this as of many other sacred shrines, through different periods of history, even if it had been originally Phœnician. (Witness, for instance, the Balbek-Roman temple of the 2d century A. D. on the identical ground-plan of the pre-historic Phœnician temple.) As always in art history, the art of Cyprus was determined rather by periods and

comprehensive waves of influence than by the variety of race in its settlements. At an early time, 6th century B. C. or earlier, the Greeks made statues as did their Eastern teachers; at a later time Cypriotes and Phœnicians adopted the Greek methods which finally became dominant for all antiquity. Therefore the question as to Greek or Phœnician character of the individual colonies is an important one for the local history of Cyprus, but not for the history of art.

So far in antiquarian exploration the discovery of the statuary contents of a temple is unique, with exception of a similar but much less extensive discovery by Mr. Lang, and is doubtless explained here by the provincial character of the town and by the desertion of its site in later times. This provincial character is attested by the humble artisan execution and the inferiority of workmanship in most of the statues. This provincial character would also be one explanation of their conservation in bulk, while the contents of more famous shrines have utterly disappeared. Such shrines, belonging to localities where later city building has continued, have served as stone-quarries until the ruin and its contents have been destroyed. The use of ancient marble statuary for the manufacture of lime has been universal in mediæval and in Turkish countries. Mr. Wood found three lime-kilns established on the ruins of the Diana temple at Ephesus. At Golgos the provincial poverty of material, a common calcareous stone, was a protection. Here only the precious votive offerings of metal will have tempted cupidity—only Christian iconoclasm would attempt destruction. Mutilation and breakage, general among the figures, is thus explained. But the overthrow of the temple once accomplished by the early Christians, the site was abandoned and all the fragments remained. Their preservation is finally explained by the peculiar construction of the temple. Sun-dried bricks of large size, turned out of wooden boxes, are still a common building material in the East. The absence of any stone above the foundation layer (which denoted a size of about 60 ft. by 30 ft.) implies that this material was used here, the building having a wooden roof, also covered with clay, which can be conjectured by the discovery among the *debris* of pieces of burnt wood and ashes. After the temple was deserted its walls and roof crumbled in over the figures, and doubtless furnished an important protection from vandalism. The statuary was found covered by a deposit of six to seven feet of earth. That the temple was a shrine of Venus is reasonably certain (Sidney Colvin). The three most important pieces of the Golgos sculptures were valued at \$30,000 by the British Museum.

Whereas at Golgos the site of the temple was covered with earth, and without external indications, at Curium the temple-site was marked by columnar remains and the temple mosaic pavement easily laid bare. Reverberations which indicated a hollow space beneath led to the discovery of the vaults containing a temple treasure. By some it is conceived that the objects had been hurriedly placed here for safe-keeping on occasion of an assault on the town, which was afterwards sacked and destroyed without discovery of this deposit. A regular arrangement of objects in different chambers according to metals—gold, silver, and bronze—may or may not be inconsistent with this theory. From the vaults at Curium were taken the remarkable collection of engraved gems already mentioned, the gold jewelry already mentioned, and a number of pieces in bronze and silver. A crystal phial, with its golden lid fastened by a chain, and an agate sceptre-head, "are two objects unique of their kind" (Newton). The same may be said of the massive gold bracelets of the Paphian King Eteandrus. On these two bracelets alone a value of \$10,000 has been placed. These belong to the 7th century B. C.; other objects vary in date from the 4th century B. C. to a high but indefinite antiquity.

In summing up the features of the Cesnola collections of the New York Museum it is to be noted that the geographical position of Cyprus explains their extraordinary character and variety. Contiguous at once to Egypt, Assyro-Chaldea, Phœnicia, and the rest of Syria, Asia-Minor and the Greek Islands, colonized both by Phœnicians and Greeks, ruled successively, in addition to the states of these colonists, by Egyptians, Assyrians, Alexandrine Greeks, and Romans, it offers, as no other single province of the ancient world could, an epitome of its history, a connected picture of its art. Types of all periods, and connecting links between all, are discovered here, and could be found nowhere else in union and in sequence. The difficulties opposed by Eastern indifference and Turkish jealousy, by the expense of excavations and the uncertainty of their results, had combined to leave this unique spot of the ancient world an almost virgin ground for the explorer until 1865. General di Cesnola has by no means been the only explorer in Cyprus, but "his official position, and that tact and judgment in dealing with the local authorities which can only be acquired by living in Turkey and speaking the language of the country, carried him through many difficulties which might have baffled a less determined and a less experienced excavator, and he was thus enabled to secure and export the rich harvest of antiquities which rewarded his discoveries" (C. T. Newton).

"Where others had found one fragment he has found tons of fragments; all previous discoveries have been thrown in the shade by the American excavator." These words were penned by Prof. Sidney Colvin (of Trinity College, director of the Fitz-Williams Museum at Cambridge), some years before the discovery at Curium, of which Mr. C. T. Newton says: "It may truly be called a museum in itself," "a discovery to which there is no parallel in the annals of archaeology."

The following results of excavation are catalogued from the report of Mr. John Taylor Johnston, President of the Metropolitan Museum:

Assyrian inscriptions on cylinders.....	4
Phœnician inscriptions on marble and terra-cotta vases.....	30
Cypriote inscriptions on marble and terra-cotta vases.....	62
Greek inscriptions on marble and terra-cotta vases...	105
Coins, gold, silver, and copper.....	2,310
Vases.....	14,240
Statues in stone, marble, and terra-cotta.....	2,110
Busts and heads in marble and terra-cotta.....	4,200
Mortuary cippi and stelæ.....	138
Bas-reliefs in marble, stone, and terra-cotta.....	270
Sculptured sarcophagi in marble and stone.....	4
Engraved gems, cylinders, and scarabei.....	1,090
Glass bottles, plates, cups, amulets, etc.....	3,719
Serpentine, stone, hæmatite and Egyptian enamelled ware.....	472
Objects in gold.....	1,599
" silver.....	370
" copper and bronze.....	2,107
" alabaster and rock crystal.....	146
" ivory, bone, lead, and iron.....	217
Terra-cotta lamps.....	2,380

About 5000 of these objects, including the entire collection of gold, silver, and copper coins, were unfortunately lost at sea near the coast of Syria in 1871 while on their way to America.

A large and judiciously selected collection was transferred to the Ottoman government by the explorer as a royalty for the firman granted him.

Various specimens were also presented by General di Cesnola to the following museums: the Imperial Ottoman Museum at Constantinople; the Royal Museum at Munich; the Egyptian Museum at Turin; the Anthropological Museum at Turin; the Archæological Society at Athens. The Museum at Perugia, the Smithsonian Institute at Washington, and the British and St. Petersburg Museums were permitted to take casts and copies of the inscriptions.

Sales were also made of small collections (chiefly duplicates) to the museums in Berlin, Vienna, Cambridge, Boston, the Kensington Museum in London, and a few others. The remainder comprises about two-thirds of all the objects found, including all the inscriptions and the statues, and is now the property of the Metropolitan Museum of Art (*Report of Mr. J. T. Johnston*).

The principal authorities on the Cesnola collections are *Atlas*, with descriptive matter by Prof. Ernst Curtius, by Dr. Samuel Birch, by Dr. A. S. Murray, and by Georges Perrot (Boston, 1884); Di Cesnola's *Cyprus*, with appendices by C. W. King, Cambridge, and by A. S. Murray (New York, 1878); *Sammlung Cesnola*, by Johannes Doell (St. Petersburg); *Antiquities of Cyprus selected by C. T. Newton*, with an introduction by Sidney Colvin (London, 1878); *Essays*

on Art and Archæology, by C. T. Newton (London 1880); *Revue Archéologique* (January, 1875); *Monuments Antiques de Chypre*, by Georges Colonna-Ceccaldi (Paris, 1882); *Histoire de l'Art dans l'Antiquité*, vol. iii., by Perrot and Chipiez (1884). For the Cypriote inscriptions see *Numismatique et Inscriptions Chypriotes*, by the duc de Luynes (Paris, 1852); various articles in the *Trans. Soc. Biblical Archæology* (London) by Smith, Lang, Birch, and others; *Versuch zur Entzifferung der Kyprischen Schrift*, by John Brandis, in *Monatsbericht der Berlin Akademie* (1873); *Die Inschrift von Idalion*, etc., by Moriz Schmidt (Jena, 1874); *Die Wichtigsten Kyprischen Inschriften*, in G. Curtius's *Studien* (1874, vii.), by Deecke and Siegismund; "The Cypriote Inscriptions of the Cesnola Collection" and other articles in *Journal of Amer. Oriental Society*, by Isaac H. Hall (1874-84); *Die Griechisch-Kyprischen Inschriften*, etc., by W. Deecke, in *Collitz's Sammlung der Gr. Dialekt-Inschriften* (1873). (W. H. G.)

D.

DAA, LUDVIG KRISTENSEN, a Norwegian writer, born Aug. 19, 1809, in Saltdalen, became professor of history in Christiania in 1862. He has been very active as a writer on politics, history, and geography. In addition to a number of articles published in periodical and in pamphlets he has written: *Svensk-norsk Handordbog* (1841); *Udsigt over Ethnologien* (1855); *Jordbeskrivelse for den norske Almue* (1857); *Om Nationaliteternes Udvikling* (1868).

DAAE, LUDVIG LUDVIGSSÖN, a nephew of Ludvig Kristensen Daa, a Norwegian historian, born Dec. 7, 1834, in Aremark, near Frederikshald, where his father was a priest. After serving from 1869 as librarian he was elected professor of history in 1876. Among his larger works are found: *Thronhjems Stifts-Historie efter Reformationen* (1863); *Norges Helgener* (1879); *Norske Bygdesagn* (2 vols., 1870-72); *Det gamle Christiania* (1871); *Breve fra Danske og Norske* (1876); *Historiske Skildringer* (2 vols., 1873-78); *King Christian I.* (1879), and *Nordmænds Udvandringer til Holland og England* (1880). With Siegwart-Petersen, Daae wrote a text-book in history, *Lærebog i Verdenshistorien* (1864-65). He is thorough and impartial.

DAHL, KONRAD, a Norwegian poet, born June 24, 1843, near Thronhjem. He has been prison chaplain in Bergen since 1873. He has written a series of stories descriptive of life in the extreme north of Norway, where he lived for several years before removing to Bergen. Among them are: *Loven* (1874), a story from the Finmark fjord; *Finnegutten* (1874); *Edda Mansika* (1875), and *Ishavsskipperen* (1878).

DAHLGREN, FREDRIK AUGUST, a Swedish poet and critic, born Aug. 20, 1816, in Wermland, the son of a mine-inspector. In 1841 he took the second prize of the Swedish academy for a poem *Sappho på Leukas*, in 1866 the royal prize for literary merits, and the literary prize of the academy of sciences for excellent translations. In 1871 he became "one of the eighteen." His songs are exceedingly popular and were published in two volumes in 1875-76. Among his dramas we note *Vermländingarne* (4th ed., 1879); *Ett Eventyr på Hegeberg* (1854); and *Kaffeförbudet* (1855). Among his numerous translations are found dramas from Shakespeare, Heiberg, Lessing, and others. In 1866 he published *Anteckningar om Stockholms Teatrar*, which gives a history of the Swedish theatres, and contains a list of all the dramas played from 1737 to 1863. Of *Skandinaviska Samfundets Handlingar* he edited vols. xxx.-xl. (1849-60), and of Chemnitz's *Geschichte des Schwedischen in Deutschland geführten Kriegs*, vols. iii. and iv. As fruits of his remarkable industry and scholarship we also have: *Konung Erik XIV's Krönika* (1847); *Ett fornsvenskt Legendarium* (1865-74); and *Skrifter till läsning för klosterfolk* (1874-75). The last three works are published in the series of collections of the society of Swedish antiquarians, whose secretary he has been since 1843.

Since 1854 he has edited the annual *Handlingar af svenska Akademien*. He has proved himself an able linguist by his excellent *Ordlista öfver svenska språket* (4th ed., 1881).

DAHLGREN, JOHN ADOLF (1809-1870), an American admiral, was born in Philadelphia, Nov. 13, 1809. His father, Bernard Ulric Dahlgren, was a merchant of that city, and also consul of Sweden till his death in 1824. The son inherited his integrity and loyalty to duty. In early youth he eagerly desired to enter the navy, and a midshipman's warrant was procured for him bearing date Feb. 1, 1826. His first cruise was in the *Macedonian*, and after six years' service at sea he passed his examination in 1832. Owing to his mathematical proficiency, he was detailed for duty on the Coast Survey, but his sight having become impaired he was obliged to seek entire rest for nearly two years. In 1840 he resumed duty, and in 1843 went to the Mediterranean on a cruise.

Returning in 1845, he was assigned to ordnance-duty at Washington. During the sixteen years he was thus engaged, his energy and inventive genius, aided by his mathematical ability, achieved surprising results. At first he labored under great difficulties, as there was no ordnance establishment, with the exception of a small pyrotechnic laboratory, and all the appliances needed to carry out his ideas had to be constructed by himself. Under his management the naval ordnance department acquired the extensive works now in Washington. When he entered this department, gunnery included nothing but the use of solid shot and its simple accessories. Gen. Paixhans had explained his system of shells, but the cannon which he proposed was a mere auxiliary. Lieut. Dahlgren discerned and remedied this defect, and the system introduced by his scientific works revolutionized the ideas on ordnance then prevailing, and has linked his name closely with the history of that branch of military science. The Dahlgren guns were the result of invention, not of experiment. They always have stood the test of use.

In 1857, Commander Dahlgren took to sea the sloop-of-war *Plymouth*, equipped in such a manner as to bring into practice his innovations. He visited the coast of Europe from Portugal to Holland, and later cruised in the West Indies. In 1858 he resumed command of the ordnance department of the Washington navy-yard. On the outbreak of the rebellion in 1861 all the other officers of the yard, with one exception, resigned and joined the Confederate service. As Commander Dahlgren remained at his post, the Government devolved upon him the charge of the defences of Washington on the left. No more responsible trust was held by any officer during the war, nor was any time more critical, for had the national capital then been lost, the consequences would probably have been irreparable. Having become captain in ordinary course of promotion, Dahlgren was in July, 1862, made chief of the bureau of ordnance, a post of great responsibility.

In Feb., 1863, he was commissioned as rear-admiral, and in the following July was placed in command of the South Atlantic blockading squadron. This fleet, numbering at times over ninety vessels of war, was required to blockade a coast of 300 miles having twenty-five ports. Many questions were to be settled in regard to iron-clad vessels, and public expectation looked for the capture of Charleston. Admiral Dahlgren conducted in person the naval operations in Charleston harbor, beginning July 10, 1863, and ending Sept. 7, 1863, either himself leading or ordering by signal the nine actions in which the fleet was engaged, sometimes with the assistance of the land-forces. Morris Island and Fort Wagner were captured, and Fort Sumter reduced to a heap of ruins. During the rest of 1863, and throughout the following year, Admiral Dahlgren was chiefly engaged in maintaining with rigor and success one of the most difficult blockades known in history. He conducted a successful expedition up the St. John's River in Florida, and furnished effective aid to Gen. Sherman in his military operations in Georgia and South Carolina. There was still a public clamor for the capture of Charleston, but the final conclusion, after several councils of war with the captains of the iron-clads, was not to attempt to take it by assault. This view was approved by the Navy Department, and fully indorsed by Gen. Sherman in a letter to Admiral Dahlgren dated Feb. 14, 1865. The fleet, however, was kept in readiness and well manned for every contingency. A few days later the city was evacuated by the Confederate troops, and Admiral Dahlgren, in company with Gen. Schimmelpfennig, immediately entered the city. An expedition purely naval captured Georgetown, S. C., Feb. 24, and a week later the admiral's flag-steamship was instantly sunk by a torpedo in that harbor.

At the close of the war, in July, 1865, Admiral Dahlgren gave up the command he had held. His son, Col. Ulric Dahlgren (1842-1864), after a brief heroic career, had been killed while engaged in a cavalry-raid for the liberation of the Union prisoners in Richmond. In 1866, Admiral Dahlgren devoted a time of comparative leisure succeeding his arduous duties to the preparation of a memoir of his son, which was published in 1872. Dec. 1, 1866, the admiral sailed from New York to take command of the South Pacific squadron. While in South America he wrote a work on *Maritime International Law*, which was published after his death. In July, 1868, he resumed his place as chief of the bureau of naval ordnance, and a year later was appointed commandant of the Washington navy-yard. He died at Washington, July 12, 1870.

He published treatises on *Boat Armament* (1852), *Percussion System* (1853), *Shells and Shell Guns* (1856). His works on ordnance have been used as text-books by the Government, and his ideas have been repeated in works by other writers. His reports on armored vessels and on the coast-defences, as well as his *General Orders from 1863 to 1865*, are of great value. His biography has been written by his widow, Mrs. M. V. Dahlgren (1882). (M. V. D.)

DAHN, JULIUS SOPHUS FELIX, a German historian, jurist, novelist, and poet, was born at Hamburg, Feb. 9, 1834. In the same year his father, a distinguished actor, removed to Munich, where Felix spent his youth and began the study of law. Having completed his course at the University of Berlin in 1853, he gave instruction in jurisprudence at Munich, and in 1863 he was made professor extraordinarius at Würzburg. Two years later he became full professor, and remained in the regular discharge of his duties till the outbreak of the German War in 1870. He then accompanied the army as a volunteer and took part in the battle of Sedan. In 1872 he was made professor of German law at the University of Königsberg, where he still remains. He published a popular treatise on the law of war, *Das Kriegerrecht* (Würzburg, 1870). He had previously published some legal works, and had entered upon those far-reaching investigations which are the founda-

tion of his valuable contribution to the history of the German race. In prosecution of his labors he went to Italy, and resided for some time at Ravenna and Milan examining the records and traces of the barbarian invasions. His great work, the fruit of these researches, is *Die Könige der Germanen* (Munich and Würzburg, 6 vols., 1861-73). Other works grew out of the same labors or were carried on at the same time. Among these may be noted his treatise on *Procopius of Cæsarea* (Berlin, 1864), in which he investigates the migration of nations and the downfall of the Roman Empire; his *Westgothische Studien* (Würzburg, 1874), a full discussion of the laws and customs of the Visigoths; and his latest works—*Geschichte der Völkerwanderung* (2 vols., 1880-81); *Urgeschichte der Germanischen und Romanischen Völker* (2 vols., 1881-82); and *Älteste Deutsche Geschichte* (1882). He has also published several volumes of poems, some of which are founded on subjects suggested by his researches, while others were intended directly to rouse the patriotic spirit of his countrymen. The earliest of these was the narrative poem, *Harald und Theano* (Berlin, 1856). The Franco-German War of 1870 furnished him occasion for numerous patriotic lyrics. Several historical novels and dramas also attest his remarkable literary activity. His *Sind Götter?* (1874), a story of the tenth century, depicts the old Norse sea-kings and the struggle between the ancient paganism of Scandinavia and the invading Christianity. *Odins Trost* (1880) is a curious mixture of the old mythology with the life of a later period. But Dahn's most popular work is the romance *Ein Kampf um Rom* (1876), which has been presented in an English dress, *A Struggle for Rome* (London, 1878). It is a tale of the sixth century, the period with which his researches had made him so familiar, and presents a vivid picture of the kingdom of the Ostrogoths in Italy and its overthrow by Belisarius. Apart from its historical value it is a powerful work of imagination.

DAHOON, in botany, ILEX DAHOON. This and *Ilex Cassine* are among the famous plants of the North American continent. In general literature *Ilex vomitoria* is also referred to in connection with the peculiarities of the other two, but this is now regarded by botanists as not essentially distinct from *Ilex Cassine*. Like the common holly, *Ilex opaca*, they are evergreen, but the leaves are not waved and spiny as in that species, and the plants seldom reach a greater height than 12 or 15 feet. Dahoon and cassine are Indian names, and the last is also called youpon. They entered largely into the religious ceremonies of the Creek Indians, who inhabited the Carolinas at the time of the settlement of the white man. William Bartram, who travelled among the Creeks about the end of the last century, notes that some chiefs took especial pains to do him great honor, and "they spent the evening in drinking cassine and smoking tobacco." He continues: "As their manner of conducting their vespers and mystical fire is extremely singular, I shall proceed to describe it. In the first place, the governor or officer who has the management of the business, with his servant attending, orders the black drink to be brewed, which is a decoction or infusion of the leaves and tender shoots of the cassine." He then describes in considerable detail the preparation for and kindling of a mystical fire by bundles of cane, which seemed to him to light up without human agency. Around the fire the chiefs and warriors are seated. Then "two slaves or servants came in together at the door, each having very large conch-shells full of the black drink, advancing with slow, uniform, and steady steps, their eyes or countenances lifted up, singing very low but sweetly; advance within six or eight paces of the king's and white people's cabins, when they step together, and each rests his shell upon a tripos or little table, but presently takes it up again, and, bowing very low, advances obsequiously, crossing or intersecting each other midway: he who rested his shell before the white peo-

ple now stands before the king, and the other who stopped before the king now stands before the white people, when each presents his shell, one to the king, the other to the chief of the white people; and as soon as he raises it to his mouth the slave utters or sings two notes, each of which continues as long as he has breath; and as long as these notes continue, so long must the person drink, or at least keep the shell to his mouth." Elliott refers to the drink as always being in use at the opening of their festivals, and it is said to act on them as opium does on other races. Like opium, it excites the torpid and languid, while it calms the restless and induces sleep. Mr. Simms, however, quoted by Dr. Peyre Porcher, does not find these effects from the leaves of these hollies alone, and believes that the famous "black drink" was a compound, the knowledge of which, if ever known to any white man, is now completely lost. The plants grow only near the sea-coast. At certain seasons of the year the Indians used to come hundreds of miles and in droves to where they grew. They boiled the leaves in a large cauldron, and would drink a pint at a time, which in a short time caused them to vomit freely. They continued to drink in this way for several days, when each would take a bundle of the plant and depart to his own home. Women, according to Rafinesque, were forbidden to use it. Tea made from it is, however, regarded as equal in many respects to Chinese tea, and it is considered very little inferior to the *maté* of Paraguay, which is from an allied species, *Ilex Paraguayensis*.

According to modern physicians, the plant has excellent medicinal properties, especially in the treatment of nephritic diseases. As already noted, *Ilex vomitoria* is now regarded as identical with *I. Cassine*. *I. Cassine* and *I. Dahoon* are regarded as distinct, but their properties are so nearly alike that what refers to one can well be taken as characteristic of the other.

(T. M.)

DAIRY PRODUCTS. Abernethy was accustomed to say of milk that it was "the most nutritious of all things." Prout characterizes it as "the true type of all foods," and Dr. Carpenter observes that milk being an admixture of albuminous, saccharine, and oleaginous substances, indicates the intention of the Creator that *all these* should be employed as components of ordinary diet.

Cow's milk of average good quality has a specific gravity of 1.027 to 1.030, water being 1.000. The composition of new milk of average quality is in 100 parts as follows: water, 87.40; butter, 3.43; caseine, 3.12; milk-sugar, 5.12, and mineral matter (ash), .93.

The manufacture of food-products from milk is of very ancient origin. Butter and cheese are frequently spoken of in the Bible. They are alluded to by Homer and other writers of antiquity, and there is reason to believe that these products were made and in use for human food many ages before any record is made of them by the earliest writers. The word *dairy* is derived from the Old English word *dey*, a milk-maid, and originally denoted the place assigned to her work.

Milk contains all the elements of nutrition, and the fact that it is almost the only food which will, when used alone, support life, and maintain health and vigor for an indefinite period, together with the fact that the products made from it are not only nutritious, but are esteemed as luxuries, must always give to the dairy claims of the highest consideration.

Dairying is an important industry in Britain and upon the continent of Europe. Of the continental nations that have made a specialty of this branch of agriculture are France, Holland, Switzerland, Italy, Denmark, Sweden, and Germany. Russia has of late entered the field, and under the American system of factories is planting dairies in many parts of the empire, and pushing the industry with vigor and success.

Although Great Britain is extensively engaged in

dairy husbandry, she imports largely both of butter and cheese for the home consumption of her people. According to English dairy statisticians the number of cows and heifers in milk in the British Islands in 1878 was 3,708,766, producing annually about 1,628,000,000 gallons of milk; estimating one-eighth of this as the quantity used for the rearing and fattening of calves, there remain 1,424,500,000 gallons available for human food in its various forms, milk, butter, and cheese. Now, 525,000,000 gallons of milk, it is estimated, are used directly for consumption, 350,000,000 are devoted to cheese, and 550,000,000 gallons for butter. Upon this basis the annual cheese crop of Britain is about 300,000,000 pounds of ripe cheese, and the butter product not far from 200,000,000 pounds. And yet, according to official statistics furnished by the honorary secretary of the London Board of Trade, there were imported into Great Britain during 1881 cheese to the value of £5,091,514 (\$25,457,570), and butter to the value of £12,141,034, or \$60,705,170.

A very large proportion of the cheese imported into Britain comes from America, while the bulk of her butter imports are from France, Holland, Denmark, and Sweden. According to Morton the annual consumption of cheese in Britain is upward of 500,000,000 pounds. This quantity, he says, represents the amount of the demand by which the English cheese industry has been created and is maintained.

The dairy industry of France is largely devoted to the production of butter, and the manufacture of soft cheeses of small size, the latter being specially adapted to home wants, and of quick consumption. Her butter exports to England are considerable, Normandy and Brittany butter having been well received in English markets for a long time. French butter is also exported in considerable quantities to tropical climates, chiefly to Brazil and the South American republics. Mr. Jenkins, secretary of the Royal Agricultural Society of England, in a recent report, thus refers to the export butter trade of France: he says, "The extent of business done by some of the French butter merchants is astonishing; for instance, the firm of Lepelletier, of Carenton, whose trade is solely with England, send the butter over in their own vessels, and in 1877 their exportation exceeded 4,000 tons, and the estimated average value in France for the ten years then ended was nearly half a million sterling, per annum. They estimated that in 1878 their trade would show an increase of 30 per cent. over its average amount in the previous ten years.

"French butter is sent to market in a great variety of packages, according to the requirements of each locality. For the London market, kegs holding about 70 pounds each, crocks holding 50 pounds, and boxes containing one dozen two-pound rolls, are most frequently seen. Extreme cleanliness and refreshing neatness (amounting almost to what the French call *coquetterie*) are characteristic of all the methods, and they are further distinguished by the free and almost lavish use of clean linen linings. The kegs and linen linings cost about 1s. 9d. each; the crocks, which are protected by an outside basket and also lined with linen, cost about 2s. each, including everything; and the boxes, holding a dozen rolls, cost about 9d. each, including linen and paper. In the hottest weather the boxes are sometimes double, the space between the two boxes being filled with cotton wadding. In fact, the French butter merchants thoroughly realize the importance of delivering their wares in an attractive condition, entailing neither trouble nor waste upon the retailer."

As an instance of the success with which dairy farming is carried on in France, the small Norman department Calvados may be mentioned. It contains about 450,000 inhabitants. Here the butter made in a year is about 25,000,000 kilogrammes, or nearly 55,000,000 pounds (English), and valued at over 80,000,000 francs, or \$16,000,000. Of this amount only 3,000,000 kilogrammes are consumed in the department, conse-

quently eight times as much is manufactured as is consumed, while one-third is exported, and chiefly to England. If we add to this the quantity of cheese manufactured, we find that there are made of the Pont l'Evêque, 2,000,000 francs value; Mignot, 200,000 francs; Livarot, 4,500,000 francs; Camembert, 3,000,000 francs—total, 9,700,000 francs value, or nearly \$10,000,000 in value. In other words, the cheese and butter interest of this small country reaches nearly 100,000,000 francs, or \$20,000,000.

Holland butter imported into England is less esteemed now than formerly, owing, principally, to its being so largely adulterated with, or wholly manufactured from, oleomargarine. This artificial butter goes to England, and is sold under the name of "margarine" and "bosh butter," and is furnished at a low price, compared with genuine butter of the best grades. A large trade is done with this product, and it has had the effect of lowering the standard on all descriptions of butter made in Holland.

The Holland cheese most in favor in England is the Edam and Gonda. The Edam is a small spherical cheese, like a cannon-ball in shape, and weighs from 4 to 6 pounds, the rind highly colored. It is of the hard variety, as distinguished from the soft cheeses of France, with a somewhat sharp taste, and finds favor with the laboring classes of England. Switzerland is the home of the Gruyere or Sweitzer Käse, a large and rather thin cheese, not of that solid texture which distinguishes English cheese, but having numerous cavities or holes distributed through its meat. It is exported to some extent.

Denmark has of late risen to the first rank in the production of fine butter. This has been brought about by the introduction of butter factories and the practice of raising the cream on the Swartz system, or by setting the milk in ice-water. Danish butter is exported in considerable quantities to England, and brings the highest market rates. Danish butter, sealed in tins, is also sent to the South American States, where it has a deservedly high reputation on account of its excellent quality. Among the foreign varieties of cheese, esteemed in England, the Gorgonzola and Parmesan from Italy may be mentioned. The Gorgonzola is a very rich cheese, resembling somewhat in quality the Stilton, though differing from it in shape and style.

There are many varieties of cheese made on the Continent of Europe adapted to the tastes of the people in the countries where they are made, but for the most part they differ materially from English cheese, or from that commonly made in America,—the latter being based on models of English manufacture and adapted specially to English markets.

It is not the purpose of this article to enter upon a minute description of European dairying, or to give the various processes employed in manufacturing the different varieties of product found among the nations of that continent. The subject has been only briefly alluded to, in so far as it has a general bearing upon American dairying, and the influence which continental goods may have upon the American export trade of dairy products.

Rise and Progress of American Dairying.—American dairying, as a specialty, can be hardly considered a century old. Dairying, as a specialty, was practised in England and Holland, and in other parts of Europe, previous to the 16th century, and the early emigrants to America must have brought with them the art of butter- and cheese-making. But, previous to the year 1800, there seems to have been no considerable number of dairies grouped together, and prosecuting the business as a specialty, in any part of America.

Most farmers in those days kept a stock of horned cattle,—animals raised for beef, for working oxen, with cows for breeding purposes to supply home wants. The farming then was of a mixed character, nearly every want of the family being supplied from the farm.

In the year 1800 we hear of the great co-operative cheese, made in Cheshire, Mass., under the auspices of Elder John Leland. He induced every family in his parish, and those in the country about that owned a cow, to contribute the milk produced on a certain day, that it might be massed together, and made into a cheese, as a present to President Jefferson. This cheese, when cured, weighed 1600 pounds, and its delivery to the President at Washington was the most notable affair in relation to dairying that had as yet occurred in the New World. It was about this time that some families that had emigrated from Cheshire to Herkimer co., N. Y., began to collect small herds and to make a specialty of dairying.

From 1800 to 1826 cheese-dairying had become pretty general in Herkimer County, but the herds were mostly small. So early as 1812 the largest herds, numbering about forty cows each, were those belonging to William Ferris, Samuel Carpenter, Nathan Salisbury, and Isaac Smith, in the northern part of the county, and they were regarded as extraordinary for their size; now there are herds in the county numbering one hundred cows and over.

About a quarter of a century had now elapsed, to prove the success of dairying in Herkimer, and about this time—1826—the business began to be planted here and there in the adjoining counties, and generally by persons emigrating from Herkimer County.

The implements of the dairy were then very rude. The milking was done in open yards, and "milking barns" were unknown. The milk was curdled in tubs, the curd cut with long wooden knives, or broken with the hands, and pressed in log presses, standing exposed to the weather. The cheeses were thin and small. They were held through the season; and in the fall, when ready for market, they were packed in rough casks made for the purpose—several in a cask—and shipped to different localities, mostly for home consumption.

The total exports of cheese from the United States in 1826 were, according to the bureau of statistics at Washington, only 735,399 pounds. In 1826 Mr. Harry Burrell, of Herkimer co., N. Y., having learned something of the markets, began dealing in cheese, contracting with dairymen for their entire season's make, as was the custom in those days. He afterward became one of the largest dealers in this description of dairy goods in the United States,—often purchasing nearly the entire product made in the whole country. He was among the first to open a regular cheese-trade with England, and for many years he was the largest dealer and shipper of American cheese on this continent.

In tracing the history of cheese dairying in other States, we find the emigration of Herkimer County dairymen often gave these new localities their first impetus in this special branch of industry.

In 1847 our exports had increased to over 15,000,000 pounds, and in 1849 to 17,000,000 pounds.

Dairying had now spread over a number of counties in New York. It had obtained a firm foothold in Ohio, and was gaining an entrance in other States. The whole production of cheese that year, in the United States, was not far from 100,000,000 pounds, about 43,000,000 pounds of which were received at the tide water of the Hudson River.

British shippers had been enthusiastic, drawing from America what was then considered an extraordinary quantity; but the severe loss which they sustained in 1848-9 caused a more moderate demand the following year, and prices fell about one cent per pound, varying for fair to strictly prime, from 5 cents to 6½ cents for Ohio choice, and 6 to 6¾ cents for New York State.

Something more than five-sixths of the cheese was bought and shipped by the middle of January; the remainder, say 2,000,000 pounds, was bought by two or three parties at 5½ cents to 6½ cents, which was generally thought by the trade too dear.

In 1831 the consumption of foreign cheese in Great Britain was only 14,000,000 pounds, and in 1849 it had increased to 48,000,000 pounds, being about 250 per cent. From 1849 to 1859 the exports of American cheese were not increased, and they fell back in 1853 to less than 4,000,000 pounds, and did not go much above 8,000,000 pounds until 1860. In 1859 the butter exports had reached a little more than 4,500,000 pounds, but they were nearly doubled the following year, increasing largely from year to year until 1863, when they amounted to 35,000,000 pounds. There was no increase in the production of American cheese during the ten years from 1850 to 1860, the United States census reports giving the amount in 1849 at 105,000,000 against 103,000,000 in 1859.

The quality of the great bulk of butter and cheese during this decade was undoubtedly inferior as a rule. The principles underlying the great art of manufacturing these products were very imperfectly understood, grave mistakes were made in many departments of the dairy, especially in the production of butter and the methods of packing and sending it to market.

Although Mr. Jesse Williams, of Rome, N. Y., had conceived the idea of associated dairying, and had put it in operation by erecting the first cheese-factory in 1851, it did not begin to attract attention until about 1860. Up to this date only 23 factories had been erected; but as factory cheese was generally better made, and more uniform in texture, shape, and quality, and as less labor was required in making as well as in buying (because cheese was then bought on the shelves on personal inspection), the system began to be regarded with favor by both dealers and farmers.

By 1866 the number of factories had increased to 500, and mostly in New York. At the present time, 1884, the number of cheese- and butter-factories in the United States is placed at over 4000.

Although the plan of collecting curds from the farmers, mixing them, and pressing them into cheese at a factory, had been tried as early as 1844 in Goshen, Conn., and in the State of Ohio, it had failed of success, because curds coming from different farms were not uniform in texture and could not be made into a good product. That system therefore was abandoned.

Mr. Williams was an original thinker, and to him are we indebted more than to any other for the great progressive step which places American dairying to-day in the front rank among the nations of the earth. The frame-work of the American system sprang from his fertile brain in one harmonious whole, and although he was fruitful in the invention of implements and appliances adapted to his work he took out no patents, but presented the result of his labors as a gratuity to the world. The inestimable benefits that have come, and are yet to come, from the original labors of Mr. Williams, can scarcely be estimated. It put American dairying upon a footing by which it could measure arms with any other branch of agriculture. In the State of New York it rises above all other agricultural interests; for if we add all the adjuncts of the dairy together—the value of pork made from whey and sour milk; the calves raised and beef and milk sold—we can hardly get the annual products from the dairy farms of New York below \$100,000,000.

About the year 1862-63 Alanson Slaughter, of Orange co., N. Y., conceived the idea of adapting the associated system to butter-making. He arranged his creamery with pools of flowing spring water, for reducing the temperature of the milk, which he set in deep and narrow cans. This was the first butter-factory that had been built on the continent or indeed in the world. His plans were original and novel, and as the choicest butter was made under his system, it was the commencement of the most important improvement in butter dairying hitherto known in America. This system was afterwards carried into Sweden and Denmark and other parts of Europe; it has spread over the United States and Canada, and, wherever planted,

whether in the old or new world, has been the means of raising the standard of butter, and promoting its consumption in a marvellous degree.

In 1862 the butter product of the United States was about 500,000,000 pounds. In 1884 our annual product is estimated to be not far from 1,500,000,000 pounds. Butter-factories have been carried into many States. An immense butter interest has been developed in Iowa, Illinois, and other parts of the West; and although the plan of setting milk has been varied in regard to deep or shallow vessels, it would have been impossible to have developed this interest to its present vast proportions, if the associated system had not been inaugurated and applied to this branch of the dairy. It promoted an inquiry and desire for better things, and consumers as they got a taste of creamery butter, with its fine grainy texture and fragrant aroma, became fond of it beyond measure, and this stimulated manufacturers to put forth their best efforts for perfection, since extraordinary prices are often paid for a "fancy article."

In 1863-64 the associated dairy system had become an established fact—an intense and widespread interest prevailed not only in New York but in Vermont, Ohio, and other States, to obtain knowledge on the subject, and this led to the inauguration of the "New York State Cheese Manufacturers' Association." A meeting was called at Rome, N. Y., Jan. 4, 1864, and the attendance filled the largest hall in that city, delegates being present from several States. No more enthusiastic gathering of those interested in agriculture had been held in the State, and people went away from the meeting with the liveliest anticipations of amassing fortunes from the dairy. That year 210 new factories were erected in the State of New York alone, and the associated system was carried into other States.

Subsequently the "Cheese Manufacturers' Association" was merged into the "American Dairymen's Association," and State dairy associations began to spring up in different States. It scarcely seems necessary to speak of the success of these associations. Thousands of people flocked to the meetings year after year. They created a dairy literature which from its wide dissemination has had a vast influence in educating the masses in this department of farming.

Contrasting the flood of light which now illumines the path of the dairyman with the meagre knowledge he possessed twenty years ago, the slough from which this industry has emerged seems infinitely deep and dark.

The associated dairy system now stretches in an almost unbroken line from the Atlantic to the Pacific. Commencing in Maine, it sweeps over New England, then through the Middle States, where it is the most important industry. Its foot is firmly planted in the West and North-west. Crossing the Mississippi, it has pushed its way into Iowa, Kansas, Nebraska, and Colorado. Even in Wyoming on the verge of the rainless region may be found cheese-factories. Along the base of the Rocky Mountains and in the cañons and parks are numerous herds and dairies. In Lake Valley, on the shores of Lake Tahoe, many large dairies had become established previous to 1875. The Mormons have been developing the business in Utah; while in California and along the Pacific coast dairies have been planted and the work has been carried on with success. At Point Reys, Cal., one proprietor has 3000 cows, divided up into herds of 100 to 150 cows each, and employed for butter-dairying. The climate here is admirably adapted to butter-making, the temperature winter and summer never varying much from 60° Fahr.

Crossing the line into Canada, we find the late Harvey Farrington—an experienced Herkimer County dairyman—in 1864-5 leading the way by building the first factories in the Province of Ontario, and teaching the art of manufacture to our Canadian neighbors. Previous to this the Canadians bought cheese largely

from the United States, and during 1865 they imported from this source to the value of \$200,000,—the production in Canada not being enough for her own wants. The rapid growth of this industry in Canada will be seen from the fact that in 1880, besides supplying her home consumption, she exported more than 40,000,000 pounds. Her make of cheese during the year 1884 is estimated at 70,000,000 pounds; and her exports, it is stated, will be between fifty and sixty millions of pounds. Canada is rapidly becoming a formidable competitor with the United States for the English trade.

As Great Britain has always been the chief outlet for our surplus dairy products, American dairymen have ever felt a strong desire to make such products as would be most acceptable to the English trade. Previous to 1866 American cheese had serious faults, and was much inferior to the best grades of English, and of course sold abroad at a comparatively low price. In order to obtain the best models of English manufacture and to get a correct account of the styles of cheese most acceptable in Britain, the American Dairymen's Association unanimously resolved at its annual convention in January, 1866, to send an agent abroad to study the manufacture and sale of foreign dairy produce and to make weekly reports of the markets, etc., to factories and dairymen. Mr. Willard was selected as the agent, and he went abroad in May, returning in November. After visiting all the dairy districts of England and Scotland, and going through portions of France and Switzerland, he found the best system of cheese-making, as adapted to English tastes, was that of the Cheddar variety, made in Somersetshire, England. This cheese also brought the highest price.

After studying the process of manufacture and its peculiarities, under the instruction of Mr. Joseph Harding, the noted exponent of Cheddar cheese-making in England, Mr. Willard on his return strongly urged this system upon American factorymen in his report at the annual convention of the association in 1867.

The advice and suggestions, growing out of the European mission, for the improvement and styles of American cheese were adopted, and the result proved of the greatest benefit to the cheese industry of America, her product rising to the highest grades and rivaling the very finest samples of English-made goods; while the bulk is far superior to that made in Britain.

Growth of the Dairy Industry in the United States and Canada.—According to the United States census reports of 1840 the number of milch cows in the United States was 4,837,043, and the value of dairy products is put at \$33,787,008. Commissioner Wells, in his report upon the "Industry, Trade, and Commerce of the United States," for the year 1869, puts the value of dairy products of the United States at \$400,000,000 per annum. Major Henry E. Alvord gives the following table of statistics from the census, which he thinks are manifestly far below the truth, the amounts consumed by producers being doubtless often omitted, at least prior to 1870:

Dairy Statistics for the United States.

Year.	No. of Cows.	Butter Made.	Cheese Made.	Milk Sold and Used.	Total Value.
		Pounds.	Pounds.	Gallons.	Dollars.
1850.....	6,392,044	313,345,306	105,535,893	.....	166,193,114
1860.....	8,585,735	461,509,854	103,875,135	.....	240,400,580
1870.....	893,332	514,092,633	162,927,379	235,500,595	360,828,000
1875.....	11,000,000	700,000,000	240,000,000	1,500,000,000	400,000,000
1880.....	12,443,120	806,672,071	243,157,850	2,000,000,000	498,000,000

Dairy Statistics for the Dominion of Canada.

1871.....	1,292,839	75,635,031	22,277,747		
1880.....	1,595,800	100,000,000	75,000,000	200,000,000	50,000,000

For the statistics of the cheese and butter factories of the United States see the accompanying table, compiled from the census report for 1880.

According to the census of 1881 Canada had 709 cheese-factories, employing 1574 men and 429 women and children, whose yearly wages amounted to \$382,615. The total value of the raw materials used was \$4,264,798, and of the articles produced \$5,464,454.

The number of milch cows in the United States in 1884 is believed to be upwards of 14,000,000. Mr. J. R. Dodge, the statistician of the Department of Agriculture, gave the number of milch cows in the United States in December, 1880, at 12,368,053, but the more exact returns of the census showed that the estimate was about 100,000 less than the actual number.

The following table will show the value of milch cows in the United States from 1840 to 1879:

Year.	No. of Cows.	Value in Dollars.
1840.....	4,837,043	72,555,000
1850.....	6,392,044	127,840,880
1860.....	8,585,735	264,643,375
1870.....	10,023,000	324,179,093
1879.....	12,443,120	312,000,000

The value of dairy products in the United States for the year 1884 we put at \$600,000,000 per annum. It may be of interest to know the States from which this enormous sum in the aggregate is obtained, and their relative importance in reference to dairying.

Of this some idea will be had from the statistics given in the last United States census (1880), which present data as collected for the year 1879:

States and Territories.	Milk sold or sent to butter and cheese-factories in 1879.	Butter made on farms in 1879.	Cheese made on farms in 1879.
	Gallons.	Pounds.	Pounds.
Alabama.....	267,387	7,997,719	14,091
Arizona.....	42,618	61,817	18,360
Arkansas.....	316,858	7,790,013	26,301
California.....	12,353,178	14,084,405	2,566,658
Colorado.....	506,706	860,379	10,867
Connecticut.....	12,289,893	8,198,995	826,195
Dakota.....	415,119	2,000,955	39,437
Delaware.....	1,132,434	1,876,275	1,712
District of Columbia.....	496,789	20,920	
Florida.....	40,967	353,156	2,406
Georgia.....	374,645	7,424,485	19,151
Idaho.....	15,627	310,644	20,295
Illinois.....	45,419,719	53,657,943	1,035,069
Indiana.....	6,723,840	37,377,797	367,561
Iowa.....	15,965,612	55,481,958	1,075,988
Kansas.....	1,360,235	21,671,762	483,987
Kentucky.....	2,513,209	18,211,904	58,468
Louisiana.....	256,241	916,089	7,618
Maine.....	3,720,783	14,103,966	1,167,730
Maryland.....	4,722,944	7,485,871	17,416
Massachusetts.....	29,662,953	9,655,587	829,528
Michigan.....	7,898,273	38,821,890	440,540
Minnesota.....	1,504,407	19,161,385	523,138
Mississippi.....	427,492	7,454,657	4,239
Missouri.....	3,173,017	28,572,124	283,484
Montana.....	41,165	403,738	55,570
Nebraska.....	625,783	9,725,198	230,819
Nevada.....	149,889	335,188	17,420
New Hampshire.....	5,739,128	7,247,272	807,076
New Jersey.....	15,472,783	9,513,835	66,518
New Mexico.....	10,036	44,827	10,501
New York.....	231,965,533	111,922,423	8,362,590
North Carolina.....	446,798	7,212,507	57,380
Ohio.....	46,801,537	67,634,263	2,170,245
Oregon.....	227,540	2,443,725	153,198
Pennsylvania.....	36,540,540	79,336,012	1,008,686
Rhode Island.....	3,831,706	1,007,103	67,171
South Carolina.....	257,186	3,196,857	16,018
Tennessee.....	1,006,795	17,886,369	98,740
Texas.....	1,296,806	13,910,393	58,466
Utah.....	155,263	1,052,903	126,727
Vermont.....	6,526,550	25,240,826	1,545,789
Virginia.....	1,224,469	11,470,923	85,535
West Virginia.....	750,279	9,309,517	100,300
Washington.....	226,703	1,356,103	109,200
Wisconsin.....	25,156,977	33,352,045	2,281,405
Wyoming.....	75,343	105,643	2,930
Total in United States.....	530,129,755	777,250,287	27,272,489

Statistics of the Cheese, Butter, and Condensed Milk Factories of the United States (1880).

States and Territories.	Facto- ries.	Capital.	Hands Employed.		Wages paid.	Milk used.	Value of materials.	Value of products.
			Men.	Women & chil- dren.				
Arizona.....	2	\$2,100	4	2	\$600	184,000	\$2,760	\$6,395
California.....	216	1,039,365	357	34	70,434	57,471,634	339,934	590,434
Colorado.....	2	11,000	6	.....	1,050	667,000	5,902	9,225
Connecticut.....	16	36,775	29	4	11,360	10,621,000	87,820	134,440
Dakota.....	4	10,200	3	.....	210	125,200	1,002	2,200
Delaware.....	3	18,200	4	4	610	620,000	4,620	7,710
District of Columbia.....	1	10,000	8	.....	3,300	1,825,000	36,500	44,920
Idaho.....	6	15,250	8	5	2,100	1,098,000	6,590	13,239
Illinois.....	285	933,586	631	67	233,974	316,636,778	2,840,327	3,876,085
Indiana.....	49	82,345	104	18	20,587	20,826,012	157,606	225,049
Iowa.....	244	657,508	670	125	139,813	181,635,746	1,261,316	1,736,400
Kansas.....	48	81,765	70	18	10,420	7,983,102	43,859	72,783
Kentucky.....	8	20,100	11	3	1,200	1,276,900	7,854	14,178
Maine.....	41	82,512	48	10	8,213	7,637,901	47,692	75,592
Maryland.....	14	22,950	18	.....	3,471	5,821,000	60,190	87,596
Massachusetts.....	22	97,550	46	6	14,277	16,671,069	128,845	194,110
Michigan.....	74	129,925	88	26	21,203	35,161,812	218,479	317,817
Minnesota.....	27	71,149	31	7	7,680	6,424,923	38,262	62,094
Missouri.....	30	123,990	38	19	8,464	9,185,585	65,950	96,128
Montana.....	3	10,250	6	.....	470	470,000	4,700	7,900
Nebraska.....	21	81,165	28	9	5,921	4,443,801	27,791	46,322
Nevada.....	2	3,200	3	.....	130	87,500	875	1,587
New Hampshire.....	2	10,400	1	3	780	2,539,868	20,683	27,887
New Jersey.....	11	42,170	30	2	8,395	9,683,992	85,491	123,063
New York.....	1,652	3,576,214	2,526	842	623,391	1,385,333,504	8,848,708	12,295,353
North Carolina.....	2	900	.....	.....	.....	19,000	152	250
Ohio.....	452	948,702	701	118	162,985	325,527,447	1,985,050	2,756,793
Oregon.....	24	192,650	32	7	6,170	3,467,942	20,233	43,216
Pennsylvania.....	146	395,020	253	51	51,943	98,218,237	655,368	915,468
Tennessee.....	2	1,800	4	1	300	198,000	1,188	1,980
Utah.....	11	22,402	14	6	2,035	1,645,985	12,095	21,928
Vermont.....	85	202,300	126	30	22,535	48,440,401	284,422	393,122
Virginia.....	4	33,700	8	.....	950	964,500	6,786	10,621
Washington Territory.....	2	16,467	8	.....	1,600	1,684,860	11,794	18,820
West Virginia.....	7	7,550	8	3	1,104	987,929	6,378	10,238
Wisconsin.....	414	613,643	497	64	98,920	181,841,161	1,036,357	1,501,087
Total.....	3,932	\$9,604,803	6,484	1,484	\$1,546,495	2,747,427,449	\$18,363,579	\$25,744,510

States and Territories.	Cheese Factories.			Butter Factories.			Combined Butter and Skim Cheese Factories.			
	Cheese made.	Value of materials.	Value of products.	Butter made.	Value of ma- terials.	Value of products.	Butter made.	Cheese made.	Value of materials.	Value of products.
	Pounds.			Pounds.			Pounds.	Pounds.		
Arizona.....	17,700	\$2,640	\$6,195	400	\$120	\$200				
California.....	1,154,121	70,567	122,967	2,074,344	269,367	467,467				
Colorado.....	64,500	5,400	8,385	2,100	502	840				
Connecticut.....	201,820	12,479	19,762	93,365	17,962	28,127	126,546	23,662	\$32,456	\$57,684
Dakota.....	700	70	140	5,800	932	2,120				
Delaware.....	.....	.....	.....	25,800	4,620	7,710				
District of Columbia.....	.....	.....	.....	.....	.....	.....	67,600	155,460	36,500	44,920
Idaho.....	97,000	6,010	12,535	3,600	580	704				
Illinois.....	4,977,286	336,278	462,178	2,414,668	439,609	591,604	4,136,361	15,240,839	1,803,606	2,374,562
Indiana.....	1,153,714	75,192	111,060	281,232	64,125	87,059	53,287	155,550	18,289	26,930
Iowa.....	2,302,936	138,400	215,729	5,458,595	965,304	1,304,763	724,518	473,877	157,612	215,908
Kansas.....	791,334	42,308	70,247	11,482	1,551	2,536				
Kentucky.....	.....	.....	.....	49,100	7,854	14,178				
Maine.....	777,365	46,852	73,942	6,000	840	1,650				
Maryland.....	.....	.....	.....	190,525	47,710	69,616	38,800	62,000	12,480	18,340
Massachusetts.....	1,093,943	65,117	99,297	52,150	18,142	28,737	92,067	277,922	34,596	47,487
Michigan.....	3,291,738	200,152	292,971	9,850	1,114	1,994	33,366	221,307	17,213	22,912
Minnesota.....	452,191	25,062	41,618	62,450	9,735	14,426	21,000	10,000	3,465	6,050
Missouri.....	550,265	38,934	54,219	126,884	23,020	32,989	13,980	39,800	3,996	8,920
Montana.....	24,500	2,450	4,660	9,000	2,250	3,240				
Nebraska.....	273,506	15,332	26,077	20,672	2,782	4,456	45,100	50,447	9,677	15,789
Nevada.....	.....	.....	.....	3,500	875	1,587				
New Hampshire.....	.....	.....	.....	99,068	20,683	27,887				
New Jersey.....	36,400	3,276	10,920	15,600	3,510	3,900	342,802	466,818	78,705	108,243
New York.....	108,722,852	6,375,556	8,720,490	4,197,424	626,669	870,383	4,758,354	12,078,272	1,116,372	1,652,089
North Carolina.....	.....	.....	.....	1,000	152	250				
Ohio.....	17,808,191	1,013,663	1,361,124	235,341	30,138	39,933	1,852,902	12,553,247	941,249	1,355,736
Oregon.....	146,534	9,869	18,548	84,500	10,364	24,668				
Pennsylvania.....	6,087,805	340,001	487,629	453,020	82,728	110,563	533,820	1,870,246	232,639	317,276
Tennessee.....	9,000	540	900	3,600	648	1,080				
Utah.....	140,022	10,059	18,974	12,020	2,036	2,954				
Vermont.....	4,575,341	282,535	389,956	5,000	600	1,100	6,837	8,500	1,287	2,066
Virginia.....	26,000	1,690	2,600	29,100	5,096	8,021				
Washington Territory.....	70,000	4,480	7,000	47,963	7,314	11,820				
West Virginia.....	96,687	6,378	10,238							
Wisconsin.....	16,806,994	932,380	1,340,860	386,010	63,401	99,673	103,281	446,919	40,576	60,554
Total in United States.....	171,750,495	\$10,063,670	\$13,991,221	16,471,163	\$2,732,333	\$3,868,235	12,950,621	44,134,806	4,540,718	\$6,335,466

These returns of the census are doubtless considerably less than the annual production, as the consumption of butter, cheese, and milk in the farmer's family does not usually go upon record, and hence in many instances would not be returned. There has also been a large increase in dairying since 1879, so that the figures we have given in estimating the products of the dairy for 1884 and their value it is believed are approximately correct.

In referring to the progress of dairying in the United States a word should be added in regard to the kind of stock generally employed for milk. Up to within the last fifteen or twenty years the common cows of the country (sometimes called native in distinction to thoroughbreds or pure-blooded animals) were used almost exclusively for dairy purposes; and even up to the present time the common cow is the basis on which our dairy industry is erected. The common cow, when properly selected, with good feed and well cared for, will yield on an average from 500 to 600 pounds of cheese or, if her milk is turned into butter, from 175 to 200 pounds of butter per annum. The cows come in milk about the first of March and are dried off in December. They get rations of grain in addition to hay from the time of coming in milk until they are turned to grass. During the summer and while at pasture no additional food is given, until August, when, as pastures begin to deteriorate, fodder-corn, raised for the purpose of soiling, is fed to bridge over the dry season, or until a good bite can be had on the aftermath of meadows.

If drouths prevail or pastures fail, rations of corn-meal or ship-stuffs may be fed daily to keep up the flow of milk; but generally nothing beyond pasturage and fodder-corn is depended upon.

The milking, morning and evening, is done in the barn, and about ten cows are allotted to each milker. The winter food of cows is hay, with such coarse fodder as may be grown on the farm. Turnips and mangolds are sometimes raised and fed, but as a general rule the American dairy farmer is not a "root-grower." At the West, where grain is cheap, corn and corn-meal are extensively employed, especially for herds devoted to butter-dairying.

Of late much attention is being paid by dairymen in the introduction of pure-blooded stock of deep-milking habit. The short-horn was at one time a favorite breed, and after this came the Ayrshire. The more recent demand is for the Dutch or Holland cattle and the Jersey or Guernsey—the former for cheese-dairying and the latter for butter-making. These breeds, crossed upon the common cows, give grades that are highly esteemed, and deep milkers of more reliability are gradually being obtained.

The plan of preserving fodder in silos and feeding ensilage is being cautiously tried by a few dairymen, and the system has some strong advocates; but the majority of dairy farmers are content to look on for the present, awaiting further developments and more thorough tests as to its practical benefits and economy. The following table from "Sheldon's Dairy Farming" will show the comparative yields of milk from herds of different breeds:

Annual Yield per Cow.

	General Averages.		Best Herds.		Best Single Cows.	
	Milk.	Butter.	Milk.	Butter.	Milk.	Butter.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
"Natives".....	4,606	180	4,710	186	10,458	581
Mixed herds and grades.....	3,658	203	5,830	242	15,043	423
Short-horns.....			6,800	290	12,815	513
Holsteins.....			11,286	308	15,960	
Ayrshires.....	5,46	238	5,483	274	8,596	
Jerseys.....	4,987	281	5,047	307	12,716	748
Swiss.....					9,295	611

Winter Dairying.—The plan of winter dairying originated a few years ago with Mr. Boies, of Illinois; and has been practised extensively and with great success in that State, in Iowa, and other parts of the West, where butter-making has been made a specialty.

The leading features are to have the cows come in milk during the fall, to feed high during winter, and then in the spring, when the animals naturally begin to fall off in milk, the May and June pastures send them up to nearly their full yield again. Later, as the summer drouth occurs, or as grass begins to deteriorate, the cows are "dried off" and take their rest, preparatory for the next calving. It is claimed for this system that cool weather is more favorable for the manufacture of butter than the heat of summer; that the butter-market is generally better in winter than in summer; that there is less risk of injury to butter in transportation; and, finally, that as large a product or more can be made in winter, a larger income can be realized than by summer dairying.

Fresh butter of the finest texture, flavor, and aroma has been sent to New York city from Illinois and Iowa in winter, and it has commanded the highest prices. It is this winter-butter of the West which has attracted the attention of Eastern markets by being more in demand, and by outselling summer- and fall-made goods from Eastern dairies, with which it has come into competition.

Mr. Boies, in describing his practice, says: "We dry our cows off about the first of July, and have them 'come in' fresh in the fall of the year, instead of drying them off in November, as is the general practice. We give our cows the most nourishing kind of food, and find it almost impossible to dry them off on account of its richness. The quality of feed makes a very great difference in the quality and yield of butter.

"We always milk our cows at the same time of day. In the morning we give each cow four quarts of meal, and do the milking while they are eating, after which we give them a very small amount of salt, perhaps a teaspoonful. We also give them a quart of oil-cake meal every day to assist digestion. After we are done milking, and the cows have finished eating, they are let out to drink. The water is always warmed in winter.

"When the weather is pleasant and warm, the cows are let out in the sun for a few hours during the middle of the day. When brought in they are fed with early-cut hay. Our hay is cut early in order to retain its natural sweetness. At 5 P. M. we give each cow five quarts of corn- and oat-meal mixed together, and then milk again. We are very careful about our stables, and enforce strict quietness in them. No striking or pounding of the cows is allowed; they are always driven quietly. We keep them warm, but avoid too high a temperature. A number of cows in a very warm stable produces an unhealthy atmosphere. We consider that there is more danger of the stable being too warm than of its being too cold."

He affirms that it does not require nearly so much milk to the pound of butter in winter as in summer; that the difference in his opinion is fully 25 per cent. in favor of winter milk; that cows would not give any more milk in summer than in winter, if properly taken care of, while in winter he gets better prices for butter.

He says his cows produce on an average 300 pounds of butter each per annum; that the manure from cattle, taken care of by his system, is of the most valuable kind, almost equal in strength to guano. Others at the West, who pursue the same plan, produce the finest kind of butter, and Mr. Boies has attained a position as a representative dairyman second to none in the West. He says the butter made on this system supplies the best hotels in the United States regularly, and is rarely ever sold under 45 cents per pound.

This system is being introduced to some extent among Eastern dairymen, and those who have tried "winter-dairying" affirm they are well satisfied with

results. Where grain is cheap, as at the West, it can doubtless be carried on with great advantage, while by supplying the market with a fine fresh article consumption is promoted.

Winter-dairying is fast overturning the custom of holding butter for long periods in makers' hands—the markets more and more demanding freshly made goods which can be put into consumption in their best state.

Organizing Cheese-Factories.—The popular method of organizing factories, and which has generally given satisfaction, is to make them joint-stock concerns. The ground is selected where there is an abundance of cold spring-water; an estimate is made of buildings, machinery, and fixtures; then the whole cost is divided up into shares of fifty or one hundred dollars each. The neighboring farmers, or those favorable to the movement, take stock in proportion to the number of cows from which they are to deliver milk; officers are chosen, and the company managed on the joint-stock principle. Usually some one of the company is selected as salesman, who makes sales of cheese at best prices, makes up the dividends, and pays over their shares to patrons whenever a sale is effected, deducting, of course, the price of manufacturing and cost of supplies, which are fixed at a point to cover any expense, including 10 per cent. on cost of buildings and fixtures.

A good cheese-manufacturer is employed as manager, either at a salary or at a certain price per pound of the cheese made. In the latter case the manager employs his own laborers, and is at all expense of running the factory, keeping record of milk as delivered, entering it in the books of the company, and on the pass-books of farmers. He also cares for the cheese while curing. He furnishes boxes, bandages, and other supplies, and puts the cheese in boxes ready for market as sales are made. The price for all this ranges from \$1.35 to \$2 per hundred pounds of marketable cheese, according to the size of the factory. The milk is weighed as delivered, and experience has shown that it takes about ten pounds of milk to make one pound of marketable cheese as an average through the season. The manager is employed with the understanding that he is to make a good article, and if his work is not satisfactory he is discharged, or held responsible for damages. But there is another method: one man, or a company, erects buildings, and is to bear all expense in running the factory and furnishing supplies, charging a stated sum per pound as before mentioned. In this case the manufacturer or proprietor of the factory has no claim upon the cheese, which belongs to patrons, further than taking his percentage as cheese is sold. The patrons appoint a salesman, and control the product precisely as in the first instance. In New York, and indeed in other States, milk which is to be made into cheese is rarely bought of the farmers and made up on account of the proprietor of the factory, though among the butter-factories this procedure is quite common.

Of late the plan of buying or hiring a number of factories, and having them under the control of one person, is coming into fashion. In this case the proprietor, who is generally a very skillful cheese-maker, employs a sufficient number of workmen to keep the several factories running, and by going around among them from day to day directs their management. In many instances this plan has proved a success, resulting in a uniform product for dairymen, and a profitable business for the manager.

Occasionally the milk is purchased by the proprietor, but generally he manufactures it into cheese for the dairymen at a stated rate per hundred pounds.

AMERICAN CHEESE-MANUFACTURE.

The annual product of cheese in the United States is now (1884) above 400,000,000 pounds. The bulk of it is made in resemblance of the Cheddar of England. The characteristics of good Cheddar are mild-

ness in flavor, having a clear, sweet, nutty taste, solidity in texture, or freedom from holes, mellowness and richness of meat, dissolving easily under the tongue, and, finally, it should possess good keeping qualities. It may be made up from uncolored milk, and is then called white, or it may be of milk artificially colored with preparations of annatto, as required by certain markets to suit the eyes of consumers.

When made from average good milk a ripe Cheddar cheese of good quality at six months old, on chemical analysis, exhibits about the following composition in 100 parts: water, 33.92; butter, 33.15; caseine, 28.12; milk sugar, lactic acid, and extractive matters, .96; mineral matters (ash), 3.85.

The quality, flavor, and goodness of cheese depends much upon the quality of milk, the manner in which it is produced, its freedom from taint and incipient decomposition when it reaches the hands of the manufacturer. It should be clean, sweet, sound, and then with proper manipulation good results may be obtained. The best milk comes from healthy cows amply fed upon old upland pastures; where nutritious grasses abound in great variety, where an abundance of clean, fresh water can be had, and is easily accessible to stock; where the animals are kindly treated, and the most scrupulous cleanliness observed in milking, in the care of dairy utensils, and in all departments of work relating to milk production.

Cheese is commonly made from the night's and morning's mess of milk mingled together. The evening's milk ought to be cooled, so as to reach a temperature of 58° or 60° Fahr. in the morning. After the morning's milk is added to the evening's mess, and well mixed together, the mass is heated from 80° to 82° Fahr., and a sufficient quantity of rennet added to produce coagulation in from 40 to 50 minutes. After the curd has attained sufficient consistency, or readily splits apart on lifting a portion with the finger, it is cut several times: first with the horizontal curd-knives and then with the perpendicular knives, a short interval intervening between each cutting. The curd-knives consist of several long thin steel blades, set about three-quarters of an inch apart, and provided with a suitable handle. The horizontal knives cut the curd in sheets, one above another, and the perpendicular knives cutting lengthwise of the vat, and then across the vat, leave the curd in small cubical blocks. The curds should be divided up fine for the season, that all parts of the mass will then be readily operated upon by heat, evenly and alike; and in order to accomplish this in the best manner, in about 20 minutes after the first cutting, and after the whey begins to form, the mass is cut again, going over with the knives three or four times in succession. This leaves the particles quite fine.

After stirring the mass with the hands and arms a few minutes, heat is applied between the vats, and the temperature of the mingled whey and curds raised gradually to about 92° Fahr., the time required being about 30 minutes, the stirring, meanwhile, being kept up, that all parts may be operated upon by heat alike. The curds are now left at rest for about 10 minutes, when half the whey is drawn off. At the expiration of this time and after the whey has been drawn off, heat is again applied as before and the mass raised gradually to a temperature of 98° Fahr., the time required being about 25 minutes, and the stirring of the curds is kept up during heating, as before described. The mass is now left at rest, with only an occasional stirring to prevent packing, until the acid begins to develop, when the remaining whey is drawn off the curds and the acid allowed to develop itself in the curds. It is very important that the development of acid be carried only to a certain point and no further, and this point must be learned by experience. Old cheese-makers are accustomed to judge of the proper degree of acidity in the curds by their feel and odor, and as a further help in this regard resort may be had to the

hot-iron test. This consists in pressing a bit of curd against an iron just hot enough to make water simmer when dropped upon it. If acidity has not been carried far enough, the curd will not adhere to the iron, but if sufficiently developed it will stick to the iron, and on pulling it away will draw out into fine threads from one to two inches long, and if too far advanced it will draw out into very fine and long threads. This test is extensively employed, and is the most accurate and reliable guide for determining the degree of acidity, or proper maturity of the curds for pressing, that can be given in a written description. Salt checks further acidity, and should now be applied at the rate of from $2\frac{1}{2}$ to $2\frac{7}{8}$ pounds for every 1000 pounds of milk, in accordance with the condition of the curds as to moisture and their richness in fat; skimmed-milk-cheese having a smaller quantity of fat and a larger percentage of nitrogen, requires more salt for its preservation.

The curds, having been thrown into the sink, are spread out and one-half the salt is scattered over them as they lie in the sink, when they are turned over and the remainder of the salt applied and well mingled through the mass. The curds are now run through the curd-mill and exposed for some time to the atmosphere, and when put to press should be at a temperature of about 65 degrees Fahr. Usually the curds remain about half an hour in the hoop before pressure is applied. In the spring when hay-milk is being received and early maturity of cheese is desirable, less salt is used—from 2 to $2\frac{1}{4}$ pounds for 1000 of milk. As there is always more or less danger of allowing acidity to develop *too far* in working large masses of milk and curds, it is advisable to draw the whey early on the approach of acidity, allowing it to develop in the curds, thus having it under more perfect control. Acidity often develops with great rapidity, and in such cases it is difficult to draw off any considerable quantity of whey without having the acid carried too far, to the injury of the cheese.

The leading features of the Cheddar process may be briefly summed up as follows: first, studying the condition of the milk; second, setting it for coagulation at a temperature of from 80 to 82° Fahr.; third, drawing the whey early, or on the approach of acidity; fourth, exposing the curd a long time to the atmosphere, and allowing it to perfect its acidity after the whey is drawn; fifth, grinding the curds in a curd-mill and putting to press at a temperature of about 65° Fahr.

In the true Cheddar process, as practised by the Somersetshire dairymen, the curds are put to press before salting for about ten minutes, then taken out and run through the curd-mill, and afterwards salted. In this method the curds are more uniform as to moisture, and hence the quantity of salt can be regulated with accuracy.

A notable improvement in cheese-making machinery is the "self-acting cheese-vat," recently brought out by Mr. Wise, of Ohio. The tub consists of two parts—the outer of wood and the inner, or milk-vat, of tin, with a space between the two in which are placed pipes for heating. The wood vat is made in the shape of a tub, from 10 to 14 feet in diameter and from 20 to 22 inches deep, and strongly hooped. It is cut in the centre of the bottom, within which staves are set up of the same height as the outside. The tin is also tub-shaped and made with a core, to correspond with the wood. A shaft, upon which is fixed the agitator for stirring the curd, extends horizontally across its top to the outer edge. By means of suitable machinery, situated in the core, a radial motion about the centre of the vat is given to this shaft at the same time that it revolves upon its own axis.

The agitator is furnished with long wooden teeth which reach to the bottom of the tin vat. They are set spirally on a wooden cylinder. Thus in operation, while the agitator revolves on its own axis, the shaft by which it is carried swings about the centre of the

vat, bringing it to every part of the vat, and agitating the whole mass of curd perfectly and evenly. As soon as the agitator begins to work, in the process of scalding and cooking the curds, a current is formed around the vat, which keeps every particle constantly in motion and removes the danger of uneven cooking. The motion of the agitator being uniform and steady, the curd is handled more carefully and with less loss of oily matter escaping in the whey than is usual with hand-stirring. When not in use, the agitator is readily lifted out of the curd and tipped back until it stands vertically over the centre of the vat. An arm is also provided to which knives for cutting the curd are attached.

The whey is drawn from the bottom of the vat, at a point near the outer edge. The vat is then tilted, the agitator working equally well on the incline, and keeping the curds fine and in good condition for salting.

Finally, when the salt is applied, the agitator does the stirring, incorporating the salt evenly, and leaving the curds in an excellent shape for the press. The advantage of this machine for keeping all parts of the curds exposed to the atmosphere for any length of time desired is a commendable feature which will be at once recognized by cheese-makers. The agitator does the work of the curd-mill and obviates its use.

These vats perform nearly the entire work of stirring the curds during the process of cooking and salting, by machinery dispensing with the use of an extra curd-drainer or sink, and doing the work as perfectly as it can be done, and much more perfectly than it is generally done by hand. By their use one man will easily do the work of two or three men using the common vats. There is also found to be an increased yield of cheese in consequence of their use.

Curing Cheese.—A very essential point in making fine cheese, and one that is often overlooked and neglected, is the proper method of curing. Large quantities of well-made cheese are greatly injured in the ripening on account of badly ventilated and damp rooms, as well as from rooms in which temperature cannot be controlled. In the early factories but little attention was given to controlling temperature in curing-rooms, and it is only of late that improvements in this regard are being introduced.

The Cheddar dairymen by long-continued practice and experiments have established three essential points as requisites on the curing of cheese. First, that a temperature of from 70° to 75° Fahr. is the proper range for securing mellowness in texture, sweet, clean, nutty flavor, and long-keeping qualities. Second, that this temperature must be maintained throughout the curing process, and that uneven temperatures much above and then sinking below the range named are prejudicial to fine flavor; and third, that excessive dryness of the atmosphere, like that produced from the heat of stoves, injures texture and flavor by producing a too rapid evaporation and loss of moisture in the cheese.

Take for instance the lump of curd as it comes from the press. It has been well made from average whole milk; we have a tough curdy-like substance consisting of—without assuming to be exact—say 28 per cent. of butter, 40 per cent. of water, the remainder being caseine and a small percentage of mineral matters. In this condition it is about as unfit for food as unbaked dough. Now what is required of this piece of raw curd to fit it for the palate of the fastidious cheese-eater of England? In the first place the caseine must be completely broken down and intimately mingled with the butter, while a portion of the water must be eliminated and the rest so distributed through the mass as to make the whole a homogeneous substance, mellow, plastic, delicious. The moisture must be so intimately distributed through the whole that it cannot be easily separated or distinguished from the other parts, but rather one should get the impression, when a bit of cheese is pressed under the finger or tasted in the mouth, that it is rich in butter. In addition the

several parts while undergoing this change must have retained a clean, sweet, nutty flavor. Now we know by analysis how much moisture should be held in a properly cured cheese. The analysis of the very best of the Cheddar cheeses, when six months old, shows that it contains nearly 34 per cent. of water, a little more than 33 per cent. of butter, and 28 per cent. of caseine. An analysis of the best American factory cheese indicates about 27 per cent. of water, 35½ per cent. of butter, and 26 per cent. of caseine. In other words it has 2½ per cent. more butter and 7 per cent. less water than the English Cheddar, thus indicating that the 7 per cent. of moisture in the English Cheddar in excess of that in the American is made to take the place of butter, producing a more palatable and desirable cheese, and one that will sell for more money than the American in the English markets.

A record of carefully conducted experiments with cheese-curing in ordinary curing-rooms, when no regard is had to the control of temperature, is, that the June and July make, during the first 30 days of curing, will shrink or lose three times as much weight as September-made cheese during an equal space of time; thus showing that as the temperature of the weather decreases in the fall, the shrinkage also decreases. It is well known that the best American cheese is made in September when the temperature of the weather approximates more nearly to 70° than in June or July.

It may be safely assumed that in all well-cured cheese of desirable quality and flavor we must have from 30 to 33 per cent. of moisture, or else an excess of fat to compensate for the deficiency of moisture when the latter runs below 33 per cent. One of the defects complained of in American shipping cheese when well made is a tendency to dryness, and hence for the home trade a softer and more plastic sort is more in favor than the ordinary shipping cheese. Much of this home-trade cheese has the appearance of possessing an excess of fat; it is not fat, but moisture which is so intimately blended with the solids as to be taken for what the cheesemonger denominates "good stock."

One of the prominent faults in curing cheese is a too rapid evaporation of moisture in the *early stages of curing*. The water does not have a chance to assimilate with the other parts before passing off, hence dryness and apparent lack of butter. If the evaporation had been gradual, and time given for the moisture to become assimilated or "fixed," so to speak, in the cheese, the curing process would be carried on more perfectly, and the evaporation thereafter would of necessity be more slow. Again, when the fermentation is carried on unevenly, at one time hastened by high temperature and then checked by a low temperature, the cheese is apt to acquire a variety of disagreeable taints. There are immense quantities of cheese, well made at first, that are seriously injured in flavor by this cause.

The best way of heating a cheese-room in cool weather is by hot-water pipes, arranged around the walls; by this means the warmth of the room is sustained in all parts alike, whereas if a stove is used some of the cheese will be too warm and the rest too cold.

A simple and effective plan for controlling temperature in cheese-curing rooms is that adopted at a factory in Whitesboro', N. Y. It is a two-storied structure 104 feet long by 30 wide, and arranged with air chambers in the walls, and with ventilators. There is no difficulty in keeping the temperature of the room between 68° and 73° during the hottest weather; and in cool weather the temperature is regulated by steam-pipes which are carried about the walls on the inside and connected with the boiler in the manufacturing department of the factory.

The construction is briefly as follows: in the side walls are four air-chambers—first the air-chamber between the outside covering and the plastered wall.

Then upon this plastered wall narrow strips are set up and another wall made with lath and plaster, leaving space between the two. Again another air-chamber is formed upon this by using building paper; and, finally, the inside wall is completed by ceiling with narrow pine boards. The floor also is double, with an air-chamber between, and is provided with floor-ventilators, with wickets and wire gratings. The upper ceiling is also double with air-chambers between, provided with ventilators and wickets. Building paper is used both in the ceiling and floor. Eight double windows with blinds are on one side and six on the other. By opening or shutting the windows and arranging the ventilators the temperature in hot weather is under complete control, between 68° to 74° Fahr., or at the desired point for curing cheese in the best manner. The result has been eminently satisfactory in securing a very fine flavored product which commands a high price.

Gruyere and *Limberger* cheese are now produced in the United States, sufficient to meet the demands of our population of foreign birth. Its manufacture is confined almost exclusively to persons born in Germany and Switzerland, who learned the art of making these sorts of cheese in the fatherland. The work is carried on at factories fitted up with apparatus and implements similar to those used in Europe, and the quality of goods made is pronounced by experts to be equal in every respect to foreign-made brands. In many of these establishments the milk is purchased direct from the farmers, the price being regulated from week to week, or from month to month, according to the rates at which the common factory cheese is sold, calling ten pounds of milk as equal to one of cheese. Perhaps the most extensive district in New York devoted to the manufacture of Swiss and Limberger cheese is in Jefferson co., N. Y. Here may be found large and costly cellars, arched with stone, in which the cheese is ripened and prepared for market, this kind of structure being considered essential for developing the peculiar flavor of these varieties of cheese. Wisconsin and other parts of the West are also engaged in the manufacture.

There are a few other sorts of foreign cheese imitated successfully in the United States, but the make is quite limited. Recently an attempt has been made to introduce the manufacture of some of the soft French cheeses, such as the Neufchatel cream, etc., and with the best results. Were these different varieties properly placed before our people, a demand would be created for them, which would soon lead to a large home-consumption, with better profits to the producer than are now realized on the great bulk of factory make.

Imitation Cheese.—This is a new variety of food of American origin, which is now attracting much attention both in this country and Europe. Ever since the introduction of creameries and butter-factories the important question of how best to utilize the skimmed milk has been before the dairy public, and has awakened a great deal of discussion and feeling, inasmuch as large quantities of poor, tough, and unpalatable cheese, made from skimmed milk, are annually thrown upon the market, and, as it is claimed, to the great injury of the trade and cheese industry of the country. Recognizing the fact that "*blue skimmed milk*," or milk deprived of all the fat that can be taken from it in butter-making, could not easily be converted into good, palatable cheese, Mr. H. O. Freeman some 10 or 12 years ago turned his attention to means for improving such milk by adding a cheaper fat to it than that which had been removed, and then turning the mixture into cheese. A low-grade butter, clarified and freed from impurities, as well also as oleomargarine oil, were used for the purpose. Patents were taken out on his process, and a number of factories were erected and run in making butter and what he called an "improved skimmed-milk cheese." The manufacture of the latter was only partially successful,

there being more or less difficulty in obtaining a perfect emulsion of the oil and milk. He demonstrated the fact, however, that skimmed-cheese, under his process, could be greatly improved when made from the character of milk named; and some of his samples were commended by experts as a fairly useful article, not inferior to the lower grades of cheese made from whole milk.

Quite recently the "Cooley Emulsifying Machine," for making artificial cream out of oil and skimmed milk, has brought this project of an improved "skim-cheese" into prominence. As this invention promises to have an important bearing on the dairy industry of the country, a brief description of the process of making "imitation cheese" may be given. The milk, after its delivery at the factory, is run into large, double vats provided with an arrangement for cooling quickly with cold spring-water. The temperature of the water, of which there is an abundant supply, is 50° Fahr. The milk remains in the vats in summer—June and July—from 24 to 36 hours, and in September and October often 72 hours, the object being to get all the cream possible from the milk, as the *bluest skimmed milk* works best in its manipulation with lard or other fats for cheese-making, an explanation of which will be given further on. The quantity of butter taken from the milk in summer is at the rate of 4 pounds to the 100 pounds of milk. In the month of October, when the milk is richer, the average is 4½ pounds to the 100 of milk. The cream is churned in a large box-churn and the buttermilk added to the skimmed milk, which is then converted into cheese. In this process 1½ pounds of lard, or oleomargarine oil, in proportion to the 100 pounds of milk, is added to the skimmed milk and buttermilk, in order to compensate in part for the butter-fat removed. Butter-oil has also been employed instead of lard when prices for low-grade butter are cheap enough to make its use profitable. The butter-oil is made by clarifying poor butter so as to render it sweet. Refined cottonseed oil, known in the market as salad oil, has also been used; but preference is given to the finest description of oleomargarine as making the best cheese. One notable circumstance in adding lard to skimmed milk is that the weight of cheese from a given quantity of milk is increased, not only by the weight of lard added, but nearly as much more weight is gained by the tendency of the curds to retain moisture. In other words, if 1½ pounds of lard are added to 100 pounds of skimmed milk, it makes nearly 3 pounds more product than could be obtained from the skimmed milk if made up without any addition of fat.

By the term "blue skimmed milk" is meant milk that has yielded all the butter-fat that can be obtained from it in the usual process of setting. In the manufacture of artificial cream from lard and skimmed milk, to mix with the mass of skimmed milk and buttermilk in the vat, it is found, if the butter from the original milk has not been thoroughly removed, the lard-fat and the butter-fat do not mix well together; hence, to get a perfect emulsion of lard the best results are obtained in working with a "blue skimmed milk."

In making the "artificial cream," to be added to the skimmed milk, a machine ingeniously constructed is employed. It may be briefly described as a cylinder 6 inches in diameter, and 20 inches long, having 50,000 points cut upon its surface, and arranged in spiral courses. This cylinder is enclosed in a shell fitting closely. It stands perpendicularly in a frame, with shafting and pulley at the bottom connected with the engine, and is made to revolve at the rate of 3500 to 4000 revolutions per minute. Two tin cans with faucets stand on top of the machine, the one for the melted oil, and the other for the skimmed milk. The faucets are arranged so as to convey the contents of the cans at one point together into the machine. The oil and milk are heated together to a temperature of 130° Fahr., when the cylinder is set in motion, and the

faucets are opened, allowing the milk and oil in proportion of two parts of the former to one of the latter to flow into the machine. The rapid revolution of this cylinder, the surface set with thousands of small points, causes the lard or oil to be divided into minute globules, which are encased or surrounded with the milk, making a perfect emulsion similar to the butter-globules in the original milk. Thus, the lard and milk being united form a thin cream, which flows from the machine into large tin cans, and is immediately mingled with the skimmed milk in the vat.

The milk is set at a temperature of about 90° Fahr., Hansen's extract of rennet being used at the rate of 3½ to 4 ounces extract to 1000 pounds of milk: it is preferred to have coagulation take place in about 10 minutes, and the top of the mass is gently stirred with the hands until the milk begins to thicken. The curds are cut over three times, first with the horizontal knives, and then twice with the perpendicular knives. The curds are scalded or cooked in the usual way for ordinary cheese, the temperature being raised from 94° to 100° Fahr., and from 2 to 2½ pounds of salt applied for 1000 pounds of the original milk. The time of raising heat in cooking, when the milk is all right, is from 1 to 1½ hours. The ratio of milk to a pound of cheese, calculated from the original milk, or milk as delivered at the factory, is, for June 12 pounds, July 12.6, and in October 10 pounds, for 1 of cheese. That this cheese, as to quality, flavor, and palatableness, has decided merit is not to be disputed. It has been tested by the most noted experts in this country and in England, and they agree in saying that were they not told they would not have suspected its origin, nor believed that such good cheese could be produced from skimmed milk. Of course it is not equal to the finest grades of whole-milk cheese, but as it can be made to rank on an equality with second grade, and can be produced at less cost, its general manufacture among creameries, it is thought, would be to cheapen all kinds of cheese, while the markets at the same time would be relieved of a great bulk of poor "skims," which, on account of their inferior flavor and quality, check consumption.

Creamery Practice.—There is no branch of farming that has made more rapid progress during the past few years than butter-dairying. The improvement commenced with the establishment of the first butter-factories and creameries managed on the co-operative plan. Dairymen make a distinction between a butter-factory and a creamery: the first is where butter only is made, the skimmed milk going back to patrons as food for domestic animals, or is otherwise disposed of than in a manufactured product; the creamery is a place where milk is turned into butter and "skim-cheese."

The early butter-factories and creameries were organized and managed on the same plan as the cheese-factories: the latter having been in operation about 10 years before the associated system was applied to butter-dairying, and although many of these establishments are still operated upon the co-operative plan, the tendency now is to manage the manufacturing department as a separate business, in which the dairyman has no part. Under this plan the dairyman sells his milk to the factoryman at a certain rate per pound, which is usually regulated according to the price of cheese—10 pounds of milk being taken as one of cheese.

Wherever the factory system has been introduced it has raised the standard of butter to the finest grade, and the product being uniform in color, texture, and quality, has promoted consumption in a marvellous degree—the finest butters finding a market at home at prices generally too high to admit of exportation. The fact that the annual product of butter in the United States, amounting to over 1,000,000,000 pounds, is nearly all consumed at home, and that only about 40,000,000 pounds at most have in any year been exported, must be good evidence of the improved

quality of this class of food. The system has not only introduced higher skill in manufacturing, but has stimulated a more thorough investigation into the causes of poor butter, and this has in turn led to new methods of setting milk and obtaining cream with a great variety of apparatus invented to meet the situation, and lessen the labor of production.

Some of the methods of setting milk introduced since the establishment of the factory system may be briefly alluded to. The first innovation was the pool and pail system. In this plan pools of flowing spring water are constructed in the milk-house, and the milk placed in pails, each having a diameter of 8 inches, and a height of 20 inches, and when filled within two or three inches of the top with milk, as delivered from the farmers, they are immersed in the pool, care being taken that the water reaches to the top of the milk-line in the pails, or a little above it. The milk remains in the pools from 24 to 36 hours, when the pails are removed and the cream dipped off with a cone-shaped vessel. The cream is then allowed to turn slightly acid, when it is churned. This plan is commonly known under the name of "deep setting," and is still practised to some extent at factories and farm-dairies.

The large shallow-pan system was next in favor. These pans are arranged in sets of four. They are made double, with space between the two for water, and pipes provided for leading cold spring-water, which is kept constantly flowing under and about the sides of the milk. Each pan is made large enough to hold the entire milk from a herd at one milking, being made of different sizes to accommodate different sized herds up to 100 or more cows. The pans are about 5 inches deep, and usually one surface foot of pan-bottom is sufficient for two cows. The method of using these pans is to put one milking of the entire dairy into one pan, adjust the water-faucet in the supply-pipe, so as to use just water enough to extract the animal heat from the milk, and keep it at the desired temperature, say at about 60° Fahr. At the time the fourth pan is wanted for use the first will be ready to skim. These pans were at one time extensively introduced among the butter-dairies of New York and in small butter-factories. Several styles of pan were manufactured, but they all embraced the one principle of "shallow-setting."

Since Swartz of Sweden made the discovery that milk when reduced to a low temperature, by being set in ice-water, would throw up its cream with great rapidity, many devices have been invented and put in use among American butter dairymen for carrying out this principle in cream-raising. Mr. Harding, of Kentucky, was among the first to apply this principle by using a refrigerator-box, having the ice in a tank above the milk, which was set in deep cans, that were then closed, and the droppings from the ice allowed to flow on the surface of the cans, and to accumulate for two or three inches around the bottom. This led to other inventions, notably the "Cooley Creamer," where the cans of milk are completely submerged in cold water; the "Mosely Cabinet Creamery," where the cans of milk are surrounded with ice-water, and the cream obtained in from 12 to 20 hours. These and several other devices of similar construction have been widely distributed among dairymen, and on account of the simplicity of the system, the dispensing with costly milk-rooms, the exclusion of taints, and the certainty of getting cream of a uniform good character, they have been of great service in improving the butter product of the country.

Among the creameries and butter-factories, where large quantities of milk are to be handled, the most notable device recently invented are the "Burrell and Whitman Twin-Creameries," and the Marquis apparatus. The first are shaped like an ordinary cheese-vat 12 feet long, and they have two compartments in each about 16 inches wide, with a tin partition in the

centre for cold water. A tube 4 inches in diameter extends longitudinally through each compartment, also for the flow of cold spring-water. This tube is adjustable, and can be raised or lowered according to the depth of milk in each compartment. When the water supplying the creamery is not sufficiently cold to lower the temperature of the milk, say from 45° to 50°, a V-shaped trough is used, which, pendent in the milk, is filled with ice. The skimmed milk is drawn from under the cream by means of a faucet at the bottom of each compartment. The capacity of the vats is from 3000 to 4000 pounds—each compartment accommodating 1500 to 2000 pounds of milk.

The Marquis apparatus is also a deep vat, similar in shape to a cheese-vat, having an adjustable cylinder running longitudinally through the vat, in which very cold water or ice-water is forced through, and causing rapid cooling of the milk. This apparatus, with some very recent improvements, is largely in use among the creameries of Eastern Pennsylvania.

Cream-gathering System.—The plan of setting milk in a uniform manner at the farm, and gathering the cream only for the factory, now extensively practised in Iowa and other parts of the West, was originated by Mr. Fairlamb, of Chicago, and is generally known as the "*Fairlamb System*." The Fairlamb can resembles in its general appearance a tall tin pail. It is 20 inches deep, 12 inches in diameter at top and 10 inches at bottom. It stands upon three short knobs, so as to raise it an inch or two from the floor. From the centre of the bottom a four-inch tube rises perpendicularly to within 3½ inches of the top of the can, and near the top of this central tube a one-inch tube enters and runs horizontally to the side of the can. Both tubes open only on the outside of the can, the object being to create a circulation of water through them and carry off heat from the central portion of the milk. A graduated glass slot is arranged in the side of the can for the purpose of showing the depth of cream. The can is provided with a cover, having a rubber band on its edge so as to exclude anything objectionable coming in contact with the milk while the cream is rising. These cans cost about \$1.50 each, and four cans are designed to be sufficient on an average for the milk of eight cows. They are intended to be set in a water-box made of common inch-boards, and which any farmer can easily construct at small cost. The cans, when filled with milk, are to be surrounded with cold spring-water, or water and ice, the same as with other plans for deep-setting. Now the Fairlamb plan of creamery is to have a building simply for receiving the cream, churning it, and packing the butter. The cream is to be raised at the farm, and the cans are so arranged as to capacity that when filled with milk and treated with water in a uniform manner, *one inch of cream*, as seen on the graduated glass in the side of the can, will make one pound of butter, and the sales of cream are so regulated.

Teams with wagons and cans for collecting the cream are connected with the factory, and are sent out daily with trusty men to measure, skim, and collect the cream. The glass on the side of the can records the quantity of cream raised, and the number of inches is credited, not only in the books of the collector, but on a book kept by the dairyman.

Among the advantages claimed for this plan are: It saves the labor of handling the milk, and the skimmed milk remains at the farm, where it can be used as food for domestic animals. As there is more or less liability of injury to milk by being carried long distances, and as its cooling and agitation tends to lessen the quantity of cream, while the time and expense in delivering milk to the factory is obviated, a considerable saving is effected.

The creamery buildings, too, need not be elaborate or expensive. The cream can be collected over a much larger territory than it would be practicable to carry the milk if delivered at one establishment. The dairyman

knows from day to day what his cows are yielding, and as prices for butter are regulated from week to week, he gets the advantage of quick sales. One team in collecting cream will travel 20 miles a day, and will collect sufficient cream to make 280 pounds of butter. In Iowa, where this plan is popular, a man furnishing his own team for collecting cream is paid at the rate of about \$45 per month. He measures and credits the quantity of cream when he gathers it, and notes defects, if any, or rejects that which is faulty or not properly cared for. In Illinois the cream-gatherer furnishing team, etc., gets a little higher wages than that named. In other States a company or individual builds a creamery and furnishes cans to farmers, buying the cream at prices agreed upon from week to week, according to the price ruling for butter. That is to say, the whole cost of collecting the cream, making the butter, with packages, salt, etc., is calculated, and the dairyman is paid so much less per inch of cream or pound of butter as this cost amounts to, the price of butter being regulated by highest quotations in markets.

The expense of manufacturing butter in a large factory on this system is said to be about one cent per pound. The dairyman under this system generally realizes considerable more money than he could were he to manufacture his butter on the farm and sell it on his own account. High skill being employed at the factory, a very fine and uniform product is made, which sells in the market as *creamery butter* instead of *dairy*, and hence commands the highest price. This change in the grade of butter makes a decided increase in the money income of a community.

In the practical consideration of starting a creamery or butter-factory the capital required is perhaps of the first importance. The complete creamery, fitted to receive whole milk, sell milk or cream, or make both butter and cheese, costs the most. Such a factory for 500 cows requires a capital of from \$4000 to \$6000. A butter-factory where whole milk is handled, though taking less room and less labor, if no cheese is made, costs but little less. But a Fairlamb factory for the same number of cows, built new and fully equipped, need not cost over \$2500; and if suitable buildings can be rented for the purpose, it may be fitted up for \$1000 to \$1200.

The Centrifugal Cream-extractor.—The most recent and striking method of obtaining cream from milk is by the use of the "Centrifugal Creamer," which separates the cream from milk immediately after being drawn from the cow, by subjecting it to rapid centrifugal motion. These machines, of German origin, were greatly improved in Denmark by Messrs. Neilson & Peterson, who brought out what is known as the "Danish Centrifugal Milk Separator." The principle on which they work in separating cream from milk has attracted great attention in Europe and on this side of the Atlantic.

Cream is of less specific gravity than milk, and for this reason it rises to the surface when milk is set aside for creaming. Now the action of centrifugal force is to throw the heaviest material farthest from the centre. By placing new milk in a cylinder and revolving it rapidly, the heaviest portion (the skimmed milk) is thrown to the circumference, and the lighter portion (the cream) remains nearest the centre. It is upon this principle that the centrifugal milk separator is constructed, the main features of the invention consisting in the means taken to draw off the cream and skimmed milk continuously, or as fast as they are separated. In other words, there is a constant stream of whole milk entering the revolving cylinder, and two streams, one of cream and one of skimmed milk, flowing from it.

At the International Dairy Exhibition in New York in 1879, an American centrifuge, the invention of D. M. Weston, of Boston, was in operation. His first machine was perfected that year and put to work by Mr. Edward Burnett, at his Deerfoot Farm, Massachusetts, and has been doing work ever since.

Now although it has been clearly demonstrated that a larger percentage of cream can be obtained from milk by this method than by any other known plan of setting milk, and also that a great advantage is gained by having the skimmed milk perfectly fresh and sweet—the limited capacity of the early machines for handling large quantities of milk quickly, together with the high cost and expense of running, have not generally commended them for use among the practical butter-makers of America. Recognizing these objections, Mr. Weston has been actively engaged to devise methods of improvement, and by combining the merits of the Danish and Weston machines produced the "Danish Weston Centrifugal Milk Separator," which has a capacity of separating 1200 pounds of milk per hour. If it shall prove that these machines are so perfected that the cream may be extracted quickly from large quantities of milk, they will be largely introduced among our factories and creameries, and we may reasonably look for another great progressive step in butter dairying to be made at no distant date.

Churning and Working Butter.—The following process is adopted for making the finest descriptions of butter at large creameries in New York: the cream is removed from the milk when sweet, and is allowed to become slightly acid before churning, and in order to bring about this change it is heated to 70° Fahr. It goes to the churn at a temperature of from 56° to 58° Fahr., and in the summer, when the color is not naturally deep enough, Hansen's butter color is mixed with the cream at the rate of 3 ounces to 500 quarts of cream. The churn now considered best is a revolving box-churn with no inside gearing or fixtures, and is revolved by machinery. This style of churn leaves the butter in a granulated shape, so as to be easily washed and freed from buttermilk. Ice is broken up and put in the churn just before the butter begins to granulate. After the butter has come the buttermilk is drawn off and the butter washed with water at a temperature of about 50° in hot weather and 58° Fahr. in cold weather. The churn is revolved a few times and then the water is drawn off. This operation is repeated, the butter getting three washings. The butter is now taken from the churn and salt is worked in with Mason's power butter-worker, which is esteemed one of the best machines yet brought out for handling large quantities of butter. This worker consists of a circular and revolving table, upon which two rollers, one corrugated and one plain, are made to revolve at one point. Owing to the revolving table and fluted roller there is no sliding or rubbing of the butter and the grain is not injured. The table is on an incline, allowing the buttermilk to run off. Each roller runs parallel with the table; the corrugated roller brings the butter to an even thickness, and the smooth one does the working.

The butter is salted at the rate of 20 ounces best English salt to 25 pounds of butter. In working, lumps of butter, weighing 12½ pounds each, are placed on the revolving table, and each lump gets 10 ounces of salt sprinkled upon it. The butter after it passes under the rollers is thrown up in a heap, and then passes under the rollers again. This is repeated till it has passed under the rollers four times, when it is considered sufficiently worked to incorporate the salt. The lumps are now thrown into tubs and placed in a cold storage-room until next morning, when they are taken out, worked over again, and packed in oak tubs or firkins made in the best manner. In the second working the butter is run under the rollers and manipulated two or three times over, or so as not to show streaks, but to be of an even color throughout.

Chemically considered, butter is a mixture of oleine and palmitine, with a trace of phosphate and other salts and certain odoriferous fats and oils, from which it derives flavor. The following table will show the average composition of milk and the products derived from it in the process of butter-making:

Constituents.	New Milk.	Skimmed Milk.	Cream.	Butter-milk.	Butter Un-salted.
Fat (butter).....	4.00	0.55	35.00	1.67	85.00
Albuminoids, caseine and albumen.....	3.25	3.37	2.20	3.33	0.51
Milk sugar.....	4.50	4.63	3.05	4.61	0.70
Various salts.....	0.75	0.78	0.50	0.77	0.12
Water.....	87.50	90.64	59.25	89.62	13.67
Total.....	100.00	100.00	100.00	100.00	100.00

For full treatment of all topics relating to the dairy and to the various processes of butter- and cheese-making, with illustrations of implements and machinery, the reader is referred to *Willard's Practical Dairy Husbandry*, *Willard's Practical Butter Book*, and *Sheldon's Dairy Farming*.

Condensed Milk.—The manufacture of this important product is being gradually increased in the United States by the erection of factories in different sections. The growth of the business has been slow compared with that of other milk products for several reasons, besides its limited use and demand for consumption. The chief of these reasons are: the high cost of building and fitting up a factory with suitable machinery; the complicated nature of the work, and the difficulty of obtaining skilled managers and competent workmen in the manufacturing department; lack of general information in regard to methods of manufacture, which have been kept secret as far as possible from the public; and, finally, lack of knowledge generally concerning the trade, and the difficulty of competing with old and established companies that have controlled the business.

The cheese- and butter-factories are always open for inspection, and managers are always ready to give information concerning processes of manufacture and new improvements, while books are published conveying information on all desirable points. The press also is constantly discussing matters relating to butter and cheese. Not so with condensed milk manufacture. The business and processes are not freely explained to the public, but are confined for the most part to persons interested in or operating the factories. About the only treatise on this branch of the dairy is that written by Mr. X. A. Willard for the Royal Agricultural Society of England, and printed in its journal, and in pamphlet in 1871, reference to which is made for those desiring more specific information on the subject than can be given here.

The history of experiments for condensing milk in America dates back to 1846. Possibly the idea of reducing milk to a solid may have occurred earlier in Europe, but if experiments were made they were not successful, or at least were of no practical importance. Preparations under the names of "Desiccated Milk," "Milk Powders," and "Milk Essence" have been in the market, but they were all too imperfect to meet the conditions required for general introduction. They were articles prepared from milk, and not the actual milk itself.

To the late Gail Borden, of White Plains, N. Y., must be awarded the credit of being the first who was successful in putting upon the market genuine milk in a condensed form, milk which would keep for long periods, and which could be readily brought back to its original consistence simply by the addition of water. A man of intense energy and unyielding tenacity of purpose, an inventor of great ingenuity if not of remarkable scientific attainments, he added to all this the enthusiasm of the philanthropist, who believed that preserved milk would be a boon to humanity. As long ago as 1849 he began his experiments, conducted simultaneously with others, whose aim was the preservation of meats. It was not until 1853 that he arrived at the conviction that he had obtained the quality he had been seeking. Meanwhile he had expended

energy, time, and quite a fortune in his experiments, for he at length saw that, to experiment to advantage, a large amount of material, involving much expense, must be used.

At an early stage of his experiments he decided that milk could not be preserved in a dry form, as "desiccated," or "powdered," or solidified, but must be left in a semi-liquid state. That some preservative agent must be added, and that nothing but water must be removed, also became apparent.

The result is that condensed milk as now known to the trade and consumers consists of milk from which only water has been taken, and to which nothing but sugar has been added. The product is of the consistency of honey, and by dilution with water it is easily reconverted into milk itself, somewhat sweetened. It may be stated here that all the *dry preserved milk* requires to be dissolved in *hot* water, while the condensed milk prepared under the Borden system readily dissolves in *cold* water.

By 1861 Mr. Borden had extensively introduced his preparation, and four or five factories were in operation, capable of producing 5000 one-pound cans per day. During the war of the rebellion large quantities were required for the Northern armies. This gave an impetus to the trade, at the same time that the shipping trade steadily increased.

About 1857 Mr. Borden put into the market for city use what he called "Plain Condensed Milk." This is prepared in the same way as the other except that no sugar is added, and it is not hermetically sealed. It will remain sound for from one to two weeks according to the temperature in which it is kept, and it is so convenient as well as economical that large quantities have been used for consumption in New York and other cities.

With the end of the war the demand for sugared condensed milk fell off, and the manufacturers who had been stimulated to too great a production turned their attention to this "Plain Condensed Milk." In Mr. Borden's early experiments the nature and cause of a peculiarly bad behavior of milk were imperfectly understood. Under certain circumstances and conditions the milk could be readily handled and gave no trouble in its manipulation. Sometimes these conditions would continue for days and for weeks, but there was no reliability on their continuing for a specified time, or indeed in different localities during the same time. The fault at first was supposed to originate in some want of cleanliness either at the factory or among those who produced and delivered the milk. This was a part, but not the whole cause.

The importance of cleanliness and of what seemed to many to be "an absurd, fastidious neatness," became apparent to Mr. Borden at an early stage of his investigation. He therefore instituted a set of rules for the government of dairymen in the care and management of milk; and as he bought only such milk as would pass the closest scrutiny of an expert, he was able after a time to enforce an observance of his printed regulations among dairymen. He adopted also the practice of cleaning and steaming his patrons' delivery cans at the factory, because he found, and with good reason, that this work might not be properly done at the farm.

It may be observed here that good condensed milk is without doubt more reliably clean and healthy than most milk that goes to city consumers. Dirty milk—milk foul with the drippings of the stable—cannot be condensed into a clean flavored product. The success of the condensing factory depends entirely upon the ability to put a fine flavored, perfect article on the market; the milk must be uniformly good. Milk is condensed in vacuum pans, the peculiar arrangement of the steam-pipes being the invention of Mr. Borden. He believed in doing the work rapidly, for the sooner you can get the milk from the cow into a condensed form the better. He therefore preferred to use two boilers of 55 horse-power each for supplying steam to

the pans at his factory at Brewster. The average pressure of steam in the pipes at the pan is from 50 to 60 pounds to the square inch. The evaporation goes on best in clear, dry weather. In damp, foggy weather it takes a little longer to condense the milk. A 6-foot vacuum pan with two coils of pipe has the capacity of condensing about 2000 quarts per hour.

The milk as it is received goes into two square-like boxes or vats, the receiving-room being 4 or 5 feet higher than the bath- and heating-room. The bath-tubs are circular, and have a coil of steam-pipe at the bottom. The bath-tubs are filled within 6 or 8 inches of the top with water. The heating-wells are of copper, egg-shaped, and stand opposite the bath-tubs, a raised platform running between the two. The milk is drawn through a hose from the receiving tanks into copper cans sitting in the bath-tubs, each one holding about 40 quarts. Here the milk is heated to from 150° to 175°. It then goes to the heating-wells, which have a jacketed bottom for steam, and in them is heated up to the boiling point. It is then immediately drawn to the vacuum pan by atmospheric pressure produced by the air-pumps. A stream of milk is kept flowing into the pan about as fast as the evaporation goes on, or at the rate of 2000 quarts per hour; when the sugared milk is to be made, the amount of sugar is calculated for the given quantity of milk, and then turned into a movable tank or well, and here hot milk is poured upon it until it is thoroughly dissolved. The hot sugared milk is drawn up last in the vacuum pan and mingled with the milk which has been partially condensed. The sugared milk must be deprived of more water than the plain condensed milk, since the addition of sugar partially liquefies the mass—a curious fact. Plain condensed milk is reduced from 4 to 1; that is to say 75 per cent. of water is eliminated. It is treated in the pan precisely like sugared milk, except near the close of the operation when the vacuum in the pan is broken and the mass is superheated or raised to a temperature of 190° to 200°.

The superheating process was discovered in 1862, and this was one reason that gave the Borden brands superiority in the market. The superheating not only helps the keeping qualities but prevents granulation.

The heat in the vacuum pan throughout the whole of the Borden process, apart from superheating, is kept at a temperature of from 135° to 145° Fahr. The filling of the one-pound cans with milk is done by machinery, and two women will fill 10,000 one-pound cans in ten hours.

The Census Report of 1880 gives the following statistics of condensed-milk factories for 1879:

State.	Condensed milk. Pounds produced.	Value of materials.	Value of product.
Connecticut.....	453,156	\$24,923	\$28,867
Illinois.....	3,645,408	260,834	447,741
Massachusetts.....	108,371	10,990	18,589
New York.....	8,826,332	731,111	1,052,391
Total.....	13,033,267	\$1,026,858	\$1,547,588

There are condensing factories in New York, Connecticut, Massachusetts, Pennsylvania, Maryland, and Illinois. The Borden patents have now expired, and the right to manufacture is free to all.

The total annual product of condensed milk in the United States is estimated between 15,000,000 and 20,000,000 pounds, and the exports during the past six or eight years have ranged in value from \$118,000 to \$180,000 a year.

Various milk-condensing factories have been established in Switzerland, in England, and in other parts of Europe. They are all operated on the Borden method. Other plans have been tried, such as heating the milk in open pans, and conveying off the moisture as it rises, by means of a system of fans driven by machinery, but such processes have been inferior to the Borden method, and have not proved satisfactory.

Dairy Boards of Trade.—Very great progress has been made of late in the manner of marketing dairy produce in the interior. Formerly dairy goods were bought from the shelves of the manufactory or dairy-house, on personal inspection and selection by the buyer. This plan kept a large force of merchants and their agents moving over the country at heavy expense, which, of course, must come from the goods purchased. Great advantage was often taken of the producer, who, unacquainted with the situation, sold his goods below market rates. Dealers, too, often found it difficult to fill orders promptly, on account of the time employed in getting the right kind of supplies together.

The necessity of an organized system of marketing dairy products had been long felt in the leading dairy districts of New York, especially at Little Falls, where large quantities of these goods are shipped from week to week. The first "Dairy Board of Trade" in the United States was inaugurated at Little Falls in 1870-71. Here shippers, dealers, factorymen, farmers, dairymen, and others interested in dairy produce meet together every Monday through the season for the transaction of business in dairy goods. The sales of cheese alone have aggregated 30,000,000 pounds per year.

The dairy board of trade system thus inaugurated soon began to attract attention, and the plan was copied, and boards were opened at other central dairy points, such as Utica, N. Y., Elgin, Ill., etc. They have spread rapidly over several States and in Canada, and now every leading dairy centre has its sale-days and boards of trade, where goods can be bought from week to week as they become ready for market.

Many claim that no such movement for the education of the producer in the laws of trade has been inaugurated during the present century, and that no class has become more intelligent in all that concerns the markets of the world for their produce than the dairymen of America, who have been accustomed to meet weekly for business at their respective dairy boards of trade.

(X. A. W.)

DAISY, OX-EYE DAISY, WHITE-WEED, and also in England MOON-DAISY. This is *Chrysanthemum Leucanthemum* of Linnæus, or *Leucanthemum vulgare* of most American botanists. Though little related to the daisy of English poetry, these are the only "daisies" recognized in the United States, in the eastern portion of which they abound. They are merely naturalized from Europe, but their introduction to the United States must have been a long while ago. They were abundant in Pennsylvania at the time of the Revolution, and Shecut, who in 1806 published a Flora of Charleston, notes them as being then in South Carolina.

Sometimes the plant covers tracts of land acres in extent, presenting at a distance the appearance of fields of snow. It is, however, only in old pastures or partially waste ground that it is found in this abundance, and so can scarcely be called a very bad weed in American agriculture. These old pastures need breaking up and improving, and a year in corn, potatoes, or other hoed crops entirely destroys the ox-eye daisy. It is of no known use in the arts. Cattle will not eat it. Contrainé says in the eighth volume of the *Proceedings of the Royal Academy of Brussels* that the powder will kill fleas, but pyrethrum powder will probably do this work better. It is also said to have been of some special use in certain hæmorrhages. Botanically, it is very near *Chrysanthemum*. The achenium or "seed" is terete, while in *Chrysanthemum* it is three-cornered or has three wings.

(T. M.)

DAKOTA, a Territory of the United States, lies between 42° 28' and 49° N. lat. and 19° 20' and 27° W. long. from Washington. It has an area of 147,700 square miles, being thus the largest of the Territories, while but two of the States, Texas and California, have a larger area. It is more than three times as

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large as the State of New York, and greater in area by one-fourth than the British Isles. Dakota is bounded on the east by Minnesota and Iowa, on the west by Wyoming and Montana, on the south by Nebraska, and on the north by the Dominion of Canada.

Surface.—Dakota, as a whole, is a vast rolling prairie of fertile land, and its wonderful productiveness, strange contradictions of supposed natural laws, in weather, climate, etc., have given to it the name of Wonderland. All of Dakota east of the Missouri River is a gentle, rolling prairie, with an occasional small and abrupt rise or coteau. The country west of the river is more broken. After riding over the Northern Pacific road 130 miles west of the Missouri the *Bad Lands* (*q. v.*) are reached. These strange formations, with their abrupt beginning and termination on either side, their barren appearance, and unproductive, crisped soil, their pointed coteaus, precipitous sink-holes, and monotonous, weird appearance, inspire wonder and awe in the beholder. Though repulsive, as their name suggests, it has been proven that cattle can be raised on parts of them very successfully, the grazing in some places being excellent.

In the south-western portion of the Territory are the Black Hills. Here the country assumes a mountainous surface, the high hills being covered with valuable pine, while they contain some of the richest mines on the continent.

History.—The territory now comprised in Dakota was known in 1845 as the Mandan region, from the Mandan Indians, who were for a long period the undisputed owners of the soil. These Indians ranked among the most intelligent of the American tribes, and many marks of their genius and thrift still remain in mounds and fortifications throughout the Missouri slope. But the hostile Sioux, or Dakotas, soon gained possession by conquest, and the vast tract became known as Dakota. The first cession of land within Dakota to the whites was made in 1858 by treaty with a faction of the Dakota tribe called Jancton, or Yankton, and also with the Poncas, a band of another nation, who claimed a portion of the country ceded. By this treaty 25,000 square miles in the south-eastern corner of the Territory were thrown open to settlement; but only a few bold hunters, prospectors, and adventurers dared venture into the newly acquired possessions, which the aborigines were slow to abandon. Subsequent and successive treaties with the Sioux or Dakotas extended this purchase until now nearly all that portion east of the Missouri River has been acquired by the government, and is open to the settler. In February, 1877, a treaty was effected, which ceded to the government the valuable mineral region of the Black Hills, in south-western Dakota. Permanent white settlement did not begin until 1859, and the Territory was not organized by act of Congress until March 2, 1861, at the close of Buchanan's administration. The necessary executive and judicial officers were immediately appointed by President Lincoln, and by June, 1861, Dakota was an organized and well-defined Territory, with the following list of officers administering her affairs: Governor, William Jayne, of Illinois; Secretary, John Hutchinson, of Minnesota; Chief-Justice, Philemon Bliss, of Ohio.

The original boundaries as defined by the act of March 2, 1861, included, in addition to the present area of the Territory, all the region now embraced in Idaho, Montana, and Wyoming, these Territories having been created by subsequent acts of Congress. The first proclamation of Gov. Jayne was issued July 13, 1861, dividing the Territory into judicial districts, and assigning the judges thereto. By a second proclamation (July 29) the Territory was divided into legislative districts, and Sept. 16, 1861, designated as the day for a general election to choose a delegate in Congress, members of the legislature, and county officers.

The first meeting of the legislature was at Yankton,

March 17, 1862, and a session of 60 days was held, during which the capital was located at Yankton, a code was enacted, and an adjournment taken on May 15, 1862. During this time the Southern rebellion was raging, and in the winter of 1861-2 the secretary of war authorized the enlistment of Company A, Dakota Cavalry, which organization was mustered into the United States service April 19, 1862, with 96 men under Capt. Nelson Miner. The following winter Company B, Dakota Cavalry, consisting of 88 men, with William Tripp as captain, was also mustered into the service.

The second general election was held Sept. 1, 1862, the candidates for delegate to Congress being Gov. William Jayne and Gen. Todd. The latter contested the election before the United States House of Representatives, and was awarded the seat. Now was the most discouraging and trying period to the settlers of Dakota. In August, 1862, the news of the outbreak of the Sioux in Minnesota was heralded throughout the land, and this, together with the report that the Indians were moving westward, struck terror to the hearts of the settlers. But in answer to the proclamation of the governor, calling into armed service all citizens subject to military duty, over 400 loyal citizens responded, and hastily formed themselves into military companies, furnishing their own arms, subsistence, and clothing. Towns were fortified, women and children were sent to neighboring States, or found refuge in the stockades at the villages. In June, 1863, the government despatched Gen. Alfred Sully with 2000 mounted troops to the Territory. He hotly pursued the Indians, and routed them at the battle of White Stone Hills. Then returning he garrisoned the frontier settlements for the winter, and Fort Sully was built. It was during the same season that the Santee and Winnebago tribes of Indians were located on reservations in Dakota. But the Indian troubles were not all that harassed the settlers, for in the summer of 1864 drouth and grasshoppers robbed them of all results of their labors, and left the fields totally bare. The war with the Indians closed in the spring of 1865, after three years of terror and uncertainty, and treaties of peace and friendship were signed.

A census taken in 1861 showed the population of the Territory to be 1786. In 1870 the census showed a population of 14,181, of whom 12,887 were whites. The population gradually increased until 1875, when the successive good crops had fairly advertised the country, and the Dakota boom was inaugurated. At this time gold was discovered in the Black Hills, and speculators and adventurers flocked in from all parts of the country. While passing through the Territory *en route* to the hills, many became impressed with the fine agricultural country, and gave up the mining craze to secure farming lands—most of this class stopping east of the Missouri River. Thousands more were attracted by the stories of the golden wheat-fields to northern Dakota, and now that portion of the Territory lying north of the 46th parallel (upon which line a division of the Territory is agitated), which then did not have a thousand souls, has a population of over 150,000, and the assessed valuation of their property in 1883 was \$37,000,000. Southern Dakota has nearly 250,000 people, whose property is assessed at \$32,000,000.

Climate.—Dakota has the same variations of climate as other portions of the North-west. The air is pure, dry, and invigorating, and on this account, even when the thermometer denotes 25 and 30° below zero occasionally during the winter months, less inconvenience is felt than in the Eastern States at a temperature 20° higher. In spring and summer abundant rain and heat insures the rapid growth of vegetation, and crops always mature and are harvested before frosts appear. About three-fourths of the annual rainfall comes in the spring and early summer. During the latter part of summer and all of the fall the rainfall is light,

and the weather is delightful, giving bright, warm days and cool nights. The winters are usually open, though occasionally fierce, blinding snow-storms, called "blizzards," last for days, and cause much suffering to those exposed to them.

Resources.—This vast domain extends through more than six degrees of latitude. The latitude of its northern wheat-belt is the same as that of Paris. The soil is a mellow rich black loam, with clay sub-soil, varying somewhat in the different portions of the Territory. In the Red River valley the soil is heavy, extremely rich, and very deep, which fact, together with the uninterrupted level surface of the country, causes "late springs" for farmers, but as a rule the crops are good. The James and Missouri River valleys are gently rolling, and the soil has a slight sprinkling of sand, and hence is much dryer than that of the Red River valley. In central and southern Dakota the surface is undulating, with a deep soil tending to a sandy loam. There is a large percentage of silex in all localities, and an abundance of lime, as the sub-soil has been formed partly from the decomposition of soft limestone. Gypsum crystals also abound in the deeper strata, and this fact will render the importation of fertilizing materials unnecessary. Owing to the lightness of the soil in the greater portion of the Territory, and the drying winds, trees and seeds must be planted deeply, but, once firmly rooted or started, plants cannot be affected by ordinary drouths or hot winds. The porous soil resists drouth with wonderful power, and readily absorbs moisture from the air, while the peculiar properties of the sub-soil account for the large yields on Dakota farms. The wheat raised in northern Dakota is known as "No 1 hard," and contains an unusually large amount of bread-producing material. Its cultivation is conducted on a scale of almost incredible magnitude, the fields ranging from 1000 to 20,000 acres, and the harvesting scenes on these farms, with their army of self-binding machines, furnish an inspiring sight. The yield is sometimes forty bushels of wheat per acre, although the average is not above twenty bushels. In central and southern Dakota there exists a very fine quality of grass, and in the sandy soil corn has been successfully raised. In the Upper Missouri valley, and even in the Bad Lands, are fine cattle-ranches, and already large herds of cattle are grazing in these valleys.

In the Black Hills every variety of mineral is to be found. Gold, silver, copper, tin, coal, salt, mica, gypsum, and other valuable minerals abound in immense quantities. Petroleum also exists in large veins and oil-springs, and is now being used for lubricating purposes. There are also extensive pine forests and hard-wood groves among the hills, rendering this isolated region richer in natural wealth than any other section of the Territory. Efforts are being made to secure the construction of a road from some point on the Northern Pacific west of the Missouri into the mineral districts at an early day. Along the banks of the various streams which flow through the Territory are small belts of timber consisting principally of cottonwood, elm, willow, box-elder, and very little oak; yet, on the whole, Dakota is destitute of timber. The press of the Territory has directed special attention to this need, and in the older-settled regions timber-culture is somewhat advanced. The question of fuel was for many years a formidable one to the settler, but the discovery of extensive veins of bituminous coal or lignite has removed a serious obstacle to the prosperity of the country. On the line of the Northern Pacific road, and in the counties of the Upper Missouri valley, veins of lignite, ranging from four to fifteen feet in depth, have been opened.

Rivers.—The largest river in the Territory (as well as on the continent, when considered from its source to its mouth) is the Missouri. This mighty stream runs diagonally through the Territory, and is navigable as far north as Fort Benton, Montana, 1200 miles west

of Bismarck on the Northern Pacific crossing. A steamboat could take a cargo at Pittsburg, Pa., or New Orleans, and discharge it at the foot of the Rocky Mountains, after having made, on the winding rivers, a voyage of nearly six thousand miles—the longest river voyage possible to make in the world. The Missouri is a rapid, turbid stream, receiving its main supply of water from the melting snow and rapid streams of the Rocky Mountains. Its channel is very uncertain, continually changing and giving trouble to the navigator. Its tributaries are numerous, and form an important part of the country's irrigation. The Yellowstone, which enters Dakota in the extreme north-west, and becomes a part of the Missouri, is the largest tributary and the only one navigable. The Knife River, a small stream, is next in order. The Dakota, or James River, rises in the northern part of the Territory, and flows 600 miles south, joining the Missouri a few miles north of Yankton in the south-eastern corner of Dakota. The valley of the James is a rich agricultural strip of land, and is being settled very rapidly. The Big Sioux River, rising in central Dakota, takes a southward course through the eastern portion of the Territory, and empties into the Missouri near Sioux City, Iowa; along this stream are several falls, which are utilized for milling purposes, the principal mill being at Sioux Falls. The Little Missouri on the west, Big Cheyenne on the east, White, Heart, Cannonball, Grand, and Moreau are also tributaries of the Missouri.

The Red River of the North is in central Minnesota, and flows north over 200 miles into Lake Winnipeg, Canada. It is a narrow, deep stream, and is navigable from Fargo to Winnipeg. It traverses a region noted for its fertility. Its tributaries are the Goose, Park, Tongue, Pembino, Cheyenne, Turtle, and Salt Rivers. The Souris or Mouse River flows into the Territory from the British possessions, and after running southward seventy-five miles returns to Canada and empties into the Red River.

Dakota has also deep and beautiful lakes. The largest of these bodies of water is Devil's Lake (probably so called on account of its salt water), in the northern portion of the Territory on the Manitoba Railroad. It is fifty miles long and fourteen miles wide, and is surrounded by a belt of timber. Among the other principal lakes are Traverse and Big Stone on the eastern boundary near the dividing line between north and south Dakota. In all these streams and lakes fish abound. Water is reached by wells at a remarkable depth, and at several points artesian wells with an inexhaustible supply are now flowing. The rain-fall has steadily increased with the settlement of the country and is now sufficient for all needs of vegetation.

Industries.—Dakota is, of course, an agricultural country, and the efforts of the settlers have thus far been put forth in the work of bringing out the wealth of the soil and raising cereals. But as the country develops and its remote regions are explored, the fact becomes apparent that diversified farming is the true basis upon which to work. The cattle interests are already assuming gigantic proportions, and herds of from 1000 to 40,000 are scattered throughout the north-western districts. Manufacturing has scarcely begun, but there are already numerous flouring-mills in the principal towns, and with the building of railroads the internal commerce of the Territory is steadily increasing.

Railroads.—The Northern Pacific Railroad traverses northern Dakota from east to west, crossing the Missouri River at Bismarck over an iron bridge which cost \$1,500,000. The Chicago and North-western and the Chicago, Milwaukee, and St. Paul roads each enter the Territory in the southern half, traverse it as far west as the Missouri River, and are now pointing toward Bismarck. The Rock Island road is also being built from Pipestone, Minnesota, in a north-

westerly direction through the Territory to the Missouri River.

Government.—Dakota, as all Territories, is governed by the United States, the governor, secretary, chief justice, associate justices of the supreme court, United States marshal, United States attorney, and surveyor-general, being appointed by the President and paid by the general government. The territorial treasurer, auditor, superintendent of public instruction, attorney-general, and officers of the penal, charitable, and educational institutions are appointed by the government.

The legislative power is vested in a legislative assembly of two branches. The council or senate has twelve members, and the house of representatives twenty-four. The members of the legislature are elected by the people and paid by the general government at the rate of \$4 per day and mileage. All laws passed are subject to a revision by Congress. The sessions of the legislature are biennial and are limited to 60 days. The delegate to Congress is elected by the people, as are the county officers; but when a new county is organized the governor appoints three county commissioners, who have the power of appointing the remaining officers. The judicial districts are four in number, with the places of holding district court as follows: First, Deadwood; second, Yankton; third, Fargo. The supreme court meets at Bismarck, the capital, twice a year.

Territorial Institutions.—The legislative assembly in 1883 passed an act removing the seat of government from Yankton, and appointed nine commissioners to locate the same at some central and desirable point. The commissioners decided upon Bismarck, and now a capital building to cost, when completed, \$500,000, is in process of construction. The public institutions of the Territory are all creditable, and are constructed on the most modern and improved plans. The hospital for the insane at Yankton, which when completed will cost over \$100,000, has been in operation over a year, and will accommodate 200 patients. Another hospital for the insane is now being erected on the detached plan at Jamestown. The completed penitentiary at Sioux Falls cost \$80,000, and another equally fine penitentiary building is in process of construction at Bismarck. A school for deaf mutes is in operation at Sioux Falls.

The educational interests of the Territory are fostered and encouraged in a most commendable manner. The Territory has provided for universities at Vermillion and Grand Forks; normal schools at Madison and Spearfish, and an agricultural college at Brookings. Every town and city in the Territory has a system of schools, and high school buildings, ranging in cost from \$10,000 to \$80,000, have been erected by the leading municipalities. In addition to these the different religious denominations are establishing universities and colleges throughout the domain. The common school system is thorough, improved, and in keeping with the advancement and progress of the country.

In the towns and growing cities of Dakota the society is refined and cultured, and all modern fashions and customs are represented. Entertainments, social gatherings, the latest operas and dramas are witnessed by intelligent audiences. The architecture of the commercial centres is in keeping with the improvements of the times. The richness of the country will in the future depend upon its exports, which are steadily increasing in proportion as its natural resources are developed. Among the chief articles of export are the minerals, one company alone shipping \$4,000,000 in gold bricks yearly from the Black Hills. In a few years Dakota will furnish food for the millions of the East, and her entire available surface will be under cultivation.

The population of the Territory is composed mostly of Americans, although there are settlements of Scandinavians, Russians, Bohemians, and Poles scattered

about. The majority of foreigners are from Scandinavia, but the major portion of the people are Americans. All the men are young, vigorous, energetic, and ambitious. Newspapers abound and form a marked feature of the civilization of this new country. Among the principal towns—or cities, as each has a mayor and board of aldermen—are Bismarck, the capital, Fargo, Sioux Falls, Jamestown, Grand Forks, Deadwood, Huron, Pierre, and Mitchell.

Dakota must soon be admitted into the Union as a State, as her population demands. The financial condition of the Territory is good, the only debt being a small one contracted in the erection of public buildings. There has been a clamor for division on the 46th parallel of N. lat. by many, but its accomplishment is looked upon as improbable at present. (J. M. Q.)

DAKOTA INDIANS, the name of a family of North American Indians, who speak languages of common origin, and are similar in general habits. Their location is between the Rocky Mountains and the Mississippi, reaching north into British America. They have a tradition that they came originally from the West, and were checked by the Algonkins on reaching the Mississippi. One tribe, however, pushed through to Lake Michigan, and formed the Winnebago tribe of that region. The Quapaws or Arkansas settled on the Ohio, whence they were driven south by the Illinois, to the region which now bears their name. The western tribes comprise the various bands of the Sioux or Dakotas proper—the Assiniboin, or Stone Sioux, the Omahas, Iowas, Kansas, Poncas, Ottoes, Osages, Missouris, and Crows, and perhaps also the Minetarees and the Mandans, though the affinities of the latter tribes are doubtful. The languages of the Dakotas are thought to approach the Mongolian more nearly than most other American languages.

The Dakotas are less fierce and warlike than the Eastern Indians. In form they are tall and vigorous, with high cheek bones and thin visages. They resided near the confluence of the Mississippi and the St. Peter's for more than two centuries. Here a little agriculture was practised, but the more western bands depended entirely upon the buffalo for subsistence. The Assiniboin separated from them two centuries ago, and are since known by them as *Hoha* or rebels. Dakota means "allied." All who are not allied are enemies, though of the same stock, and it was deemed glorious to kill one of them. The Dakotas are more reserved and slower in their mental activities than the Southern Indians, but their memories are better, and their characters more robust. The Dakotas are divided into three grand sections—the Isamjati (Santees), formerly residing near the Mississippi; the Ihanktonwan (Yanktons), prairie tribes ranging from Lake Winnipeg to the Missouri; and the Tetonwan (Tetons), who comprise many bands, and range mostly south-west of the Missouri. The total number is estimated at about 60,000 souls.

Like most of the Northern Indians they have a vague belief in a Great Spirit and in a future life, and numerous superstitions, but little than can be called worship. Great affection for their children is manifested by the women, but little respect is shown to the aged and infirm, who were often left on the prairie to perish, a little food being provided them. This was rather a result of the necessities of a nomad life than deliberate heartlessness. Some tribes inflict upon themselves severe self-tortures, as a part of their religious observances.

The former country of the Dakotas contained the famous pipestone quarry in Pipestone co., Minn., which was long a neutral ground, all Indians resorting to it for material for their pipes. It was considered sacrilegious to use this substance (catlinite) for any other purpose, and the Dakota workmen are very skillful in working it into pipes. Great skill is also displayed with the lasso and the bow in their buffalo hunts. The confederated Dakota tribes were called by the French

and the Algonkins the Nadowosious, whence the name Sioux. (See SIOUX.) (C. M.)

DALE, ROBERT WILLIAM, an English Congregational minister, was born in London, Dec. 1, 1829. He was educated at Spring Hill College, Birmingham, and graduated at the University of London in 1853. He took his degree of M. A. in philosophy and political economy, and won the gold medal in that department. In 1853 he became associate pastor with Rev. John Angell James in the Congregational church at Carr's Lane, Birmingham, and on the death of Mr. James, in the autumn of 1859, succeeded to the sole pastorate of the church. In 1868 he was made chairman of the Congregational Union of England and Wales. For several years he was editor of the *Congregationalist*, and in 1873 he delivered the Congregational Union lectures, taking for his subject the doctrine of the atonement. He has taken part in all the movements of the Congregational churches of England in recent years, and has also had a share in many public movements not of a strictly religious character. Among these were—the effort, under the leadership of Mr. John Bright, for the extension of the parliamentary franchise, which led to the Reform Act of 1867; the short but stormy agitation caused by the National Education League, which led to the Education Act of 1870; and the agitation for the disestablishment and disendowment of the Church of England. Since 1859 he has been chairman of the education board of Spring Hill College. He has also taken great interest in municipal and educational matters in Birmingham. In 1870 he was elected to a seat in the first school board, and when he retired in 1880 he was its vice-president. He was appointed by the senate of the University of London to represent it in the governing body of the School of King Edward VI., which chiefly provides higher education in Birmingham. Mr. Dale insists that if the will of God is to be done on earth as it is in heaven, Christians must take their full share in political and municipal life; and he has endeavored to enforce his precept by his example. In his theology he holds what are commonly understood as the evangelical doctrines, but rejects that of eternal suffering, believing that though man survives death, he has no enduring existence unless his life is voluntarily rooted in Christ; those who are not "in Christ" will therefore perish. In politics he is a Liberal of the more advanced type, and for many years was intimately associated with Mr. Joseph Chamberlain. Mr. Dale has travelled in the East, and in 1877 visited America at the invitation of the theological faculty of Yale College to deliver the Lyman-Beecher lectures on preaching. He received from that college the degree of D. D., but as he has scruples which prevent him from using the title of "reverend," he is also unable to avail himself of the other title. On his return to England he published in the *Nineteenth Century* his *Impressions of America*, and these, except the part relating to religion, have been republished in the United States in a popular form. He is the author of numerous other works, among which are the *Life of Rev. J. A. Adams*; *Discourses on the Epistle to the Hebrews* (1865; 5th ed. 1880); *Discourses on Special Occasions* (1866); *The Ten Commandments* (1871); *Week-Day Sermons* (1867); *The Ultimate Principle of Protestantism* (1874); *The Atonement* (1875; 8th ed. 1881); *Nine Lectures on Preaching* (1877); *The Evangelical Revival* (1880); *Lectures on the Epistle to the Ephesians* (1882). He has contributed frequently to the *British Quarterly*, *Nineteenth Century*, *Fortnightly Review*, *Contemporary Review*, *Good Words*, and the *Sunday Magazine*.

DALL, CAROLINE HEALY, an American author, born in Boston in 1824, and married in 1844 to the Rev. Charles Henry Apple Dall, a Unitarian minister. She early began her literary work, devoting much attention to the anti-slavery movement, in which she heartily engaged, and in later times to the questions of woman suffrage, and of employment for women. Among her works are *Essays and Sketches* (1848);

Bunsen's Egypt, a presentation (1868); *Patty Gray's Journey* (1870); *The College, the Market, and the Court*; *Historical Pictures Retouched*; *a Life of Dr. Marie Zakrzewska*; and *Sunshine, Lectures on Health*.

DALLAS, a town of Texas, county-seat of Dallas co., is on the east bank of the Trinity River, 265 miles N. N. W. of Houston, at the intersection of the Texas and Pacific Railroad with the Houston and Texas Central Railroad. It is also a terminus of the Dallas and Wichita Railroad and the Texas Trunk Railroad, and is on the Chicago, Texas, and Mexican Central Railroad, now in construction, and on a branch of the Texas and St. Louis Narrow Gauge Railroad. It is thus an important railroad town, and the centre of trade of Northern Texas. It has a fine court-house of gray limestone, 1 national bank and 3 other banks, 16 churches, 2 colleges, and excellent public and private schools. There are 3 daily newspapers, 4 weekly newspapers, one of which is German, besides 4 religious papers and 2 monthly magazines. Its industrial works comprise 2 foundries and machine-shops, 3 flour-mills, 4 spice-mills, marble- and metal-works, wagon- and carriage-factories, and manufactories of soap, boots, shoes, harness, agricultural implements, barrels, pumps, etc. It has 2 cotton compresses, 2 grain-elevators, a telephone exchange, gas- and water-works. Its annual shipments of cotton exceed 70,000 bales, and of grain 500,000 bushels. Its exports, including live-stock, are valued at \$4,000,000. It is situated on a bluff with good natural drainage, and the private as well as the public buildings are of brick and stone. It was settled in 1844 by John N. Bryan, and is incorporated as a city. The surrounding country is remarkably fertile and raises large crops of grain, cotton, fruits, and vegetables. Population, 10,358.

DALLAS, ALEXANDER JAMES (1759–1817), an American statesman, was born June 21, 1759, in Jamaica, W. I., where his father, Robert Charles Dallas, a distinguished Scotch physician, had resided for several years. When his father returned to Scotland, Alexander was placed at school near London. In 1780 he married Arabella Maria, daughter of Major George Smith, and after the death of his father returned to Jamaica, where he remained till 1783, when he removed to Philadelphia. In 1785 he was admitted to the bar of Pennsylvania, practised in Philadelphia, contributed to several periodicals, and edited the *Columbian Magazine*. In 1790 he began to publish his *Reports of Cases in the Courts of the United States and of Pennsylvania before and since the Revolution*. In 1791, Gov. Mifflin appointed him secretary of the commonwealth of Pennsylvania, and while holding this position Mr. Dallas published an edition of *The Laws of Pennsylvania from 1700 to 1801*, with notes. On July 4, 1793, he took part in the formation of the Democratic Society of Pennsylvania. In 1795 he actively opposed the ratification of the treaty negotiated with England, and published a pamphlet on the *Features of Jay's Treaty*. About the same time, and for many years later, the violence of party spirit led to impeachments of judges and other officers, both State and national. In most of these trials Mr. Dallas took a prominent part, generally in defence of the accused, and by his arguments assisted in determining the fundamental principles of the newly-established system of government. In 1801 he was appointed by Gov. McKean recorder of Philadelphia, and also by President Jefferson United States attorney for the eastern district of Pennsylvania, and remained in this office till 1814, when he was appointed by President Madison Secretary of the Treasury. In 1811 the Senate had refused to renew the charter of the Bank of the United States, although Mr. Gallatin, then Secretary of the Treasury, had strongly urged its necessity. When he was driven from his post after the war with Great Britain had commenced, the Government soon became bankrupt and loans impracticable. Mr. Dallas, Mr. Gallatin's most intimate friend and the sharer of his financial views, was now called to the posi-

tion, insisted upon having a national bank, and got it. The bank was chartered for twenty-one years with a capital of \$35,000,000, and had twenty-five directors, five of whom were appointed by the Government. Mr. Dallas succeeded in calming the fears of those who dreaded the effects of a large issue of Treasury notes, and in a short time confidence was restored and the Government notes were taken at par. Similar success attended the new tariff which he prepared and presented to Congress. In March, 1815, he assumed in addition the duties of Secretary of War, and successfully performed the difficult task of reducing the army. In Oct., 1816, he resigned his office, and returned to Philadelphia to resume his profession. He died suddenly at Philadelphia, Jan. 16, 1817. Besides the works already mentioned, Mr. Dallas published several legal and political tracts and an *Exposition of the Causes and Character of the Late War*, 1815. In 1862 his son, Hon. Geo. M. Dallas, prepared for the press the *Life and Writings of A. J. Dallas*, which, however, was not published till 1871.

DALLAS, GEORGE MIFFLIN (1792-1864), an American statesman, second son of the preceding, was born at Philadelphia, July 10, 1792. He graduated at Princeton College in 1810, with the highest honors, studied law with his father, and was admitted to the bar in 1813. In that year President Madison sent Mr. Albert Gallatin to St. Petersburg as one of the commissioners to negotiate a treaty with Great Britain with the aid of the Russian emperor. Mr. Gallatin took Mr. Dallas as his private secretary, and when the British Government declined the mediation of the Czar, the commissioners sent their young companion to London to make arrangements for a meeting elsewhere. Ghent was the place selected, but before the treaty was concluded a year later, Mr. Dallas had returned to the United States, bringing the first proposals of Great Britain, which were so unjust that they revived the war-spirit in the country. After assisting his father for some time in his arduous duties as Secretary of the Treasury, Mr. Dallas devoted himself to the practice of his profession, and was solicitor of the United States Bank. He delivered his first public oration July 4, 1815, in vindication of the course of the United States in the controversy with Great Britain. In 1817 he was appointed deputy attorney-general for the city of Philadelphia. In 1828 he was elected mayor of Philadelphia, but soon resigned the office to accept that of United States district attorney. In 1831 he was elected by the Pennsylvania legislature to the United States Senate, and was one of the youngest members of that body. He made his first speech Jan. 9, 1832, when he presented the application of the United States Bank for the renewal of its charter, which had originally been granted at the instance of his father when he undertook the responsibilities of the Treasury. Mr. Dallas voted for the bill to renew the charter at every stage of its passage, but in the Presidential contest later in the year he supported his personal friend, Gen. Jackson, who had shown persistent hostility to the bank. In 1837, President Van Buren appointed him minister to Russia, where he remained till October, 1839, when he was recalled at his own request. He spent the next four years in the practice of his profession in Philadelphia, having declined the office of attorney-general of the United States. In 1844 he was nominated by the Democratic party for the Vice-Presidency, and was elected. He had heretofore been an advocate of protection, and was nominated expressly to secure the vote of friends of that system; yet when the Tariff act of 1846, which was a free-trade measure, was before the Senate, he gave the casting vote in its favor, thus repealing the protective tariff of 1842. In an address to the Senate he gave his reasons for this action, declaring that he was convinced that a majority of the States desired a change in the tariff, and "he did not feel at liberty to counteract by his single vote the general will." He defended the treaty of the United

States with Mexico in 1848 as an honorable example of magnanimity to a conquered foe. He again resumed his place at the Philadelphia bar, but in 1856 was appointed by President Buchanan minister to England. He showed great skill in the management of the Central American question, as well as in his course with regard to the recall of Sir John Crampton, the British minister at Washington. Although his diplomatic business was important and intricate, he found time to write a *Series of Letters from London in the Years 1856-1860*, which were published in 1869. He returned in 1861, and thenceforth spent his life in privacy, but he freely declared his detestation of the "pernicious sorceries of nullification and secession." He died at Philadelphia, Dec. 31, 1864. Mr. Dallas was an eminent lawyer, a distinguished statesman, an able diplomatist, and a refined and cultivated gentleman.

DALLES, or THE DALLES CITY, the county-seat of Wasco co., Oregon, is on the S. bank of Columbia River, 110 miles E. of Portland, Oregon, 50 miles above the Cascades and 5 miles below the cataract known as the Dalles. The river is here a mile wide and is crossed by a steam-ferry; the line of the Oregon Rail and Navigation Company passes along the river bank. The town has 3 large hotels, a weekly newspaper, 6 churches, an academy, and various industries. At the Dalles the stream passes between cliffs of basaltic rock and is only 200 feet wide. Population, 2232.

DALL' ONGARO, FRANCESCO (1808-1873), an Italian poet, born in humble life at Oderzo, in Friuli, in 1808. He was educated at Venice and Padua and became a priest, but some years later left that profession and began a diversified career as a journalist, dramatist, teacher, public reader, and political agitator. In 1838 appeared his dramas, *Il Fornaretto*, *I Dalmati*, and *Marco Crabieric*, followed by *L'ultimo dei Baroni*. He composed the tragedy *Bianca Capello* for Madame Ristori, and *Fasma* and *Il Tesoro* for Salvini. His *Ballate* and *Stornelli* were attempts in the vein of popular poetry. Expelled from Trieste in 1847 on account of his free expressions of political opinions, he established, during the temporary success of the republic of 1848, in Venice, a journal called *Fatti e non parole*, "Deeds, Not Words." He took part in the Roman revolution of the same year, but was in 1852 banished to Switzerland, whence he was soon expelled by Austrian influence. He lived seven years in Belgium and France, gaining subsistence by his pen and his literary lectures. In later years he held literary professorships in Milan, Venice, and Naples, and died in the last-named city, Jan. 10, 1873. His poetry, tales, dramas, and lectures on literature were for a time highly popular, and he still takes rank as one of the best of recent Italian lyric poets.

DALTON, a city of Georgia, county-seat of Whitfield co., is 99 miles N. of Atlanta, on the Western and Atlantic Railroad, and on the East Tennessee, Virginia, and Georgia Railroad. It has a park, a national bank, a public hall, 2 hotels, 2 weekly newspapers, 10 churches, a high school and 5 other schools, and is the seat of Dalton Female College. It was settled in 1844, incorporated in 1850, and was nearly destroyed by Gen. Sherman's army during the civil war. It has since revived, and is now a picturesque mountain-town. Population, 2516.

DALTON, JOHN CALL, M. D., an American embryologist and physiologist, was born at Chelmsford, Mass., Feb. 2, 1825. He graduated in 1844 at Harvard College, and received his medical degree in 1847. He was professor of physiology in a medical school at Buffalo, in 1851-54; in the medical college of Vermont, 1854-57; in Long Island College hospital, 1859-61; and in 1855 was called to the chair of physiology in the New York College of Physicians and Surgeons. He early became distinguished for his original observations and discoveries, and published many important scientific papers. His *Treatise on Human Physiology* (1859) is a work of high value. During a

large part of the civil war he was actively employed in the medical corps of the army.

DAMAGES are the pecuniary satisfaction which a plaintiff may obtain by success in an action, either as a compensation for an injury done him, or in satisfaction of a wrong which he may have sustained. The amount is usually assessed by the jury or referee before whom the case is tried, according to the facts and circumstances as proven or shown by the evidence in the case. The amount or nature of the damages necessarily depends upon the nature of the action. In some instances they may be actual, and in others nominal. They are actual when an injury is done a person which results in his sustaining positive damages, as when a person is injured by means of the act of the defendant; there the actual loss of time and money are the guide to the assessment of damages; or where damages arise in the natural course of events, as the non-payment of money, or the non-delivery of goods; in the former case the party loses the benefit of his money, or has to provide himself with money elsewhere; in such instance the damage is the amount of money due, with legal interest, and the cost of suit. In the latter case, by the non-delivery of the goods, he is compelled to procure goods elsewhere, and the criterion of damage is the difference between the price purchased and the price he was compelled to purchase in order to meet the orders predicated upon purchase of the goods which were not delivered; and, in the event of his failure to procure the goods elsewhere, the damage is the loss he sustained by not being able to fill his orders, by reason of the non-delivery. Actual damages also arise from an injury done by means of an illegal distress for rent: in this case the damages would be the actual injury done the plaintiff, to his character or business, because of the distress. In an action for malicious prosecution the law awards damages commensurate with the actual injury done the plaintiff, or the loss sustained by him by reason of the prosecution; but malice on the part of the prosecution must be here fully shown, in order to sustain the action. Damages are nominal where no evidence of loss is given; as in the case of an invasion of a man's property by riding over it, even though the plaintiff sustain no injury from it, it is an invasion of his property, for the other had no right to come there; or in an action for breach of contract, where no actual injury is shown, no more than nominal damages are recoverable. Every injury imports a damage where a man is thereby hindered of his rights. The maxim, *de minimis non curat lex*, when properly applied to prevent a recovery in any action has reference to the injury and not the resulting damage, but in action for a wrongful or positive invasion of property this doctrine is not applicable, as any violation of a right imports some damage, and if none are proven, the law gives nominal damages to protect the right. Damages are termed remote when, although arising out of the cause of action, loss does not immediately and necessarily flow from it, and it cannot be shown that in the ordinary course of things damage would flow from the act. Though the lines of distinction are very clearly drawn by the law, yet considerable latitude is granted in the ascertainment of correct mode of the computation of damages; as for instance, in an action for an injury done the profits arising from the legitimate business of the plaintiff, and interrupted by the physical or mental injury caused him by the defendant's neglect, are proper subjects of compensation in damages; as also in the estimating of damages for death caused by collision of trains on a railroad, the age, habits, health, and pursuits of the plaintiff may be taken into consideration as a means of ascertaining the damage suffered. The measure of damage for conversion of shares of stock loaned, where the value has risen since the conversion, is the value at the time of the sale. There is also a damage known to the law as exemplary

damage, which mean such damages as would be a good round compensation and an adequate recompense for the injury sustained, and serve for a wholesome example to others in like cases.

The courts under the laws exercise a discretionary power over damages, as to whether the verdict or award shall stand, by the granting of a new trial in such cases where in their opinion the damages awarded are excessive or too small. The courts are vested with this power in order that they may grant that necessary protection to suitors that the law in all cases guarantees. If, however, the parties consider themselves aggrieved by such action of the court, when refusing a new trial (their power in granting a new trial is final) either that the court misinterpreted or misapplied the law, they have their proper remedy by the way of an appeal to the higher court of the State or county, which upon a proper review of the subject will correct such error as may exist in the lower finding. Damages are recoverable in all personal actions, and must necessarily be recovered in all cases where a person is entitled to a verdict or reward. (F. H.)

DAMIAN, PETER (1007-1072), Lat. *Petrus Damiani*, Ital. *Pier Damiano*, a saint and doctor of the Roman Church, was born at Ravenna, in 1007. His father, though poor, was of high lineage, but his mother is said to have refused to care for him in infancy, and he was supported by a brother, who a few years later sent him into the fields, half naked, to herd swine. But another brother, Damianus, an archdeacon, sent the little Peter to the best schools of the time, and the latter, from gratitude, afterwards called himself *Petrus Damiani*, "Peter, Damian's brother." Having been carefully schooled at Ravenna, Faenza, and Parma, he taught for some years in his native city with great applause. When nearly 30 years old he suddenly renounced the world and became a hermit of the order of Fonte Avellana, a congregation now long extinct, its members having been transferred in 1570 to the Camaldulians. As a monk he outdid his brethren in those austerities to which he was already no stranger; and after having been made abbot (in 1041) he introduced a new system of self-flagellation by way of penance. This system was taken up with such avidity that Damian was compelled to interfere, in order to restrain the brethren from dangerous excesses of self-punishment. He was a born leader of men, and all those Italians who favored strict monastic rules looked to him for encouragement and help. The people hailed him as a great saint, and the Emperor Henry III. courted his favor. But Damian, while he maintained intimate relations with the emperor and gladly favored all his reforms, was, like his colleague Hildebrand, a hearty defender of the papal prerogative and the church's autonomy. He was the adviser and minister of several successive occupants of the Holy See. In 1057 he was made a cardinal and bishop of Ostia, and in 1058 he vigorously opposed the election of Benedict X., and soon after induced that unworthy pontiff to resign. Since that time all the papal elections have been made by the cardinals. In 1062 he persuaded the antipope, Honorius II., to renounce his claims to the tiara, and then at once obtained leave to abandon his preferments and retire again to his cell. His *Liber Gomorrhianus* sets forth in stern language the evil practices too prevalent among the clergy of his time—practices which, including concubinage, simony, pluralism, and kindred vices, for a time seemed too strong for him to contend with. But Damian was the man for the hour; his conscience was aflame with love for the church and desire for the reformation of the lives of clergy and people. In 1062 he became confessor to Agnes, the empress dowager, who had opposed some of his reforms. In 1063 he went to France, inspected the clergy, and unfrocked the bishops of Chartres and Orleans, who had been guilty of simony. In 1069 as papal legate he prevented Henry IV. from divorcing his wife Bertha. He also settled the Lombard schism.

Worn out by labors and by the rigors of a self-imposed discipline he died at Faenza, of a fever, Feb. 23, 1072. His works have been often published. Bassaini's edition in 4 vols. folio is called the best. His writings include many letters, some sermons, lives of the saints, a tractate *De correctione episcopi et papæ* and a *Disceptatio synodalis inter Imperii advocatum et ecclesie defensorem*. At least one hymn of rare excellence is ascribed to him. His life has been written by Laderchi, 1702; by Vogel, 1856; by the Bollandists; by Capececiatro, 1862; by Neukirch, 1876; and by Kleinermann, 1882. Zeal for the honor of the Virgin Mary and extreme claims in regard to the advantages derivable from ascetic practices are noteworthy in his teachings. Whatever estimate we may form of his opinions, there can be no doubt that he was a great light in one of the darkest periods of mediæval times.

DANA, CHARLES ANDERSON, an American journalist, was born at Hinsdale, N. H., Aug. 8, 1819. Receiving a classical education, he spent two years at Harvard College, and then left on account of a disease of the eyes. In 1841 he joined with other persons of literary tastes and utopian ideas in forming the Brook Farm Community at Roxbury, Mass., and was one of the editors of the *Harbinger*, a weekly paper which advocated the socialist ideas of Fourier. He afterwards contributed to the Boston *Chronotype*, and in 1847 became assistant editor of the New York *Tribune*, taking charge especially of the foreign department. He was also managing editor for some years, until his famous editorials "On to Richmond" in 1861 caused a disagreement with Horace Greeley, in consequence of which Mr. Dana left the *Tribune*. In 1863 he was appointed by Secretary Stanton assistant Secretary of War, and was employed chiefly in the West in forwarding the military movements under Gen. Grant. Soon after the close of the war he became editor of the Chicago *Republican*, but that paper not proving successful, he returned to New York, and with some others purchased the New York *Sun*, which for thirty years had been a successful one-cent paper. Mr. Dana raised the price to two cents and largely increased the circulation. Of the first number, Jan. 1, 1868, 43,000 copies were issued, and since that time its circulation has occasionally reached 100,000. It has been sensational and personal, but has been managed with great ability. Mr. Dana is a vigorous writer and forcible speaker, well informed on all subjects of general interest, quick and bold in expressing his ideas. Besides his labors as a journalist he has compiled the *Household Book of Poetry* (1858), and in connection with George Ripley, literary editor of the New York *Tribune*, he edited Appleton's *New American Cyclopædia* (1858-63). In 1873 the first volume of a new edition was published under the name *The American Cyclopædia*, and the work was completed in 1876.

DANA, FRANCIS, LL.D. (1743-1811), an American statesman and jurist, was born at Charlestown, Mass., June 13, 1743. He was a son of Judge Richard Dana, and fourth in descent from Richard Dana, who settled at Cambridge in 1640. He graduated at Harvard College in 1762, was admitted to the bar in 1767, and joined the "Sons of Liberty." In 1774 he was chosen to the first provincial congress of Massachusetts, and the next year visited England on behalf of the colony. In May, 1776, he was made a member of the council which acted as the executive of Massachusetts till 1780. He was also delegate to the Continental Congress in 1777 and 1778, and spent some months at Valley Forge. He was secretary to the embassy sent in 1779 to negotiate the treaty of peace with Great Britain, and arrived at Paris in February, 1780. The next year he was appointed minister to Russia, and spent two years at St. Petersburg. In December, 1783, he returned to the United States, and was again elected to Congress. In 1785, Gov. Hancock appointed him a justice of the supreme court of Massachusetts. Although chosen a delegate to the convention which framed the Federal Constitution, he was, on account of ill health and his

duties as judge, unable to attend, but he advocated its adoption in the State convention. In 1791 he was appointed chief-justice of Massachusetts, which position he held for fifteen years. After his retirement in 1806 he gave much attention to various enterprises for the public benefit, and was one of the founders of the American Academy of Arts and Sciences. He was an earnest, high-toned Federalist, an eloquent public speaker, an influential member of Congress, an upright and learned judge, and a successful diplomatist. He married a daughter of William Ellery, one of the signers of the Declaration of Independence. He died at Cambridge, April 25, 1811. His public correspondence is given in Sparks's *Diplomatic Correspondence of the Revolution*, vol. viii.

DANA, JAMES DWIGHT, an American geologist, mineralogist, and naturalist, was born at Utica, N. Y., Feb. 12, 1813. He graduated at Yale College in 1833, and during the years 1838-42 was one of the scientific corps of the U. S. exploring expedition around the world under Capt. Wilkes, having charge of the departments of geology, mineralogy, zoophytes, and crustacea. In 1844 he married a daughter of Prof. Benjamin Silliman. In 1850 he was appointed to the chair of geology and natural history at Yale, and in 1855 entered on its duties, in which he still continues. In 1846 he became one of the editors of the *American Journal of Science*, established by Prof. Silliman, and in 1878 the proprietor of this journal, in which he was associated with his son, Mr. Edward S. Dana. In 1837 he published a *System of Mineralogy*, the fifth edition of which was issued in 1868. As results of his exploring-expedition labors he published in 1846 *Report on Zoophytes*; in 1849, *Report on the Geology of the Pacific*; and in 1852-54, *Report on Crustacea*, each report in quarto and illustrated with folio volumes of plates. In 1862 he published his *Manual of Geology*, which reached its third edition in 1880; and in 1872 his *Coral and Coral Islands*. His smaller works are a *Manual of Mineralogy* (1854, the third edition of which appeared in 1878 under the title *Manual of Mineralogy and Lithology*), *Text-Book of Geology* (1863, 1874, 1877), *The Geological Story briefly Told* (1875). He is the author of many memoirs on geology, mineralogy, and zoology, published for the most part in the *American Journal of Science*.

DANA, RICHARD HENRY (1787-1879), a distinguished American poet, was born at Cambridge, Mass., Nov. 15, 1787. He was a son of Chief-Justice Francis Dana, and was educated at Harvard, but having taken part in a college rebellion in 1807, refused to submit to the terms imposed, and finished his studies privately at Newport. In 1819 the college authorities, relenting, conferred on him the degree as of 1808. He studied law at Boston and at Baltimore, and was admitted to the bar in the former city in 1811. For a time he took an active part in politics and was a member of the legislature, but on account of infirm health and his literary inclinations he abandoned his profession. He was one of the founders of the *North American Review* in 1814, and in it his first writings were published. In 1818 he became associate editor of the *Review*, but two years later withdrew, and for a year published a serial consisting of tales and essays, and called *The Idle Man*, in which he was assisted by his friends, W. C. Bryant and Washington Allston. In 1825, Mr. Dana contributed to the *New York Review*, edited by Bryant, his first poem, "The Dying Raven," and in 1827 appeared his most celebrated poem, "The Buccaneer." His collected poems and prose writings were published in 1833, and again in 1850. He also delivered a course of lectures on Shakespeare, which evinced a profound study of the characters delineated by the great master. In the Unitarian controversy in Massachusetts about 1830, Mr. Dana, then a Congregationalist, took an active part on the Trinitarian side, but he subsequently joined the Episcopal Church. He died at Cambridge, Mass., Feb. 2, 1879. While he

wrote but little, and never attained popularity, his poems have been highly esteemed and praised by the ablest critics. His style is severe in its simplicity; his power lies in his dramatic treatment of the strong and gloomy passions, yet he also excels in pathos and in descriptions of certain aspects of Nature.

DANA, RICHARD HENRY, JR. (1815–1882), an American lawyer and author, son of R. H. Dana the poet, was born at Cambridge, Mass., Aug. 1, 1815. He entered Harvard College, but during his course an attack of measles so injured his sight that he gave up his studies, and Aug. 14, 1834, shipped as a common sailor on the brig *Pilgrim* on a voyage to California around Cape Horn. This adventure he afterwards described in his entertaining volume, *Two Years Before the Mast*, which passed through numerous editions, was republished in England, and translated into several European languages. He returned thoroughly invigorated in health, resumed his studies, graduated at Harvard in 1837, studied law, and at the same time acted as tutor in the college. In 1840 he was admitted to the bar, began to practise, especially in admiralty cases, and the next year published a manual of the laws and customs of the sea, called *The Seaman's Friend*, republished in England as *The Seaman's Manual*. He was engaged in some of the most prominent cases in the New England courts, defended the right to use the Bible in the public schools, and discussed the relations between the civil law and the ecclesiastical laws of different denominations. In 1848 he took part in the convention at Buffalo which formed the Free-Soil party, and in 1853 was a member of the Massachusetts constitutional convention. He defended the rescuers of the slave Shadrach in 1853, and of Anthony Burns in 1854, and was in consequence brutally assaulted on the street. When the Republican party arose he became a prominent member of it, taking part in all the Presidential campaigns from 1856 to 1876. In 1859 and 1860 he made a voyage around the world. In 1861 he was appointed United States attorney for Massachusetts, and became noted for his arguments in the prize cases occasioned by the war, the principles he laid down being confirmed by the decision of the United States Supreme Court. He drew up the prize act of 1864. In 1866, Mr. Dana received the degree of LL.D. from Harvard College, and for a time delivered lectures on international law in the law school of that college. In 1867 and 1868 he was a member of the Massachusetts legislature and chairman of the committee on the judiciary. In 1868, at the request of the family of Mr. Wheaton, he published an edition of Wheaton's *Elements of International Law*, enriched with valuable notes, which were frequently cited in the arbitration of the Alabama claims at Geneva in 1872. This work, however, led to a most unpleasant controversy with Mr. W. B. Lawrence, who, having also published annotated editions of Wheaton's *Elements* in 1855 and in 1863, charged Mr. Dana with infringing his copyright. In 1869 he republished his popular work, *Two Years Before the Mast*, with an additional chapter, giving an account of his later visit to California and further information about persons and ships mentioned in the work. His other literary labor consisted chiefly of contributions to the *North American Review* and memoirs of Prof. Edward Channing and Washington Allston prefixed to their published works. In 1876 he was nominated by President Grant as minister to England, but on account of the dispute with Mr. Lawrence was rejected by the Senate. He afterwards went to Europe to pursue his studies in international law, and died at Rome, Jan. 7, 1882.

DANBURY, a town of Connecticut, one of the county-seats of Fairfield county, on Still River, and at the junction of the Danbury and Norwalk Railroad with a branch of the Housatonic Railroad, 67 miles by rail N. N. E. of New York. It is also on the New York and New England Railroad. Danbury con-

tains a court-house, 2 national banks and 2 savings, 9 churches, a large subscription library, 2 hotels, and an opera-house. The making of hats is extensively carried on, and is the principal industry; sewing-machines, shirts, and boots and shoes are also manufactured. Danbury was settled in 1684, and was attacked and burned by the British under Gen. Tryon, in 1777, when the patriot, Gen. Wooster, fell, mortally wounded. The township has a population of 11,666, of whom about 9000 live in the borough.

DANIEL, BOOK OF. The most common form of the traditional opinion concerning this book is that it was written by Daniel himself, that the narrative parts of it are faithful records of historical events, and that the predictive parts are genuine prophetic anticipations of the future. The traditional opinion has been greatly divided as to whether these predicted events close with the times of Antiochus Epiphanes, or extend forward so as to include the Roman Empire and the coming of Christ. But the article in the *ENCYCLOPÆDIA BRITANNICA* holds that the book was either originally written, or at least written in its present form, as late as the reign of Antiochus Epiphanes (175–164 B. C.); and that the predictive parts of it are therefore history presented in the form of prediction, and the narrative parts, probably, stories of fictitious events; both written, of course, for pious and patriotic purposes.

The proof that Daniel himself wrote the book is, strictly speaking, not decisive. The title may conceivably be counted as indicating the subject of the book, and not its author; although ancient tradition uniformly understood it as pointing to the author. But the proof that Daniel was a historical personage, and that the book was written either by himself or by some contemporary of his (that is, as early as within the time of one generation after his death), stands on a footing altogether different.

In evidence of the late composition of the book it is alleged that it has not those marks of a Babylonian origin which we should look for in a work written in Babylonia in the times in which Daniel is said to have lived, though it is admitted that it bears the impress of Babylonian ideas to a certain extent. The alleged late author of the book, it is affirmed, must have been a student of history, and was quite successful in his attempt to reproduce the times of which he treated. But he was not so successful that modern criticism cannot detect his failures. It would be impossible to avoid the admission that this Babylonian element is in the book of Daniel. The evidence for it is clear and abundant. But in the face of it, any proofs drawn from the book itself to the effect that it was not written in Babylon nor till long after the Babylonian period, need to be equally unmistakable, in order to entitle them to recognition.

It is said, for example, that the writer of the book of Daniel has blundered in his use of proper names as no one would have blundered who had lived in Babylon before the Persian period. "The writer of Daniel evidently supposes that Belteshazzar is compounded with the name of Bel," and is mistaken in so supposing. But we need not necessarily hold that he supposes so. The king's language in the verse cited may imply no more than that there was a resemblance between the names. Moreover, in the present state of knowledge, one had better be modest in his assertions that there is here no genuine etymological connection. And even if it be admitted that the writer intended to derive Belteshazzar from Bel, and that he is mistaken, it is still the easiest thing in the world to explain this as an instance of philological corruption, like those which are supposed to be found in the names Hamelsar (Melzar) and Abed Nego. And if it be conceded, as it seems that it must be, that the two latter are, lingually, corrupt Babylonian names, and that Arioch is the revival of an ancient Accadian

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name, this has a positive weight in favor of the Babylonian origin of the book, which no merely negative testimony can counterbalance.

It is further alleged that the names Ashpenaz, Shadrach, and Meshach "cannot be explained at all." But, like many other things that we cannot yet explain, they may nevertheless be facts.

The book is said to contain nine or more words of Persian origin, while no Persian words occur in Ezekiel, Haggai, Zechariah, or Malachi. But Daniel is represented as having lived till after the Persian conquest. And until the Persians conquered the Babylonians they had been subject to the Babylonians. There must have been Persians at the Babylonian court. If Daniel or some contemporary, much of whose life was spent at court, wrote this book, there is nothing strange in its containing Persian words, even if men like Ezekiel, whose lives were spent away from court, used no Persian. There are Persian words in Ezra and Esther, as well as in Daniel. Moreover, according to Zöckler, of the seven Persian words which occur in the Chaldee of Daniel, only one is found in that of the Targums. The book of Daniel, therefore, seems to belong to an earlier period, when the Persian influence was very strong, leading to the introduction of many Persian words into the Israelitish vocabulary, and not to a latter period when this influence had faded, and the Persian words had been mostly dropped.

Stress is also laid upon the fact that the book contains three or four Greek names of musical instruments. It is argued that this shows that Daniel cannot have been written until some time in the Greek period, after the fall of the Persian empire. We are even asked to notice that among the musical instruments mentioned is the Greek *Symphonia* or bag-pipe, an instrument which was a favorite of Antiochus Epiphanes. Has not this great weight to prove that the writing of the book belongs to the times of that monarch? If this be reasoning we may, by processes precisely parallel, prove the writing of the book to have been contemporaneous with almost every music-loving Greek prince from Agamemnon down. If any one of the Greek names of musical instruments mentioned in this verse can be cited in evidence as to the date, it is the term *κitharis*, lyre. This is a Homeric word. The Greek translation has, instead of it, *κithára*, which is the current form in all Greek writings except the earliest. The inference is that this narrative was most probably written before the latter of these terms had superseded the former in common usage—that is, not much later than the time of Daniel. For the rest, why should not Greek minstrels find their way to the luxurious Babylonian court as early as the reign of Nebuchadnezzar, bringing Greek terms with them? And if, in the times of Joel, the Tyrians had been in the habit of selling Israelites as slaves to the Grecians (Joel iii. 6), what should hinder a few Greek terms from having found their way into the vocabulary of a contemporary of Daniel? Long before the birth of Daniel, Sargon of Assyria claimed Javan among his tributaries. Strabo testifies (xiii. 3, 2) that there was a Greek element in the armies of Nebuchadnezzar.

In Dan. vi. 1 it is said that Darius the Mede appointed 120 satraps. But an inscription of Darius Hystaspis mentions only 23 satrapies. It is therefore inferred that the author of Daniel applies the term satrap to subordinate governing officers. But the Greek translator of 1 Kings x. 15 has used the term satrap in the same way. Hence it is argued that the author of the book of Daniel must have been a contemporary of this Greek translator, in the second century before Christ. By reasoning in all respects parallel to this, if a Turkish or Egyptian correspondent of an American newspaper, in the year 1884, should apply the term *Bey* to some official who was only a *Pacha*, this use of terms would prove him to be a contemporary of the author of Daniel.

To these supposed philological reasons against the

antiquity of the book certain historical reasons are added. The strongest of these has been supposed to be the mention of Belshazzar. It has been urged, not only that this man is not mentioned in other history, but that the statements made in other history are such as to show that he never existed. These difficulties were regarded as removed only in part by the discovery of Belshazzar's name in the inscription mentioned in the *ENCYCLOPÆDIA BRITANNICA*. But in 1879 an inscription of Cyrus the Great was translated by Mr. T. G. Pinches, which mentions Belshazzar, not indeed by name, but as the son of Nabonidus, and in such a way as to make the identification of him complete. This last discovery, added to what had been previously learned, sets the matter entirely at rest; Belshazzar is now known to be precisely the historical personage which the book of Daniel represents him to be. This proves that the author of this book had access to sources of historical information which have been neglected by the other historians whose works have come down to us.

Next to the difficulties in this case stress has been laid on those concerning Darius the Mede. It is not easy certainly to identify him with any person mentioned in profane history. But now that the more difficult problem of the historicity of Belshazzar has been conclusively solved it would be foolish to be over-confident that the less difficult problem concerning Darius is incapable of solution.

Certain contradictions with other history are also alleged against the first chapter of Daniel. "If the battle of Carchemish took place in the fourth year of Jehoiakim (Jer. xlv. 2), Jerusalem cannot have been captured in the third; and our one certainly contemporary authority, the prophet Jeremiah, nowhere alludes to a captivity at this period." But Dan. i. does not say that Jerusalem was captured at this time. It affirms that Nebuchadnezzar gained important successes, and that captives and spoils from the temple somehow fell into his hands, and were carried to Babylon. This was in the accession-year of Nebuchadnezzar. Coming to the throne in this year, his first year was nevertheless, according to Babylonian custom, counted from the following New Year's day, and was the 4th of Jehoiakim, and the year of the battle of Carchemish. And even if it be true that no other author mentions this particular item in the deportation of Judah, that has little weight against its historical character; for the deportation occurred in several successive expeditions, in different years. Several of these are mentioned just once and no more. See 2 Kings xxiv. 12, 17; Jer. liii. 24-30, and parallel passages.

The alleged contradictions between the different parts of the book, *e. g.*, the allegation that Arioch's introduction of Daniel (ii. 25), as "one of the captives of Judah," is inconsistent with the statements in chap. i., are too readily explicable to be of any considerable weight. And what weight they have would simply go to show that the book was composed in parts, either by one author or more than one, and not that it was of late date. Indeed, a late author, writing a piece of historical fiction, would be much less likely than a contemporaneous narrator to have left the earlier narratives in it (the account, for instance, of what became of Daniel's three companions) so incomplete; for it is characteristic of fiction of this sort to give to its creations the completeness which is often lacking in the incidents that occur in actual life.

It is further alleged that the ninth chapter "suggests a very late origin for the book by the way in which the prophets are looked back upon (ver. 6, 10); and the minute study of the works of the prophets described in verse 2 seems to many to point to a time when prophetic inspiration had ceased, and the prophetic writings (here called 'the books') were already collected." It certainly points to a time when there were already collections of the sacred books; but that is not necessarily a time when prophetic inspiration had

ceased. This passage may prove that the Jews possessed and studied collections of the prophetic writings, during the 70 years of the captivity, instead of proving that the book of Daniel was written at a later date.

Again, it is urged that this book teaches the doctrine of a resurrection, and of angels; and must have drawn these from Persian sources, and must therefore be of late origin. But even if it be admitted that the book drew these doctrines from Persian sources, those sources may easily have been within the reach of such a man as Daniel, in the times of Cyrus, or even in those of Nebuchadnezzar. And if the presence of these doctrines proves the late origin of Daniel, then it equally proves a late origin for the 25th of Isaiah, for many of the Psalms commonly ascribed to David, and for other parts of the Old Testament. The more usual modes of weighing evidence would lead one to pronounce the doctrines ancient, on the ground of their being mentioned in so many ancient documents, rather than to assume that the doctrines cannot be ancient, and that the writings which contain them must therefore forfeit their claim to antiquity.

Finally, it is alleged that the predictive element in Daniel is evidently of the apocalyptic order, and not genuine prediction (even if there is any such thing as genuine prediction), and therefore must have been written after the event. This argument would have no weight except with those who believe that the predictions of the book terminate upon Antiochus Epiphanes. If any of its predictions point to events later than his time, they, of course, are genuine and not merely apocalyptic. And if none of them do this, it is still conceivable that they may be genuine, if there be any such thing as genuine prediction, and, therefore, that the book may be of earlier date. And it would hardly be claimed that the ear-marks by which these predictions are said to be shown to be spurious are such as to convince one who believes in the possibility of genuine prophetic prediction, and who is not otherwise convinced of the late origin of the book.

Men who hold to the impossibility of predictive prophecy must of course regard the book as following the course of history down to the times of Antiochus, and must regard this circumstance as determining its date. But apart from this it can hardly be said that there is any very strong internal evidence for dating it later than the times of Daniel. The external evidence of its early date is very strong, but can be briefly presented.

First, there can be no doubt that Daniel was regarded as one of the books of the Old Testament canon from the earliest times in which we can trace the existence of that canon. All the evidence, therefore, which goes to prove that the Old Testament was complete as early as about 400 B. C. goes to prove that the book of Daniel was then already in existence. (See BIBLE.)

Secondly, Josephus testifies (Ant. xi. 8, 5) that the book of Daniel was shown to Alexander the Great, by the high priest Jaddua, about B. C. 333; and that Alexander was greatly influenced by finding in it the predictions concerning himself. This implies, of course, that the book was then already old enough so that the fulfilment of its predictions would seem remarkable. It is currently objected to this that much of what Josephus says about Jaddua is in contradiction with the statements of the book of Nehemiah, and is therefore fabulous, and hence that this statement of his cannot be depended upon. But it is shown in the article on the BIBLE that the other parts of his account of Jaddua can be depended upon. This gives the greater credibility to his statement concerning the book of Daniel.

Ewald assigns the first part of the apocryphal book of Baruch to the times of the Persian empire. But this book (i. 1, and ii.) clearly presupposes the existence of our book of Daniel. In 1 Mac. ii. 59, Mattathias, during the lifetime of Antiochus Epiphanes, is represented as citing Daniel and his companions along with

Abraham, Caleb, Elijah, David, and other ancient worthies. Passages in the other apocryphal books, in the Septuagint, and in Zechariah, are claimed as presupposing the existence of the book of Daniel, in a continuous chain of evidence, back to the time of Ezra and the second Temple. And although much of this evidence is disputed, it may at least fairly claim to be of greater force than the evidence for the late origin of the book.

Finally, there is a close connection between the view one takes of the date of this book and his view of its character. If written in the Maccabean times, it is merely apocalyptic. On this hypothesis, it is difficult to see what claim it can have to a place in the canon, even if the canon had then still been open for the receiving of new books. In fact, those who hold to its late origin are quite apt to hold that its contents rank it among the apocrypha rather than among the Scriptural books. In this condition of things, the distinct testimony of the New Testament to the effect that the book of Daniel is genuinely Scriptural, prophetic, and predictive (e. g., Matt. xxiv. 15), must also count as testimony to its early origin.

Literature.—Recent works on Daniel are Dr. James Strong's translation of Zöckler's *Commentary* in Schaff's *Lange's Commentary* (1876), and the article on Daniel in McClintock and Strong's *Cyclopedia*, which is especially full in its bibliographical lists. Older American works of value are the commentary of Prof. Moses Stuart (1850), and that of Prof. Cowles (1867). (W. J. B.)

DANIELSONVILLE, a borough of Windham co., Conn., is on the Quinebaug River, on the Norwich and Worcester Railroad, 26 miles N. N. E. of Norwich, and 4 miles W. of the Rhode Island line. It has 2 banks (1 national), a weekly newspaper, 3 hotels, 5 churches, a high-school, and other schools. It has several cotton-mills and other manufactories. Population, 3118.

DANSVILLE, a village of Livingston co., N. Y., is on Canaseraga Creek, and on the New York, Lackawanna, and Western Railroad, 44 miles S. of Rochester. It is the terminus of the Erie and Genesee Valley Railroad, and of the Dansville branch of the Genesee Valley Canal. Its abundant water-power is used in 4 paper-mills, flour-mills, planing-mills, machine-shops, woollen-factories, and a tannery. It has 2 banks, 3 hotels, 2 weekly newspapers, a public library, 8 churches, a seminary, and good private schools, and the "Home Hygienic Institute," a large water-cure establishment. The village is surrounded by hills, which furnish building- and flagging-stone. It was incorporated in 1845, and is named from Daniel P. Faulkner, who settled here in 1798. Population, 3625.

DANTE. There is no evidence of American acquaintance with Dante before the present century. In 1807, Lorenzo da Ponte, a Venetian of some literary attainments, came to New York, and in the years that followed gave instruction there in Italian, reading more or less of Dante with over fifteen hundred pupils; yet he accomplished little to remove the ignorance of Dante which had prevailed ever since the country was settled. In 1815, Mr. George Ticknor of Boston, after procuring with some difficulty a copy of the *Divine Comedy* in Italian, found it impossible to obtain any help in reading it. Failing in his attempt to study here, Mr. Ticknor, on visiting Germany in that same year, met Balhorn, "who knew everything about Dante," and who was at that time tutor to some small prince at Göttingen. Balhorn was persuaded by the offer of some fine cigars to read and explain the *Divine Comedy* to Mr. Ticknor, who became so absorbed in its study that it was one of the few books that he constantly carried about with him.

In 1814, Cary's translation appeared in England, and soon found readers in America, so that after 1820 allusions to Dante are occasionally met with in the American magazines, and in 1822 an American reprint of

Cary's version was made. The first article upon Dante which ever appeared in America was a review of this translation in the *North American* for March, 1819, by Mr. John C. Gray; which is full of interest, not only as the first American essay on the poet, but as showing the way in which the *Divine Comedy* was read by one who was still under the influence of the classical models of the eighteenth century. Mr. Gray, however, was soon to have another companion in his study of Dante. Mr. Longfellow, referring to his stay in Rome in 1827, writes in *Outre-Mer*: "In poring over the gloomy pages of Dante, or 'Bardello's laughing tale,' I protract my nightly vigil till the morning-star is in the sky;" the first record of a study which was to continue until his death.

In 1830 the Rev. E. D. Griffin gave a course of lectures at Columbia College on Roman, Italian, and English literature, devoting at least one lecture to Dante; but the course was soon ended by his early death. About the same time, Mr. Ticknor, who had been appointed to a professorship at Harvard, was giving those lectures upon Dante which were to do so much toward exciting an interest in the poet. Though not a man of distinct creative genius, he had a rare appreciation for all that was best in literature, and his return, fresh from contact with the leaders of European thought, served as one of the chief stimuli to the literary life of Boston in the years that followed. His influence upon the study of Dante was very great personally, and his rank as a Dante scholar is attested by his intercourse with Prince John of Saxony in 1836; but, unfortunately, he never published his notes on the *Divine Comedy* which he made in 1832, of which Count Circourt wrote later to Mr. Prescott, "The commentary which Mr. Ticknor has begun is one of the highest interest. Few persons in the world are so intimately acquainted with the old bard, and nowhere, perhaps, such a combination of profound learning, acute criticism, and serene elevation of mind can be found as in this highly gifted and excellent man." The next work on Dante, after an appreciative essay by Miss Inglis in the *North American* for October, 1833, was the translation of the three extracts from the *Purgatorio* by Mr. Longfellow which he published in the *Voices of the Night* in 1839, and republished in 1845 in his *Poets and Poetry of Europe*, and which he afterwards incorporated, with some slight changes, in his translation of the whole poem; the translation being of special interest as showing that he had already adopted the principle of literal, verse-for-verse, unrhymed translation. "In 1836," writes Dr. Parsons in 1865, "my father took me with him to Italy, and there I became enamored of the *Divine Comedy*." As a result of that visit he published in 1843 the first volume relating to Dante that ever appeared in America—a thin book containing a rhymed translation of the first ten cantos of the *Inferno*, prefaced by the well-known lines on a bust of Dante, and containing a few notes and a brief essay to the reader. In the same year one of Mr. Longfellow's letters shows that he was still busy with Dante. "How different from this gossip," he writes, "is the divine Dante with which I begin the morning! I write a few lines every day before breakfast. It is the first thing I do—the morning prayer—the keynote of the day. . . . I really have but a few moments to devote to it daily, yet daily a stone, small or great, is laid on the pile." In 1859 he again writes: "Long, long ago I planned a book to be called *An Introduction to the Study of Dante*. It was to contain a translation of—1. Boccaccio's Life; 2. The *Vita Nuova*; 3. The Letter of Fra Hilario; 4. The Vision of Frate Alberico; 5. Schelling on the *Divina Commedia*; 6. Anecdotes, etc. from the *Novellieri*; 7. The best things said upon Dante by Carlyle, Macaulay, and others, etc.," adding that he had relinquished the design, which afterwards he was to undertake again with such success.

After the publication of Dr. Parsons' translation in 1843 the only important contributions to the study of

Dante were an essay by Mr. S. G. Brown in the *North American* for April, 1846; another by Dr. Schaff in the *American Whig Review* for August, 1848; and a translation of the second canzone of the *Convito* by the Rev. Chas. T. Brooks in the *Crayon* for February, 1858, "the happiest version of one of Dante's minor poems that exists in our language;" until, in 1859, Prof. C. E. Norton published in the *Atlantic*, and afterwards reprinted for private circulation, an essay on the *Vita Nuova*, with translations which won the praise of "tender and just" from Mr. Ruskin. It was ably reviewed by Mr. L. G. Ware in the *Christian Examiner* for November, 1862. Mr. Norton followed this work by a review in the *Atlantic* for May, 1861, of Tamburini's edition of Benvenuto da Imola's comment, which thoroughly exposed the worthlessness of that work. In 1863, Mr. Longfellow, partly from need of congenial occupation and partly in consequence of friendly urgency, was led to resume his work on Dante, and for the next four years he devoted himself to the translation of the *Divine Comedy*, meeting Mr. Lowell and Mr. Norton every Wednesday evening to go over the proof-sheets and to discuss every doubtful passage in the poem with their help and the help of all the early comments. Early in 1865 ten copies of the translation of the *Inferno* were printed, of which five were sent to Florence with a special dedication, reaching there in time for the celebration of the sixth centenary of the poet's birth in May. For this centenary Dr. Parsons had published another edition of his translation, increased to seventeen cantos, with a dedicatory letter addressed to the duke of Sermoneta. Mr. Norton, too, had printed for private circulation a small but valuable volume on the original portraits of Dante, illustrated by photographs from the death-mask and from the fac-simile of Giotto's picture of the poet in the Bargello at Florence, which he also sent to Italy; while Vincenzo Botta paid his tribute to his mother-country by sending his volume entitled *Dante, as Philosopher, Patriot, and Poet*. In April, 1866, Mr. Norton prepared the way for Mr. Longfellow's forthcoming translation by his able review in the *North American* of several new translations of the *Divine Comedy*, in which, after a critical discussion of the difficulty of adhering to rhyme and of the limits of translation, and after giving high praise to Dr. Parsons' work, he decides in favor of a literal, line-for-line translation in the metre of the original. In the following year Mr. Longfellow published his translation of the *Divine Comedy*, which at once won the praise, which it has ever since maintained, of being "the most faithful version of Dante that has ever been made." Only a short time before his death he expressed an intention of going over the work once more and revising his translation, but deferred it until Mr. Lowell should return from Europe. In the same year Mr. Norton republished his essay on the *Vita Nuova*, but so changed as to be almost a new work; the whole of the *Vita Nuova* had been translated in the same literal style, "following the footing of his feet," which Mr. Longfellow had adopted, and to it were appended a body of admirable notes and several essays, comprising all, and more than all, that had appeared in 1859. In 1867, too, Dr. Parsons completed his translation of the *Inferno*, which has maintained its position as second only to that of Mr. Longfellow. Since that time he has been at work upon the *Purgatorio*, publishing it canto by canto in the *Catholic World*, the twenty-first canto appearing in December, 1881. Of the many reviews that these translations called forth, mention can be made only of those by Mr. Norton in the *North American* and the *Nation*; that by Mr. G. W. Greene in the *Atlantic*; and that by Mr. John Fiske in his *Unseen World* in 1876. In 1872 appeared the contribution of the last of America's four great Dante scholars to the study of the poet, Mr. Lowell's review of Miss Rossetti's *Shadow of Dante*, in the *North American* for July, and this, somewhat enlarged, forms the first essay in the second series of

Among my Books, which appeared in 1876. This essay, the finest ever written upon Dante, supplemented his biography of the poet in the *American Cyclopædia* in 1859, which also deserves the praise of being the best biography of Dante ever written. A course of lectures on the poet was delivered in Boston before the Lowell Institute in the autumn of 1880 by Mr. Luigi Monti, and an able essay appeared anonymously in the *American Catholic Quarterly Review* for October of the same year.

From influences taking their rise in the courses of Profs. Lowell and Norton at Harvard, and having perhaps a remote origin in the lectures of Mr. Ticknor fifty years before, and in the meetings at Mr. Longfellow's and at Mr. Norton's while they were working upon their translations, there was formed in the winter of 1880-81 the Dante Society, whose object was "the encouragement of the study of the life and works of Dante." Mr. Longfellow accepted the presidency of the society, and its growth and prosperity have been chiefly due to his constant interest in all relating to Dante. The work of this society is yet in the future, but it already has a membership of fifty, and, with Dante scholars at its head like Mr. Lowell and Mr. Norton, it may well be expected to continue the work which America has already done in the study of Dante.

(P. C. K., JR.)

DANVERS, a town of Massachusetts, in Essex co., is 19 miles N. by E. of Boston, on the Boston and Maine Railroad (Newburyport division), and on the Salem and Lawrence Railroad, near its junction with the Salem and Lowell branch. It has a national bank and a savings bank, 2 newspapers, a high school, the Peabody Library (free), and extensive manufactures, chiefly of boots and shoes. The adjacent village of Danvers Port has a tide-mill, and is accessible by sea-going vessels, being situated on Porter's River, an arm of Salem Harbor. Danvers is the seat of the Massachusetts Insane Asylum, one of the largest institutions of the kind in this country. The township contains also Danvers Centre and Putnamville, and is celebrated for its onions. Population of township, 6597.

DANVILLE, a city of Illinois, county-seat of Vermilion co., at the forks of Big Vermilion River, 124 miles by rail S. of Chicago. Through the town pass the following railroads: the Chicago and Eastern Illinois, the Indianapolis, Bloomington, and Western, the Wabash, St. Louis, and Pacific; and the Danville, Olney, and Ohio River Railroad here terminates, as also the Cairo division of the Wabash system of railways. Danville is in a fertile and well-timbered region. Coal-mining is a leading industry. The city has a court-house, 14 churches, an opera house, a high school, a national bank, locomotive, car, and railway shops. Population in 1870, 4751; in 1880, 7733.

DANVILLE, the county-seat of Boyle co., Ky., is in the centre of the State, 114 miles S. of Cincinnati, on the Cincinnati Southern Railroad. It has a court-house, 3 hotels, 3 national banks, 2 weekly newspapers, 12 churches, and the State institution for deaf mutes. It is especially noted for its educational facilities, having an academy, the Caldwell Female College, Centre College, a Presbyterian institution founded in 1819, with which a theological seminary has been connected. Its industries are limited to a planing-mill and flour-mills. The town was first settled in 1783, and was the first capital of Kentucky. It is a handsome town, lighted with gas, and the surrounding country is famous as the Blue-grass region. Population, 3074.

DANVILLE, a borough of Pennsylvania, county-seat of Montour co., on the N. bank of the Susquehanna (North Branch), 67 miles N.E. of Harrisburg. The Catawissa, the Lackawanna and Bloomsburg, and the Danville, Hazleton, and Wilkesbarre Railroads accommodate the business of the town. Mon-

tour's Ridge, just N. of Danville, affords limestone and good iron ore, and anthracite coal is mined near at hand. The town is the seat of extensive iron-works, turning out pigs, castings, railway-iron, bars, and other forms of iron in great variety. Danville has about 20 churches, a State insane asylum, 3 weekly newspapers, 2 national banks. Population, 8346.

DANVILLE, a city of Virginia, in Pittsylvania co., is on the S. bank of the Dan River, and on the Richmond and Danville Railroad, the Lynchburg and Danville Railroad, the Danville and New River Railroad, and the Piedmont Railroad, 141 miles W. S.W. of Richmond, and 4 miles N. of the North Carolina line. It has gas- and water-works, 4 banks (1 national), 1 daily and 2 weekly newspapers, 10 churches, an academy, 2 female colleges, and good schools. It has good water-power, a cotton-mill, flour-mill, grist-mill, foundry, and 40 tobacco-factories. It is the centre of the fine yellow tobacco section, and 30,000,000 pounds of leaf-tobacco are sold here annually. Population, 7526.

DARBY, JOHN NELSON (1800-1882), an English theologian and founder of the religious body commonly known as the Plymouth Brethren, was born at Westminster, London, Nov. 18, 1800. He was educated at Trinity College, Dublin, where he graduated with high classical honors. He studied law and was called to the bar, but afterwards took orders in the Church of England. About 1827 Mr. Edward Cronin, of Dublin, having investigated the nature of the Christian Church, began to deny the need of officers or ordination, asserting the right of believers, as such, to "break bread" whenever they met together as disciples of Christ. Mr. Darby soon joined the few who held these new doctrines, and they held religious meetings at a private house, but did not separate from their respective churches. Mr. Darby published a pamphlet *On the Nature and Unity of the Church of Christ* (1828), which had the effect of spreading their views. In 1830 he went to Paris and afterwards to the English Universities, and in 1832 he withdrew from the Established Church. In that year he first visited Plymouth, where he found persons of kindred views, among whom he soon became a leader. Other persons prominently connected with the movement were A. N. Groves, who became a missionary to Bagdad, B. W. Newton, and at a later period S. P. Tregelles and George Müller, of Bristol. In the society which they formed they renounced all distinctive names, calling themselves simply "Brethren," but as the advocates and propagators of the views came chiefly from Plymouth, they became known as the Plymouth Brethren; on the continent of Europe they are known as Darbyites. In his *Christian Liberty of Preaching and Teaching the Lord Jesus Christ* (1834), Darby maintained that all believers had equal right to preach, though not equal gifts. In the *Christian Witness*, a periodical which he established in 1834, and in various pamphlets, French as well as English, he asserted the universal apostasy of the Christian Church, maintaining that every system, Protestant and Catholic, had failed by unfaithfulness and is condemned. But individuals are still saved by the grace of God and receive the gifts of his Spirit, which they are to use for the good of others, but they must withdraw from the corruptions of existing churches. Mr. Darby gave considerable attention to the exposition of the prophecies of Scripture. In 1838 he went to Switzerland, where he labored with considerable success, and engaged also in controversy with the Methodists. Here he prepared and issued, first in French but afterwards in English, a *Synopsis of the Books of the Bible* (5 vols.). In 1845 he returned to England and found dissensions existing at Plymouth. After investigation Darby withdrew from fellowship with Mr. Newton, the leader of that meeting, charging him with fundamental doctrinal error. Yet he did not altogether renounce fellowship with some who sympathized with Newton, as some more exclusive mem-

bers insisted on doing. This division has continued to exist and to affect seriously the growth of Plymouthism. Mr. Darby was incessant in his labors with his pen, producing numerous pamphlets on religious questions of the day, in exposition of the Scriptures and on controversies connected with his peculiar views. His work on *The Sufferings of Christ* (1858) did not meet with the usual warm approval of his followers, yet no division took place among them in consequence. His subsequent work on *The Righteousness of God* (1859) had a similar effect. In 1860 and later he visited the brethren in Canada, and in 1870 he extended his journey into the United States. Special interest was excited during his later visits, and meetings were established in several cities. In 1876 he went to Australia and New Zealand, making converts and forming societies. He had continued to labor much on the continent of Europe, especially in France, Switzerland, Spain, and Italy. About 1879 a division similar to the one already mentioned took place among his followers in London, the seceders following William Kelly, a notable writer of the body. Mr. Darby died at Bournemouth, April 9, 1882.

Darby's writings comprise controversial, doctrinal, practical, and devotional treatises, yet he gave most prominence to the exposition of the Scriptures. He was an able scholar of the original languages of the Bible, and translated the Bible into German and the New Testament into French. Many of his writings were notes of lectures which he had delivered, and many were brief tracts. Altogether they are said to amount to eighty volumes. The most important of them have been edited by W. Kelly.

DARLEY, FELIX O. C., an American artist, was born in Philadelphia, July 23, 1822. Darley's first artistic work was done while he was engaged as a clerk in a mercantile house. His early drawings were chiefly of a humorous character, and he was employed to furnish the illustrations for certain humorous works, and otherwise was encouraged to devote himself exclusively to art. His early designs are creditable as the performances of an untrained young man, but do not more than hint at the excellence which he afterwards achieved. They show, however, that from the first his sense of humor was keen, and that he was a quick observer of the characteristic traits of common humanity. Having resolved to devote himself to the practice of art, he seems to have found sufficient employment to keep him busy, although at that time very little was done in the way of publishing original book, magazine, and newspaper illustrations in the United States. Darley, however, had the field, such as it was, pretty much to himself. By 1850, when he was solicited by the Art Union to make some illustrations of Irving's humorous writings, to be offered to its subscribers as premiums, he was as much a master of his craft as he ever became. He prepared two sets of designs for the Art Union, one illustrating *Rip Van Winkle* and the other *The Legend of Sleepy Hollow*, and these were in every respect so felicitous that they at once advanced him in the estimation of the public to the front rank of American artists. These drawings were in outline—a style which is open to objections on artistic grounds; but for which the artist has a decided predilection. To say that these admirable designs did full justice to their subject would be to award them but partial praise, for if any comparisons were to be made between author and artist it would be in favor of the latter. The illustrations to the two stories of Irving, above mentioned, were made to order, but the other set of outline drawings, which have proceeded from Darley's hand, were executed for his own satisfaction, and owe their origin to his intense interest in their subject. A curious novel of Sylvester Judd, entitled *Margaret*—which contains some strong characteristics, and some very realistic descriptions of certain long-extinct phases of New England rural life—furnished the materials for one set, which was published

in 1856, and Hawthorne's romance of *The Scarlet Letter* the materials for the other. These outline-drawings very adequately represent Darley's genius, and, without disparagement to many other admirable designs executed by him, they may be said to constitute the most valuable portion of his life-work. Among the other important set of designs made by Darley are those in illustration of Cooper's and Dickens' novels. These drawings are in light and shade, and they include all classes of subjects from the most tragic to the most comic. Darley has been a frequent contributor to the illustrated newspapers and magazines, and he has supplied an immense number of designs for books. Although his chief employment has been as an illustrator, he has produced a considerable number of independent works, some in black-and-white and some in color. He was one of the original members of the American Society of Painters in Water Colors, and he has employed the aquarelle method in nearly all of his color work. Darley has made one or more visits to Europe, and has returned to America with greatly enriched portfolios. Among his exhibition pictures of a representative character may be mentioned *The First Blow for Liberty*, *Foraging in Virginia*, *Giving Comfort to the Enemy*, *Attacked by Indians*—this picture was painted for Prince Napoleon—*Puritans Surprised by Indians*, *The School-Boy*, *The March to the Sea*, *The Sheepfold*, *Feeding the Pet*, *Cold Snack*, and *Cavalry Charge at Fredericksburg*. This last-mentioned work was at the Paris Exhibition of 1867. Darley was elected a full member of the National Academy of Design, New York, in 1852, and is a member of the Artists' Fund Society of New York. He is a great artist, and, all qualities being considered, it may be doubted whether America has produced a greater one. That he has done more than any other one artist to advance the interests of American art by educating the public to a genuine liking for pictures, and to a consequent appreciation of certain artistic qualities, is certain. Darley's designs, while being marked by technical qualities of no mean importance, and without, in the majority of instances, descending to the commonplace, were fairly within the understanding and appreciation of a public which had no very elevated artistic standards; and they performed an educational work to which the artist's rivals of the present day are indebted for many of their opportunities. (W. J. C., JR.)

DARLING, GRACE (1815-1842), an English heroine, was born at Bamborough, Northumberland, Nov. 24, 1815. Her father was the keeper of the Longstone lighthouse, on one of the Farne Islands, off the coast of Northumberland. On the night of Sept. 6, 1838, the steamer *Forfarshire*, on its way from Hull to Dundee, was wrecked on the rocks of one of the Farne group. There were 53 people on board, of whom 38 were drowned, 6 escaped by means of a boat, and when day broke on the succeeding morning the remaining 9 were perceived clinging to the wreck, in imminent danger of being swept off by the billows. Although the sea was still fearfully raging, Grace insisted on going to their rescue. She induced her father to aid her in launching a boat, and to go with her to the wreck. The exploit was successfully performed and the survivors rescued, though the storm continued so violent that it was three days before they could leave the lighthouse for the mainland. When this daring rescue became known, all Europe rang with the praise of the young heroine. Tokens of public applause were showered upon her, and a subscription of £700 was raised for her. She did not long survive her sudden fame, but died of consumption on Oct. 20, 1842.

DARLINGTON, WILLIAM, M. D., LL.D. (1782-1863), an American botanist, was born in Birmingham, Chester co., Pa., April 28, 1782. In early life he worked on a farm, then studied medicine, and received the de-

gree of M. D. from the University of Pennsylvania in 1804. Two years later he sailed to India as ship's surgeon, and afterwards published in the *Analectic Magazine* an account of his voyage under the title "Letters from Calcutta." After his return, in 1807, he practised his profession in West Chester, taking part also in politics. In the war of 1812 he raised a company in his neighborhood, and in 1814 was chosen major of a militia regiment. He was elected to Congress as a Democrat in 1815, and again in 1819 and 1821. He did much to improve the literary and social culture of the community, founding in West Chester an academy, an athenæum, and a society for the study of natural history. In 1813 he began a descriptive catalogue of the plants in Chester county, which he continued to improve and enlarge in successive editions, under the title of *Flora Cestrica* (3d ed. 1853). It is one of the most complete local Floras ever prepared. He published also *Mutual Influence of Health and Disease* (1806), *Agricultural Botany* (1847), *Agricultural Chemistry* (1847), *Memorials of John Bartram and Humphrey Marshall* (1849). He also edited in 1843 the correspondence of Dr. William Baldwin, with a memoir, under the title, *Reliquiæ Baldwinianæ*. In 1853 he published the *Sesqui-Centennial Gathering of the Clan Darlington*, which contained a genealogical account of the descendants of his ancestor, Abraham Darlington, an English Quaker. He prepared a *History of West Chester*, with a valuable paper on Mason and Dixon's Line, which was published in the *West Chester Directory* for 1857. He also published in a local newspaper *Notæ Cestrienses*, or notices of Chester county men and events. Many of his literary and scientific addresses were published in pamphlet form. His style was easy, mingling wit and humor with knowledge and instruction. In 1848, Yale College conferred on him the degree of LL.D., and in 1855, Dickinson College gave him that of doctor of physical science. He was a member of more than forty literary and scientific societies, among which were the American Philosophical Society and the Botanical Society of the Netherlands. His reputation as a botanist was deservedly high, and several times his name was assigned to classes of plants, but that to which it is permanently attached is the remarkable insect-eating plant *Darlingtonia Californica*. He died at West Chester, Pa., April 23, 1863. He bequeathed his extensive herbarium and his scientific works to the Chester County Cabinet of Natural Science. The following is his epitaph, composed by himself twenty years before his death: "Plantæ Cestrienses, quas dilexit atque illustravit, super tumulum ejus semper floreat!"

DARTMOOR, a desolate region in the southern part of Devonshire, England, comprising altogether about 130,000 acres. It is named from the river Dart, which rises in a swamp in the centre of the moor. (See further description in article DEVONSHIRE, in the *ENCYCLOPÆDIA BRITANNICA*.) In 1809 the British government here constructed a prison, enclosing 30 acres with a double wall, and having seven buildings, for the detention of French prisoners. It was soon after also used for the confinement of sailors taken from American vessels, who, claiming to be citizens of the United States, refused to serve in the British navy. At the close of the war of 1812 about 6000 Americans were confined in this place, some having been there for five years. When they learned of the signing of the Treaty of Ghent, they expected a speedy release, and afterward in their impatience violated some regulations. The commandant, learning of the disobedience, and apprehensive of an attempt to escape, ordered the guard to fire upon the prisoners. Five were killed and thirty-three wounded. This act produced great indignation in the United States, but is now believed to have been due to a misunderstanding. The prison has since been used for convicts, and over 1000 acres have been brought under cultivation by the inmates.

DARTMOUTH, a town of Nova Scotia, in Halifax

co., on the E. side of Halifax harbor, and 1 mile from the city of Halifax. It is the seat of the provincial hospital for the insane; has a newspaper, 5 churches, graded schools, manufactories of skates, shovels, bolts, nails, and iron bridge-work, 2 iron-foundries, boiler-works, a sugar-refinery. It was founded in 1750, and incorporated in 1873. Population, 3786.

DARTMOUTH COLLEGE, the fourth in chronological order of the New England colleges, is situated at Hanover, N. H. It owes its origin, permanent organization, and character to the Christian philanthropy and executive force of Eleazar Wheelock, D. D., a Congregational pastor at Lebanon, Conn., widely known for his earnest piety and practical wisdom. After the Great Awakening of 1740-42, in which he bore a conspicuous part as "one of the first preachers," he became convinced that "the Indians were the proper objects of charitable attention," and resolved to devote half his time to them. In December, 1754, he took two Indian boys into his family, and in June following his friend Joshua More (usually, but incorrectly, spelled Moor) gave two acres of land, with a small house and shop, to found a school for Indian youth. "Moor's Indian Charity School" in Lebanon, Conn., was the germ of Dartmouth College. The London commissioners of the Society for Propagating the Gospel gave several annual donations of from £12 to £20 in aid of it, and there were six or seven other contributions from England during the first four years. Assistance was also received from Scotland, and the enterprise was commended in a circular issued by the leading ministers of Connecticut, and again by those of New Hampshire. In 1761 the General Court of Massachusetts granted £12 for educating six Indian youths, and afterwards the legislature of New Hampshire voted a grant of £50 a year for five years. Meanwhile, the number of Indian pupils had increased to 22, and with them were associated in 1762 three of English birth, who were to be prepared as missionaries to the tribes. Dr. Wheelock wished to educate Indians of both sexes, in order to introduce the home element into their life. The defect of his plan, as proved more conclusively by later experience, was in expecting that a few young persons, well educated away from their tribes, could on their return raise their countrymen to a higher life.

The Scotch commissioners of the Society for Promoting Christian Knowledge entered into an agreement in 1764 to aid the enterprise, and appointed a board of correspondents in Connecticut, thirteen in number. Dr. Wheelock's efforts to secure a legal incorporation either from the legislature or from the king, though commenced as early as 1758, had proved unsuccessful. In 1765, Rev. Nathaniel Whitaker and the Indian preacher, Samson Occum, visited Great Britain, and raised nearly £10,000, including a gift of £200 from King George III. The earl of Dartmouth, who had liberally assisted in raising these funds, was made chairman of a board of trustees who took charge of their disbursement. Meantime, Dr. Wheelock found it necessary to change his original plan, so that the missionaries should not require to be sent away to complete their education. Various considerations appear to have moved him to change his location with the growth of his plan. He wished to secure large tracts of lands for endowment and to be nearer the Indian tribes. He also considered the need of preachers for the new settlements. Moreover, the State of Connecticut was already provided with a college.

When his project of establishing a new college became known numerous offers were made him, and his parishioners in Lebanon earnestly entreated him to remain. He sent agents to Pennsylvania, Massachusetts, and New Hampshire, and to a congress of Indian tribes at Fort Stanwix, N. Y. The reports having been submitted to the trustees in England, they decided in favor of Northern New Hampshire, where the ministers, the legislature, and the royal governor all took an interest in the project. As the more definite determi-

nation of the site was left to Dr. Wheelock, he spent eight weeks in exploration, and then selected Hanover. The liberal offers of land in that vicinity, its situation in a fertile plain on a river "convenient for transportation," and the facility of "communication with Crown Point and with Canada," were all reasons that moved him in his choice. Gov. Wentworth had by this time procured a royal charter, in which the institution was incorporated as a college and named Dartmouth, in honor of the earl who was one of the most zealous promoters of the enterprise in Great Britain. In some respects the governor had modified Dr. Wheelock's draft, and had declined to avail himself of the latter's readiness to change the name to Wentworth. The charter, dated Dec. 13, 1769, was received early in the next year, and in August, Wheelock plunged into the unbroken pine forest. Thirty students soon followed him on foot, and his family came over almost impassable roads in a coach sent by a London friend. A "hut of logs, eighteen feet square, built without stone or brick, glass or nail," received the women, while his sons and students occupied "booths and beds of hemlock boughs" till the end of October. Dr. Wheelock personally superintended the clearing of lands and digging of wells, the erection of houses, a college building, saw-mill, grist-mill, malt-house, and barns, directed the studies of his pupils, and organized a church in the wilderness. His nearest neighbor was two and a half miles distant. Among the difficulties besetting the enterprise was occasionally that of procuring provisions. Four students—three of them from Yale—constituted at once a Senior class. The first commencement, held in 1771, was attended by the governor and a retinue of gentlemen who had made their way through the almost trackless forest from Portsmouth.

From this time the college went steadily forward, but the Indian element faded out. The supposed proximity of the site to those who were intended to be benefited proved delusive. The number of Indians under Dr. Wheelock's instruction before and after the removal to Hanover is stated at 150. Among them were Isaiah Uncas, apparently the son of the Mohegan chief, and the noted Mohawk, Joseph Brant, who at a later date sent his son also to the college. Few of the Indians remained through a complete course of education, and the principal service they could render was that of schoolmaster or interpreter. With the exception of Occum, the comparatively few preachers died in early life. The influence they carried back to their tribes was too isolated and destitute of concurrent agencies to work effectually. Above all, the rising disputes between Great Britain and the colonies, which culminated in the Revolution, had begun to agitate the Indian tribes almost from the foundation of the college, and the missionaries were for more than ten years effectually excluded from the whole Indian country except that of the Oneidas.

Wheelock, worn out with care and toil, died in 1779, but not until he had given the institution the character of an ordinary American college. Of the *matériel* of the college as it existed in his day almost nothing remains. Its first edifice long ago disappeared, and its funds had been so far exhausted, while new supplies were prevented by the troubles of the Revolution, that soon after his death the whole property of the college would not have paid its debts. John Wheelock, his son and successor, nominated by him in accordance with the charter (and elected by the board), had been a member of the first graduating class, and had subsequently had five years of military life. He entered on his work with much activity; visited Europe to recover the Indian charity funds; raised money at home to erect Dartmouth Hall, which was begun in 1786 and is now standing; attended the legislatures of New Hampshire and Vermont and procured land-grants from each; was instrumental in securing the so-called Evans and Phillips professorships; erected a chapel and a building for Moor's Charity School, both now destroyed;

and by land-sales extinguished much of the college indebtedness. He also gave instruction many years. His long administration of thirty-six years ended in his removal by the trustees and the famous lawsuit, "the Case of Dartmouth College." The original controversy was of long growth, primarily a question of administration, or rather of fundamental policy, but included secondarily an ecclesiastical element, as well, perhaps, as an educational bearing. Dr. Wheelock was by vote of the trustees "excused from hearing recitations." He then presented his case to the public, and in June, 1815, appealed directly to the legislature to interfere. The trustees, with two dissenting votes, thereupon removed him from office. The suit that arose is equally noted for the settlement of a great legal principle for the country and the opening to Daniel Webster of a field for his first national fame. In response to Wheelock's appeal and the recommendation of Gov. Plumer (in which Jefferson concurred) the New Hampshire legislature passed a bill revolutionizing the college. Its name was changed to "Dartmouth University," the number of its trustees increased from twelve to twenty-one, and their appointment transferred from their own body to the governor and council. A board of overseers was to control the action of the trustees. Dr. Wheelock was made president, with two professors. For two years the college and the university were running side by side, with keen rivalry but with courteous relations.

The college trustees refused to submit, and in 1817 brought an action, first in the court of common pleas, then in the superior court of New Hampshire, against W. H. Woodward, their former secretary and treasurer, to recover the records, treasurer's books, original charter, and college seal, then in his hands and retained by him in the interest of the university. It was ably argued for the college by Jeremiah Mason, Jeremiah Smith, and Daniel Webster, and for the defendant by George Sullivan and Ichabod Bartlett. The decision, delivered by Chief-Justice Richardson for the court, was against the college. An appeal was at once made to the Supreme Court of the United States, and was argued before the full bench in March, 1818, by Mr. Webster and Joseph Hopkinson for the college, and by William Wirt and John Holmes on the other side. The decision, for the college, was rendered in 1819 by Chief-Justice Marshall, with the concurrence of Justices Washington, Johnson, Livingston, and Story, and the dissent of Judge Duvall, Justice Todd being absent.

The case is celebrated as settling the inviolability, under certain circumstances, of chartered rights, even as against the infringement of legislative and judicial bodies. The issue, as stated by the chief-justice, was, that the legislature of New Hampshire had passed "a law impairing the obligation of contracts," and thereby violating the Constitution of the United States. He held it clear that here was a contract: an application to the Crown in 1769 to incorporate a literary and religious institution, to which large contributions were to be conveyed as soon as incorporated; a grant of the charter sought; and a conveyance of the property on the faith of that charter. "In this transaction every ingredient of a legitimate contract is to be found. It is a contract such as the Constitution protects—a contract concerning property, and that private property; not a grant of political power, a civil institution, or a portion of the public possessions, nor a matter in which the government of New Hampshire alone was interested, but the funds of a private eleemosynary corporation, in which the living trustees represent the deceased donors, a contract within the letter and spirit of the Constitution, which cannot be impaired without violating the Constitution." The question whether it was impaired by the act of the New Hampshire legislature was also answered in the affirmative, and characterized as a question on which "two opinions cannot be entertained." And, though the charter was granted before the formation of the present Government, the

rights of property "remain unchanged by the Revolution." The important bearings and actual applications of this decision are beyond the scope of the present sketch. "That decision," said Chancellor Kent, "did more than any other single act proceeding from the authority of the United States to throw an impregnable barrier around all rights and franchises derived from the grant of Government, and to give solidity and inviolability to the literary, charitable, religious, and commercial institutions of our country."

When President John Wheelock was removed, Rev. Francis Brown, D. D., was elected in his place—a gentleman of excellent qualities and of great intellectual resources, which were strained to their utmost by the lawsuit and the straitened circumstances of the college. The difficulties were so great that at one time he was ready to surrender the control of the college to the State. He was worn out, and died after only five years of service. Rev. Daniel Dana, D. D., his successor, held the office but one year, and Rev. Bennett Tyler, D. D., six years; both of whom appear to have found the cares and labors too uncongenial and oppressive. During all this time of early struggle and embarrassment, however, the college was not only fairly supplied with students, but sent forth many men of great power and influence. Rev. Nathan Lord, D. D., LL. D., who followed President Tyler, was in many respects a remarkable man. He brought to the office great intellectual ability, sagacity, and discernment of character, gathered round him able professors, and brought the college on the whole to a high scholarly condition. A favorite measure of his, the abolition of all distinctions founded on scholarship, was continued through about thirty years of his administration, but abandoned after his retirement. His long presidency of thirty-five years was in its closing years somewhat clouded by a divergence of views between him and the public sentiment around, growing out of his millenarian opinions and his peculiar notions on slavery and the War of the Rebellion, which constrained him to resign his office in 1863. Rev. Asa D. Smith, D. D., LL. D., followed him, and did much to gain the sympathy and interest of the public to the college, to attract students, and to secure scholarship and other funds. After thirteen years he died exhausted by the arduousness of his labors, and was succeeded in 1877 by the present incumbent, Samuel C. Bartlett, D. D., LL. D.

To the original Dartmouth College there have been added—in 1797 a medical school, in 1852 a Chandler Scientific School, founded by Abiel Chandler, and in 1871 a Thayer School of Civil Engineering, founded by Gen. Sylvanus Thayer, who had been superintendent of West Point Military Academy. The latter was designed for a first-class engineering school; the Chandler Department or School for "instruction in the practical and useful arts of life," requiring only a common-school education in preparation for it. The New Hampshire College of Agriculture and the Mechanic Arts sustains but a quasi relation to Dartmouth College, having a minority of its board of trustees appointed by the college, and having the use of one public building in common with it.

Dartmouth College, by its history, location, and methods, has always had the good fortune to draw around it a large representation of young men in moderate circumstances and earnestly intent upon an education. These influences have impressed certain marked characteristics on the work of the college and its graduates. The college has furnished a remarkable proportion of teachers in educational institutions of every grade. It has been noted for the number of its alumni who have been eminent at the bar and on the bench. It has furnished a large number of faithful and laborious pastors and preachers, and has been well represented in the medical profession. Its graduates have done less in the fields of literature than might have been expected from their number without a consideration of other circumstances. But its entire record

is eminently honorable, and the list sometimes given of responsible positions held by its graduates is long and remarkable. Among its prominent names in public life are those of Salmon P. Chase, Amos Kendall, Thaddeus Stevens, Levi Woodbury, Rufus Choate, Daniel Webster, and many others, judges, governors, Congressmen, and foreign ministers. Its list of medical graduates includes such men as Reuben Dimond Mussey and Edmund Randolph Peaslee. Among its literary men may be mentioned George Ticknor, George Bush, Thomas C. Upham, George P. Marsh, James Marsh, Caleb S. Henry, Samuel Hopkins, George Punchard, Joseph B. Felt, Charles D. Cleaveland, Alpheus Crosby, Henry Coleman. Its eminent teachers and preachers are too many to be enumerated, while its band of missionaries, led by such men as Goodell, Poor, and Temple, have aided in giving the gospel to Africa, India, Ceylon, Turkey, Persia, Syria, Japan, the Sandwich Islands, and the Indian tribes, and have aided in translating the Scriptures into the Japanese, Armeno-Turkish, and Hawaiian languages. The entire number of graduates of the college proper to the year 1882 was 4332. The Chandler School graduates numbered 249, those of the Thayer School 19, and of the Medical School 813.

The college has maintained a conservative character throughout its history. Its course of study adheres to a settled curriculum, but with fair allowance for optional and elective courses in the last two years; and it provides for those who choose to dispense with Greek the substitution of a larger amount of scientific studies and modern languages. And, though by its charter equally open to students of all religious views and connections, it was also by its charter placed originally in the hands of a board of trustees of whom one-half were Congregational clergymen in full sympathy with Dr. Wheelock. Since that time the majority of the board has been composed of men who represented the Congregational and Presbyterian churches, and the patronage largely, though by no means exclusively, from similar sources. The board of trust consists of twelve members (including the governor of the State for the time being), of whom eight must be residents of New Hampshire and seven must be laymen. The number of instructors in the college and associated institutions in 1882 was 32, and the number of students 426. (S. C. B.)

DARWIN, CHARLES ROBERT (1809–1882), an illustrious English biologist, was a grandson of Erasmus Darwin on his father's side, and of Josiah Wedgwood on his mother's, and son of Dr. Robert Waring Darwin. He was born at Shrewsbury, Feb. 12, 1809.

According to the admitted laws of heredity, Darwin should have felt a strong predilection for natural science; but his taste for its pursuit not only was slow of development, but for a time appeared not to exist. While attending Shrewsbury school, of which Dr. Butler (afterward bishop of Lichfield) was head master, he displayed no zeal in the fields, no energy in the laboratory, and left so neutral an impression as a student that no legends of those early days have been handed down. It was his father's wish that he should adopt his own profession, that of medicine; but the prospect of living the grim and dreary life of a practitioner did not please his fancy. While attending the University of Glasgow, for the purpose of studying medicine, he evinced some interest in natural history. The records of the Plinian Society show that in 1826 and the year following he read two papers, one on the ova of *Flustra*, in which he stated that he had discovered organs of motion. Yielding to his repugnance toward the practice of medicine, Dr. Darwin sent his son to Christ College, Cambridge, with the expectation that divinity would prove more attractive to him and that he would take orders; and at the university he met a strong and gentle man who was destined to exercise a controlling influence in forming his mind and moulding his destiny. This was Prof. Henslow, who

filled the chair of botany. Darwin says that prior to meeting him the only objects of natural history for which he cared were foxes and partridges; but under his leadership the young man became an ardent collector, especially in entomology, the capture of an insect in the fens furnishing the first occasion on which his name appeared in print. He became so absorbed in the fundamental studies of natural science that he abandoned, if he ever seriously entertained, the intention of seeking ordination; and the charm of his intercourse with Prof. Henslow seems to have acted profoundly upon him in settling his dominant qualities, mental and social, and in finally shaping his career. The grateful words he has written of his friend and teacher have been reiterated of Darwin by those who had close personal intimacy with him. He writes of Prof. Henslow, "I never once saw his temper even ruffled. He never took an ill-natured view of any one's character, though very far from blind to the foibles of others. It always struck me that his mind could not well be touched by any paltry feeling of envy, vanity, or jealousy. With all this equability of temper and remarkable benevolence, there was no insipidity of character. A man must have been blind not to have perceived that beneath this placid exterior there was a vigorous and determined will. When principle came into play, no power on earth could have turned him a hair's breadth. . . . In intellect, as far as I could judge, accurate powers of observation, sound sense, and cautious judgment seemed to predominate. Nothing seemed to give him so much enjoyment as drawing conclusions from minute observation." The zeal and proficiency which Darwin displayed in every department of natural science gradually won him such distinction that when a naturalist was wanted to accompany Capt. Fitzroy on the surveying voyage of the *Beagle*, the opportunity was offered Darwin through the friendship of Prof. Henslow. At first his father objected to his availing himself of it, fearing that so thorough a change of life would dissuade him from entering the church, but he at length consented and Darwin sailed in December, 1838. During the voyage he suffered so severely from sea-sickness and encountered such prolonged hardship that his health was permanently injured, chronic dyspepsia holding him a life-long victim. In resisting its effects upon his temper it was fortunate that he was able to recall the gentle and amiable example of his university tutor. After marrying, Darwin selected a home at Down in Kent, where he spent his entire life, away from the annoyances and distractions of great cities and surrounded by the physical and moral environment which suited his scientific habits. Haeckel, who visited him, has given this brief and vivid picture of his home and its master: "In Darwin's own carriage, which he had thoughtfully sent for my convenience to the railway station, I drove one sunny morning in October through the graceful hilly landscape of Kent, that with the chequered foliage of its woods, with its stretches of purple heath, yellow broom, and evergreen oaks, was arrayed in its fairest autumnal dress. As the carriage drew up in front of Darwin's pleasant country-house, clad in a vesture of ivy and embowered in elms, there stepped out to meet me from the shady porch, overgrown with creeping plants, the great naturalist himself, a tall and venerable figure with the broad shoulders of an Atlas supporting a world of thoughts, his Jupiter-like forehead highly and broadly arched, as in the case of Goethe, and deeply furrowed by the plow of mental labor; his kindly mild eyes looking forth under the shadow of prominent brows; his amiable mouth surrounded by a copious silver-white beard. The cordial, prepossessing expression of the whole face, the gentle, mild voice, the slow, deliberate utterance, the natural and naive train of ideas which marked his conversation, captivated my whole heart in the first hour of our meeting, just as his great work had formerly, on my first reading it, taken my whole understanding by

storm. I fancied a lofty world-sage out of Hellenic antiquity—a Socrates or Aristotle—stood before me." Others have borne testimony, equally explicit, to the simple and engaging personality of the man.

The foundation of Darwin's career as a scientist was laid during the voyage of the *Beagle*, which lasted for five years and during which he made copious notes of everything he saw. Well read in the literature of all branches of science, animated by the *Personal Narrative* of Humboldt, and trained by Henslow to habits of cautious and acute observation of the minutest phenomena in the organic and inorganic world, he was led to seek for himself a key to the mystery which Lamarck had left unsolved when he affirmed that the similarity of organic forms was to be explained by their derivation, and their diversity by their adaptation to the conditions of existence. His contemplation of what herein is left undefined—namely, the law by which both derivation and diversity may be accounted for—gradually crystallized into a single inquiry, How did species originate? and it was during the year 1834, when he was twenty-five years old, being "much struck with certain facts in the distribution of the organic beings inhabiting South America, and in the geological relations of the present to the past inhabitants of that continent," he conceived that "by patiently accumulating and reflecting on all sorts of facts that could possibly have any sort of bearing on the matter, some light might be thrown on the origin of species." He did not, however, at once disclose this object, which became from that time until his death almost the sole burden of his investigations, but contented himself with a modest epitome of his observations made during the voyage of the *Beagle*. This was entitled *Journal of Researches*, and appeared in 1839. Under the auspices of the Lords of the Treasury the special geological report of the voyage was published in three successive parts, *The Structure and Distribution of Coral Reefs*, in 1842; *Geological Observations on the Volcanic Islands Visited during the Voyage of H. M. S. Beagle, together with some Brief Notices of the Geology of Australia and the Cape of Good Hope*, in 1844; and *Geological Observations on South America*, in 1846. Of all his contributions to geology Prof. Geikie says that while they have not been epoch-making, "every one of them bears the stamp of his marvellous acuteness in observation, his sagacity in grouping scattered facts and his unrivalled far-reaching vision that commanded all their mutual bearings as well as their place in the economy of things." The most important part of his geological work has dealt with the forces within and under the earth, those that are effective in earthquakes and volcanoes, in the elevation of mountains and the subsidence of extensive areas of the earth's surface. Out of his geological notes taken on the *Beagle* he also contributed three papers to the *Transactions of the Geological Society*; one "On the connection of volcanic phenomena" (1840); a second "On the erratic boulders of South America" (1842); and a third "On the geology of the Falkland Islands." Of the earliest of his geological papers, that on the "Formation of Mould" (1840) is especially curious as showing his unlimited patience and his painstaking habit of reaching conclusions by personal observation. This subject interested him so much that in 1842 he deposited a layer of chalk on a patch of ground; watched it constantly until 1881, and then wrote the results; they are embodied in his last published work, *Vegetable Mould* (1881). Indeed so precise and unaffected were his methods of investigation that the passer-by, seeing the grounds and buildings around his home, would have taken him to be a gardener and cattle-raiser. Occasionally he made short excursions for study and recreation, and always brought back substantial evidence of industry; when he visited the Welsh district described by Buckland, he prepared a paper (1843), affirming his belief in the former presence of glaciers in Britain.

In 1851 and 1854 the Ray Society published Dar-

win's very important *Monograph of the Cirripedia*, two massive volumes, finely illustrated, preserving the results of several years of close inquiry. Meanwhile he had been assiduously accumulating facts in support of his theory of Natural Selection; and after nearly twenty-five years of slowly deepening conviction he ventured, after he had completed his fiftieth year, to make it public in a volume entitled *The Origin of Species* (1859). (See DARWINISM.) The work created a profound sensation throughout the scientific and non-scientific world. The fact that the theory of evolution was an old one was forgotten; and Darwin was assailed as the inventor of that, while many of those who perceived that he merely suggested the method by which that theory might be brought within the pale of speculative debate, carried it far beyond the limits which he with undeniable modesty and candor had himself prescribed. That he feared and regretted the disturbance it would effect in the domain of religion is shown by the deprecatory extracts from Whewell, Bacon, and Butler which precede the title-page, and by the delicacy and respect with which he met the attacks of those who accused him of promoting atheism. The *Origin of Species* was translated into most of the European languages; and the controversy it engendered continued with unabated vigor during the life of the naturalist, who never descended into the arena of the conflict except with a new collection of facts which seemed to sustain it. In addition to the volumes mentioned he published the *Orchids Fertilized by Insects* (1862); *Climbing Plants* (1865); *Variation of Animals and Plants under Domestication*, 2 vols. (1868); *Descent of Man* (1871); *Emotional Expression in Man and Animal* (1872); *Insectivorous Plants* (1875); *Fertilization in the Vegetable Kingdom* (1876); *Forms of Flowers* (1877), and *Power of Movement in Plants* (1881). He wrote many papers on minor phases of the great scientific issues of the day. (See DARWINISM.) The literary style of his works is so simple and pleasing that he has been read with as lively interest by those who could not accept his conclusions as by his disciples; and the generosity with which he assisted all who sought his aid, his eagerness to acknowledge the merit of the work of others, his silence under personal attack, the universally acknowledged sincerity and love of truth in his character and in his writings, secured the esteem of his contemporaries of all schools of scientific opinion. To the end of his life he continued his painstaking researches and elaborate investigations of the facts of nature. He died at Down, Kent, April 19, 1882, and was honored with interment in Westminster Abbey.

Darwin was ably seconded in his experiments and investigations by his sons; one of whom, Francis, a naturalist, has prepared a biography of his father. Another, George H., is professor of astronomy in Cambridge University. (M. F. S.)

DARWINISM, a doctrine in scientific philosophy first definitely elaborated by Charles R. Darwin, the eminent naturalist, whose life is sketched in the preceding article. "It is the doctrine of 'natural selection' in the 'struggle for existence,' through which results the 'survival of the fittest,' or those forms which are best adapted to the situation, a result which perpetuates the best modifications of an organic form, and leads progressively to improvements which in time amount to the origination of a form so changed that it may be denominated a new specific type. It assumes, therefore, and undertakes to establish, the older doctrine of the indefinite variability of organic structures, and hence the secular instability of specific and higher types, the derivation of all existing forms of organization from lower forms, and the possibility of indefinite organic improvements in the future. The improvements which it contemplates are, so far as the essence of the doctrine is concerned, relative rather than absolute. They are improvements in that kind of harmony with the environment which best promotes the

well-being of the organism, and not necessarily an inherent perfection of the organism in itself. Certain changes in the environment may therefore be attended by changes in the organism which shall render it a more consummate structure; but other changes in the environment may be of a retrogressive character, and the responsive changes of the organism must cause it to recede from perfection. Since, however, the environment consists chiefly of conditions growing out of the progressive advances of the physical world toward a completer differentiation of its parts, changes of environment as a rule are attended by changes in organization which multiply the number of its relations, and constitute progress toward inherent perfection. The older doctrine assumed by Darwinism as a truth, and which the data of Darwinism tend strongly to confirm and establish, is the mutability of specific forms and their inferential derivation from one or more primitive forms. It is the doctrine of the derivative origin of species, in distinction from their separate creative origin. The still broader conception expressed by the term "evolution" embraces the derivative origin of organic forms, whether by natural selection or any other means, and, similarly, the origin of inorganic forms of matter and modes of being out of pre-existing states—a morphological conception expressed long ago in the formulation of the Leibnitzian *Principle of Continuity*.

The Darwinian conception, in the language of its founder, involves the operation of the following laws: "Growth with Reproduction; Inheritance, which is almost implied by Reproduction; Variability, from the direct and indirect action of the external conditions of life, and from use and disuse; a Ratio of Increase so high as to lead to a Struggle for Life, and, as a consequence, to Natural Selection, entailing Divergence of Character and the extinction of less improved forms." (*Origin of Species*, Am. ed., p. 424.)

The term *Darwinism* has been loosely employed by various writers under the significations just indicated:

1. *Evolution*, or the derivation of all existing forms and modes out of older forms and modes.

2. *Lamarckism*, or the derivative origin of all organic forms (*Entwickelungslehre, Descendenztheorie*).

3. *Darwinism* proper, or the derivative origin of organic forms by means of natural selection—a restricted application of the principle of natural selection which other thinkers have legitimately extended into many other realms of inquiry (*Züchtungslehre, Selectionstheorie*).

I. DARWINISM proper. This is the aspect to which we shall chiefly confine the present discussion.

A. *Historical Notice*.—The "struggle for existence" has been going on before the eyes of all observers from the beginning of the world. The contemplation of the struggle would not, in itself, suggest it as a condition of the origination of new specific forms. The attentive study of it through a succession of generations might, however, reveal progressive changes which should demonstrate the variability of species and prompt to the inference of a derivative origin for all species. Apart from the philosophic contemplation of the struggle for existence, common observation had shown the variability of specific forms within certain limits, and had led many, in the progress of the history of thought, to maintain that such variability is unlimited, and that consequently existing forms are merely derived. The recognition of the indefinite variability of species opened the way to the detection of the tendency of the struggle for existence, and the discovery in it of a means for promoting variations and eventuating in new specific forms. Thus the conception of gradual improvement through the continual survival of the fittest sprang up. This conception is the signal triumph of Darwin, and is the essential gist of Darwinism. The survival of the fittest had been often remarked by his predecessors. Aristotle (*Phys.*, ii., 8; *De Part. Anim.*, i., 8) and Plutarch (*De Plac.*

Philos., lib. v., cap. 19, 26) have recorded of Empedocles (500 B.C.) that he regarded organic forms as having come into existence by a method of survival and natural selection. Plants first sprang from the earth; from them came the separate animal organs, which joined themselves together by the attraction of love. At first many grotesque and monstrous combinations resulted, together with those which were harmonious and useful. The former perished, while the latter persisted and reproduced themselves. Epicurus (341 B.C.) adopted the Empedoclean doctrine as something quite in harmony with the dogma of fortuitous atomic arrangements. Lucretius (*De Rerum Natura*, i. 1020 seq.) says that many races of men have lived and perished, and those which survive have been protected by superior courage or strength, or other advantages; and he intimates, contrary to the teaching of Plato, that existing races have risen from a state of savagery.

Spinoza conceived the law of "self-preservation to be the determining force in things." Sir Matthew Hale, whose intelligence combined extensive observation in natural history with a philosophic apprehension of the deeper meaning of phenomena, wrote, more than two centuries ago, at considerable length, on the means by which nature restrains over-multiplication of individuals. "So among brutes, birds, fishes, insects," he says, "there is a continual invading and prevalence of the more powerful, active, and lively over the more weak, phlegmatic, and unactive natures; the bear, lion, wolf, dog, fox, etc., pursue the sheep, oxen, hare, coney, etc., and prey upon them: the like is evident among birds and fishes, and generally insects, being the weaker and more inconsiderable parts of nature." (*The Primitive Origination of Mankind*, 1677, p. 211.)

Erasmus Darwin, in his *Zoönomia* (1794)—especially xxxix.—appears from the researches of Dr. Ernst Krause to have argued with clearness and force, and considerable fullness, the doctrine of the derivative origin of species many years before Lamarck treated the subject, and even to have enunciated definitely the principle of natural selection. Speaking of the use of the spur among cocks, and the jealous battles of these males with each other, he says: "The final cause of this struggle among the males seems to be that the strongest and most vigorous animal may propagate the species, which, by such means, shall be improved." This improvement may continue its progress through many generations. Similar views, and others destined to be argued with fullness and force by his grandson, are contained in his *Phytologia* and *The Temple of Nature*. (See a copious and appreciative memoir by Dr. Krause in *Kosmos*, February, 1879, pp. 397-424.)

The conception of natural selection was quite clearly enunciated by Dr. W. C. Wells in 1813, in a paper read before the Royal Society of London (*Trans. Roy. Soc.*, London, published in 1818). In some reflections on a curious physiological case, he remarks that all animals tend to vary to a certain extent, and that breeders, by availing themselves of this property, and by selecting, succeed in improving the domestic animals. "But what in such cases happens through art seems to me to work with equal efficiency, though more slowly, in the natural way, in the production of human races, which thus gradually become accommodated to the regions which they inhabit." In illustration he proceeds to explain how certain African races may have become dominant in consequence of some greater immunity from certain diseases.

The principle of selection was also fragmentarily stated in 1831 by Patrick Matthew in a work on ship-timber and tree-culture. Sir Charles Lyell also says, "Unhealthy plants are the first which are cut off by causes prejudicial to the species, being usually stifled by more vigorous individuals. . . . In the universal struggle for existence the right of the strongest eventually prevails." (*Principles of Geology*, 8th ed. 1850, p. 582).

Mr. Alfred Wallace, as early as 1855 (*Ann. and Mag. Nat. Hist.*, 1855), formally announced his belief in the theory of descent of species, and intimated that the manifest adaptation of certain varieties to their surroundings secured them the best chances of perpetuation. Later records show that Mr. Wallace did not stop at this stage of development, as we shall see.

Beyond all question Mr. Darwin was the first to work out with any adequate detail the significance of the principle of natural selection. While still attached to the *Beagle*, on her voyage around the world, he became convinced of the derivative origin of species, and began methodically to inquire by what means specific transitions were effected.

He has given us this information in a letter to Prof. E. Haeckel, written Oct. 8, 1864 (Haeckel's *Natürliche Schöpfungsgeschichte*, 119), rewritten from the German version in Prof. Oscar Schmidt's *The Doctrine of Descent and Darwinism*, p. 32, New York, 1875. See also *The Origin of Species*, Introduction.

The question occupied his attention from the time of his return in 1837 till 1842, when he first drew up some short notes. These were enlarged in 1844 to a "sketch of the conclusions which then seemed probable." This sketch was read by Dr. Joseph D. Hooker, and the purport of it was communicated to Sir Charles Lyell. The first part treated of the variability of organisms in the domestic and wild states. In the second chapter the writer considered specifically the variability of organic beings in a free state, the influence of natural selection, and the relation of domestic races to true species. But nothing was yet made public, and Mr. Darwin continued for fourteen years more to institute experiments and record his observations. That his aim was fixed and his convictions unchanged appears from a letter addressed to Prof. Asa Gray in September, 1857, in which, in six points, the fundamental principles of what is here styled Darwinism were laid down.

In February, 1858, Mr. Wallace addressed to his friend Darwin, from Ternate in the Moluccas, a letter which loosed the spring that forced Darwin's conclusions before the public, and fixed the natal day of Darwinism. This letter treated of "the tendency of varieties to deviate indefinitely from the original type." It set forth, to Darwin's astonishment, the identical ideas which he had himself penned sixteen years before concerning the struggle for existence and natural selection, and illustrated them by a very similar method. Mr. Wallace requested his friend, if he found anything new or interesting in the paper, to show it to Sir Charles Lyell. Mr. Darwin, who of course placed the highest estimate on the value of Wallace's suggestions, hastened to request Sir Charles Lyell to publish the communication as soon as possible. Both Lyell and Hooker consented to this on the condition that Darwin would no longer withhold from publication his own memoir, which so many years before had become known to both of them. To this Mr. Darwin was disinclined through regard for his friend Wallace. Finally, however, he consented to place it in their hands with the request to use it freely as they might think best. Accordingly the *Journal of the Proceedings of the Linnean Society* of London for August, 1858, contained communications setting forth the foregoing circumstances, and embracing the following documents: 1. An extract from Darwin's memoir (pp. 46-50). 2. Abstract of Darwin's letter to Prof. Gray, of Cambridge, Mass., dated Sept. 5, 1857 (pp. 50-53). 3. The communication from Mr. Wallace, as already mentioned (pp. 53-62). This is the true date of the birth of Darwinism, as we here employ the term. The following year, 1859, is, however, more commonly regarded as the natal year of Darwinism, because in this year appeared Mr. Darwin's first, greatest, and most important work upon the principle of natural selection, and the questions of variation and derivation

so inseparably connected with it. The work bears the title: "*On the Origin of Species by means of Natural Selection; or, the Preservation of Favored Races in the Struggle for Life.*"

The work bears the date "Down, Bromley, Kent, Oct. 1, 1859." The first edition saw the light Nov. 24, 1859. The second appeared, unchanged, Jan. 7, 1860 (pp. ix. and 502); the third, enlarged, improved, and supplied with an introduction, in March, 1861 (pp. xx. and 538); the fourth, in 1866; a fifth, improved edition, in May, 1869 (pp. xxiii. and 596); a sixth—the seventeenth thousand—in 1872. Numerous editions have appeared in Germany, the first on July 5, 1862, by Brown. The best-accepted, and certainly the most sympathetic, translations of this and Darwin's other works have been supplied by Victor Carus. Two French, two Russian, one Dutch, one Italian, and numerous American editions had been published before 1870.

Mr. Darwin regarded it as merely a preliminary statement of conclusions accompanied by characteristic selections of facts, and he frequently apologizes for the absence of references and authentications for which space did not exist, promising a more extensive and complete work in which the details should be spread before the public.

The sequel, however, showed that a succession of partial publications would more satisfactorily meet the public want; and during the remainder of his life he sent forth, at convenient intervals, instalments of facts and conclusions bearing upon particular branches of the inquiry broached in his first volume.

The following are the most important productions of his pen in subsequent years:

1862.—*On the Fertilization of Orchids by Insects*, 365 pp., with numerous wood-cuts. "On the Two Forms or Dimorphous conditions in the species of *Primula*, and on their remarkable sexual relations."—*Jour. Proc. Linn. Soc.*, vol. vi. (Bot.), pp. 77–96. "On the three remarkable sexual forms of *Catasetum tridentatum*, an orchid in the possession of the Linnæan Society."—*Ib.*, pp. 151–157.

1863.—"On the thickness of the Pampas-Formation of Buenos Ayres."—*Jour. Geol. Soc.*, xix. pp. 68–71. "On the so-called auditory-sac of Cirrhipeds."—*Nat. Hist. Rev.*, pp. 115, 116. "Observations sur l'heteromorphisme des fleurs et ses conséquences pour la fécondation."—*Ann. Sci. Nat.*, xix. (Bot.), pp. 204–255. "On the Existence of two forms of several species of the genus *Linum*, and on their reciprocal sexual relations."—*Jour. Proc. Linn. Soc.*, vii. 69–83.

1864.—"On the sexual relations of the three forms of *Lythrum Salicaria*" (1864).—*Ib.*, viii. 1865 (Bot.), pp. 169–196.

1865.—"On the Movements and Habits of Climbing Plants" (1865).—*Ib.*, ix. 1867 (Bot.), pp. 1–118. Also as a separate work, of which a second edition appeared in 1875.

1866.—"Note on the Common Broom" (*Cytisus scoparius*), (1866).—*Ib.*, ix. 1867 (Bot.), p. 358. "On the specific difference between *Primula veris*, *vulgaris*, and *elatior*, and on the hybrid nature of the common Oxlip, with supplementary remarks on naturally produced hybrids in the genus *Verbascum*" (1868).—*Ib.*, x. pp. 437–454, 1869 (Bot.)

1868.—*The Variation of Animals and Plants under Domestication* (vol. i. pp. viii. and 411, with 43 wood-cuts, vol. ii. pp. viii. and 486). American edition (Orange Judd & Co.), with preface by Prof. Asa Gray, a special preface by the author, and sundry corrections and additions not in the English edition, appeared in 1868. Another American edition by D. Appleton and Co. "On the character and the hybrid-like nature of the offspring from the illegitimate union of Dimorphous and Trimorphous plants" (1868).—*Jour. Proc. Linn. Soc.*, x. 1869 (Bot.), pp. 393–437.

1869.—"Note on the Fertilization of Orchids."—*Ann. and Mag. Nat. Hist.*, iv. pp. 141–159.

1870.—"Note on the Habits of the Pampas Woodpecker (*Colaptes campestris*)."—*Proc. Zool. Soc.* (p. 705, 706).

1871.—*The Descent of Man and Selection in Relation to Sex*, 2 vols. (2d. ed. 1875, Amer. ed., in one volume, 1877, 688 pp.).

1872.—*The Expression of the Emotions in Man and Animals* (304 pp., ninth thousand, 1875; Amer. ed. 1873).

1873.—"On the origin of certain instincts."—*Nature*, vii. pp. 417, 418. Also other brief communications. "On the males and complemental males of certain Cirrhipeds, and on rudimentary structures."—*Nature*, viii. pp. 431–433.

1875.—*Insectivorous Plants*, 462 pp., with illustrations.

"Perception in the lower animals."—*Zoölogist*, viii. pp. 3488, 3489.

1876.—*The Effects of Cross and Self-Fertilization in the Vegetable Kingdom* (12 mo., 182 pp., Amer. ed. 1877).

1877.—"Biography of a little child."—*Mind*, pp. 285–294. *Different Forms of Flowers and Plants of the same Species*.

1881.—*The Power of Movement in Plants. The Formation of Vegetable Mould through the Action of Worms, with Observations on their Habits*; *Transactions of the Linnæan Society* for Dec. 6; Posthumous paper on *Instinct*.

These publications are almost exclusively amplifications of the store of facts with which the doctrine of the "Origin of Species" had been already wonderfully enriched. The application of these doctrines to man was a step beyond any position conspicuously taken in the first work, and the hypothesis of *Pangenesis* was the result of later reflection. We thus discover how sound and enduring became the results, which for their maturity had demanded no less than a fifth of a century.

On the extraordinary character of these works for unity of aim, persistence, manliness of statement, unostentatious daring, and gentle force, we should feel irresistibly tempted to descant were it not a duty to confine ourselves to a concise statement of facts. The esteem which his life and life-work inspired is, however, a phenomenal fact which ought to be recorded; and we choose, in doing this, to cite a passage from an English biographer:

"The greatness of Mr. Darwin as the reformer of biology is not to be estimated by the fact that he conceived the idea of natural selection; his claim to everlasting memory rests upon the many years of devoted labor whereby he tested this idea in all conceivable ways: amassing facts from every department of science, balancing evidence with the soundest judgment, shirking no difficulty, and at last astonishing the world as with a revelation by publishing the completed proof of evolution. Indeed, so colossal is Mr. Darwin's greatness in this respect that we doubt whether there ever was a man so well fitted to undertake the work which he has so successfully accomplished. For this work required not merely vast and varied knowledge of many provinces of science, and the very exceptional powers of judgment which Mr. Darwin possessed, but also the patience to labor for many years at a great generalization, the honest candor which rendered the author his own best critic, and last, though perhaps not least, the magnanimous simplicity of character, which, in rising above all petty and personal feelings, delivered a thought-reversing doctrine to mankind, with as little disturbance as possible, of the deeply rooted sentiments of the age." (*Nature*, xxvi. 5, 1882.)

B. Natural Selection in the Organic World.—With this sketch of older opinions on the distinguishing conception of Darwinism, we shall endeavor now to present a logical exposition of Darwinism in its subject-matter, together with the antecedent principles which it both implies and tends greatly to establish. In doing this it seems best not to confine ourselves strictly to conceptions formally enunciated by Darwin, but to notice, in due connection, the criticisms, exceptions, qualifications, and additions offered by other students and thinkers. We shall thus get, it is to be hoped, a compact and methodical apprehension of Darwinism as it exists in its latest phase. Let us endeavor thus to bring the different moments of Darwinism into some systematic presentation.

Darwinism embodies three distinct implications—variability, heredity, and selection. We shall consider each in order.

1. **Variability.**—The susceptibility of variation must be a condition provided in the nature of the organism. The phenomena may be regarded as the results of perturbation in the action of the law of heredity. Heredity is centripetal; variability is centrifugal. What are the causes which deprive heredity of su-

preme control? And may the effects of these causes be accumulated indefinitely?

(1) *Inception of Variations*.—Extended observations show (Darwin: *Animals and Plants under Domestication*, ii. ch. xxii., xxiii.) that variations take place under various conditions, but a large class of them may be generalized under the expression: "Discord with the Environment." The great influence of this sort of discord was shrewdly apprehended by de Maillet and presented with amplitude of argument by Lamarck; but Darwin has surpassed his predecessors in copiousness of facts and clear discernment of their import. Discord with the environment includes the principle of rivalry among individuals, the principle of progress through antagonism, and the great principle of the struggle for existence. (*Der Kampf ums Dasein*.)

(a) *Conflicts between Individuals*.—This is one of the most familiar forms of discord with the environment. The fellow-existences of an organic being constitute an environment; competition arises for the possession of the same favorable conditions; and a rule of warfare and extermination is established, very much as Hobbes conceived it. In the prosecution of this warfare the functional equilibrium of the organs is destroyed. Those powers best suited for waging the conflict successfully are kept in most constant action, dormant and potential powers are called into use, and some of those powers in full play, in a condition of undisturbed existence, find restricted opportunity for exercise. Under these constraints and restraints certain parts of the organism experience abnormal exigencies which determine increased or diminished nutrition and increased or diminished vigor and development, and a changed relation of volumes and strength in the several parts. Thus variations may be initiated and developed in individuals. How these become perpetuated and augmented through successive generations will be afterward shown.

One aspect of this conflict between individuals is seen in the state of universal warfare in the animal kingdom, and another in the struggles among individuals of the same species. Where a species is gregarious the contest for the most favorable conditions of existence may be largely limited to the individuals of the species. This is especially the case where a single species monopolizes a certain district. The range of the conflict is a narrow one also in the case of competing progeny of the same parents, or the young in general of the same species. The exigencies arising must impress themselves more indelibly on the plastic organism of the young, and must more frequently determine changes in the relations of parts in the organism.

(b) *Conflicts with Physical Conditions* (*Animals and Plants under Domestication*, ii., ch. xxiii.).—All changes in the physical environment involve changed efforts in the organism to maintain the existence of the individual. Supposing the organism previously adjusted to the physical environment, all changes in the latter must create new exigencies for the former. Thus the previous balance of the organic activities will be destroyed; certain efforts must become more intense, and others perhaps less so; and thus, as before, a changed ratio of the organs, and of the parts in the same organ, will be established. In short, the structure will be changed—not by any absolute additions or subtractions, but by the changed ratio of development of parts.

Now the physical environment is subject to a variety of changes, some sudden and irregular, others slow, progressive, and secular. Changes in the cosmical conditions of the earth have been in progress ever since organic life has had existence upon its surface. Thus the constitution of the air has changed; certain land situations have been elevated and others depressed; the depth of seas has varied; the ratio of land and water has changed. When such changes have been cataclysmic or destructive, and as far as, at any epoch,

they have been so, no changes have been impressed upon the organisms of individuals; though even then the restoration of habitable conditions would invite immigration, and the commencement of a struggle to establish harmonious relations with new surroundings. But as there are reasons for believing the greatest changes to be but aggregates accumulated through ages, each individual in its lifetime must have received some impression far short of a destructive one, which determined such changed ratio of physiological activities as to develop some structural deviation from the type of its parents. The amount of deviation which, in the course of a million years, might be aggregated by a set of progressive terrestrial changes, always of the same tenor, may be easily conceived as all which fills the interval between lowest and highest organic beings. Such a cause of variation is more readily admissible than more energetic and more rapidly acting causes, since we observe that the organism yields more willingly to a gentle action than to a violent one.

But climatic and chorographic vicissitudes of a more spasmodic character, even though perhaps connected with secular terrestrial changes, have more conspicuously impressed organization. It is quite well understood that during the last geologic period important changes have taken place in the temperatures of certain regions, in the extremes of temperature and in the distribution of moisture to them. By the erosion of barriers waters have been drained; by the introduction of sediments seas and lakes have grown shallower or even become displaced. By such changes the local precipitation has been diminished, the vegetable growths unbalanced in their ratio to each other, some exterminated and some new ones introduced, and thus the food-supplies for all vegetable-feeding animals in the same ratio changed. Some species of animals may thereby have perished, other species have been introduced by immigration, and the aptitudes of the old endemic species slowly changed, as the circumstances demanded, by the augmentation of the efficiency of those structures best suited to maintain individual existence. Mr. Darwin's works teem with pertinent illustrations of these general statements, and numerous other writers have added to our store of facts. Changes in the depth of water have had much to do not only with the hydrostatic pressure experienced by aquatic animals, but in the supplies of light admitted to them. The influx of rivers in new situations, or the formation of bars or ridges across the mouths of bays, have diminished the salinity of portions of the sea and brought changed necessities to its inhabitants. Migrations have given rise to important changes in physical environment. The migrant finds itself probably in new surroundings, and begins immediately to feel their influence. If added to the fauna of the region arrived at, the old fauna is not only aroused to new conflicts, but portions of it must probably be destroyed or expelled. Then the relations of the fauna to the flora are changed, and the flora feels the reaction. A changed flora invites new birds and new insects, and these bring new factors to bear upon the immigrant fauna. Similarly the region abandoned experiences a changed relation of fauna and flora, and the change reacts on the flora and ultimately on the old and the incoming animals of the region. These are new elementary conceptions in the theory of variations.

A changed relation to the environment, even when no changes take place in the latter and no proper migration of individuals takes place, would be experienced during the gradual extension of a species over wider regions or the prolonged residence of the same species, however introduced, in districts geographically remote or chorographically diverse from each other. These phenomena have been carefully studied in the United States. The results of late investigations tend to show that very many of the animal species character-

ized in the earlier settlement of the country by naturalists of the standing of Rafinesque, Lesueur, Bonaparte, Audubon, De Kay, and even later investigators down to the earlier labors of S. F. Baird and L. Agassiz, are merely geographical varieties. Prof. Baird himself, now the honored secretary of the Smithsonian Institution and United States commissioner of the fisheries, was one of the first to point out the influence of geographical position (*Amer. Jour. Sci.*, II., xli.); and he formulated certain laws under which the variation from point to point exists. Researches in this direction by J. A. Allen (*Proc. Bos. Soc. Nat. Hist.*, vol. xv., p. 156; *Radical Review*, vol. i., No. 1, May, 1877), and by Robert Ridgway (*Amer. Jour. Sci.*, III., iv., 454, Dec., 1872, and v., 39, Jan., 1873), have resulted in the disclosure of other laws regulating the longitudinal and latitudinal distribution of birds and mammals. The result is that the number of accepted species of these classes has been much reduced. Similar results have been accomplished in the study of molluscs by Binney, Bland, Stearns, Cooper, Lewis, Tryon, and Weatherby, and in that of insects by Edwards, Packard, Walsh, Scudder, and others.

The special point to make in this connection is that the disturbance of the statical equilibrium (if it ever completely exists) between organization and environment, between fauna and flora, and between different species of the fauna or the flora, is perpetually creating new emergencies, which call certain powers into intenser action and throw others into a state of relative disuse, and by such means change the volumetric and sthenic ratios among the parts of the organism of the individual.

This conflict with physical conditions exerts its most important influence upon young offspring, upon the unborn embryo, and upon the circumstances under which the powers of parentage arise, develop, and come into activity. Well-fed and healthy individuals will develop the most potent parent cells. "I am strongly inclined," says Darwin, "to suspect that the most frequent cause of variability may be attributed to the male and female reproductive elements having been affected prior to the act of conception." But whatever the vigor of the parentage, starvation, disease, or hardship during the gestative period will leave its record upon the embryo. Whatever the vigor of the young offspring, subsequent hardships may determine a puny growth and maturity. In any of these stages a changed bias may be imparted to the organism and some new variation may be inaugurated.

Such facts have led, during the history of discussion on the mode of derivative origins, to various suggestions as to the way in which embryonic history may have been impressed, not alone by the environment, but by any other influence, known or unknown. The author of the remarkable work on the *Vestiges of the Natural History of Creation* (third edition, 1845; *Sequel* to the same, 1846) suggests, with great reason, that *prolonged embryonic development* might be the cause of the attainment of an advanced status. Since the embryo, as had been shown by Von Baer, R. Owen, L. Agassiz, and others, passed through stages which figured successive grades of organic structure, an extraordinary prolongation of the period might bring it to a structural stage in advance of that reached by the parents. Quite analogous was the suggestion of Alpheus Hyatt (*Mem. Boston Soc. Nat. Hist.*, I., pt. ii., 1867. See further, Hyatt: *The Evolution of the Cephalopoda*, *Science*, iii., 122-7, 145-9, and *Genera of Fossil Cephalopods*, *Proc. Bos. Soc. Nat. Hist.*, xxii., 1884. Compare also Hyatt's *Embryology of the Fossil Cephalopods of the Museum of Comparative Zoölogy, Cambridge*) that the same result would be attained by an *acceleration* of embryonic development without a prolongation of the period. Prof. E. D. Cope, in view of occasional relapses in the grade of structure, completed the series of suggestions in this direction in recording the fact that *retardation* of development, in

addition to acceleration, would furnish us with a physiological explanation equally of improvement and deterioration of type ("Origin of Genera," *Proc. Acad. Nat. Sci.*, Philadelphia, Oct., 1868; "The Hypothesis of Evolution," *Lippincott's Magazine*, 1870, and *University Series*, New Haven, 1873; "The Method of Creation," *Amer. Naturalist*, March and April, 1880. See also his *Synopsis of Cyprinidae of Penn.*, 1866, and numerous other papers.) Cope maintained also that most structures are *not* adaptations to the environment. Somewhat in a different direction is the theory of *heterogeneous generation* propounded by Prof. A. Kölliker: (*Ueber die Darwin'sche Schöpfungstheorie, ein Vortrag*, Leipzig, 1864; *Morphologie und Entwicklungsgeschichte des Pennatulidenstammes, nebst allgemeinen Betrachtungen zur Descendenzlehre*, Frankfurt, 1872). "The fundamental conception of this hypothesis," he says, "is that under the influence of a general law of development the germs of organisms produce *others different from themselves*. This might happen: (1) By the fecundated ova passing in the course of their development, under particular circumstances, into higher forms; (2) By the primitive and later organisms producing other organisms without fecundation, out of germs or eggs (Parthenogenesis)." The first mode of variation is supposed to be quite analogous to what we actually witness in cases commonly known as "alternation of generation." There is, however, this fundamental difference, that in alternate generation a cycle of three or more terms returns to the starting-point, while Kölliker's theory supposes the first term not to be reproduced, but the intermediate term to become endowed with sexual properties and to reproduce itself only. Earlier than Kölliker's speculations, however, were those of Prof. Theophilus Parsons (*On the Origin of Species*, *Amer. Jour. Sci.*, II., xxx., p. 1, July, 1860), who conceived that divergence of organic forms might result simply from the occurrence of "extraordinary births," through homogeneous generation. "It is always possible," he says, "that offspring may be born differing as much from their parents and kindred in the way of gain, of advantage and improvement, as we know that offspring have differed in the way of loss, of hindrance, and of degradation." A view almost identical in this respect was independently propounded by Prof. Richard Owen in 1868 (*Anatomy of Vertebrates*, ch. xl.); though Prof. Owen, in common with Lamarck, Huxley, and others, holds also to the existence of an inherent tendency to change, irrespective of circumstances.

(c) *Hybridity*.—It is now generally admitted that this is an actual condition of some specific variations, as was maintained by Lamarck. Mr. Darwin discussed the subject at some length (*Origin of Species*, ch. viii.), but so great are the obstacles to the attainment of certainty that, though he cited some cases of fertile hybridity which we hold to be good, he showed the extraordinary disinterestedness to conclude that hybridity ought perhaps to be omitted from the list of variative conditions among animals. "I doubt," he says, "whether any case of perfectly fertile hybrid animals can be considered as thoroughly well authenticated." He nevertheless proceeds to state the case of the hybrid of the common and Chinese geese, and even cites the fact that "whole flocks of the fertile hybrid are kept in various parts of India, and kept for profit, where neither pure parent species exists." This case has since been more certainly established by abundant additional evidence (*Nature*, xxi., 207, Jan. 1, 1880; *Kosmos*, April, 1880, p. 77). It is paralleled, however, by the fertile hybridity of the common and Muscovy ducks, as demonstrated in Mt. Auburn Cemetery, Cambridge, Mass. (T. M. Brewer, *Proc. Bos. Soc. Nat. Hist.*, Jan. 21, 1874). Another case similarly turned to economical advantage is the fertile hybridity of the European hare and rabbit. The hybrid posterity are described by official authority as possessing great vigor and a delicacy of flesh which renders them superior

for food purposes, to either of the original species (Gindre, *Bull. de la Soc. Imp. Zoöl. d'Acclimation*, 1870, 659-67. Hæckel has named this hybrid *Lepus Darwinii*). It is also maintained that fertile hybridity is attainable between the goat and steinbock, the goat and sheep, the various species of the genus *Bos* (including the zebu), the fox and dog, and the dog and wolf. (See Von Tschudi: *Thierleben der Alpenwelt*, 555, 413; C. Vogt: *Köhlerglaube und Wissenschaft*, 66, 67, 60, and *Lectures on Man*, 416, 417; Hæckel: *Natürliche Schöpfungsgeschichte*, 132; C. Darwin: *Animals and Plants under Domestication*, i., 35, 39, 106, etc.) As to the latter little doubt can be entertained, since the Esquimaux and other peoples practise the crossing of their dogs with feral wolves. These being some examples among domestic and bulky animals, there is much room for the opinion that fertile hybridity may be rather a common occurrence among the thousands of inconspicuous and less differentiated species which populate the world. As to plants, the fact of fertile hybridity has long been fully recognized by nurserymen and botanists, as may be seen by reference to the writings of Mr. Darwin, or to any of the local floral mammals. (On this subject see A. de Candolle: "Etude sur l'espèce à l'occasion d'une revision de la Famille des Cupulifères," *Bibliothèque Universelle*, Nov., 1862; and Naudin: "Hybridity in the Vegetable Kingdom," and "On the Nature of Hybridity and Variability in Plants," *Comptes Rendus*, Sept. 27 and Oct. 4, 1875.)

Something depends in this discussion on the conception entertained of the species. Formerly, when fertile hybridity was shown possible in any given case, it used to be claimed that the two species were really one. And again, infertile hybridity, and especially infertile crosses, used to be assumed as evidence of distinctness of species. Mr. Darwin has shown, however, that infertility of crosses or hybrids bears only a remote and indirect relation to the affinity of the forms crossed. Moreover, when we ask ourselves in the light of derivative doctrine, what can be understood by a species? we perceive that discussions of hybridity can have no bearing on questions of species. This is the more apparent since the discovery of the regular habit of mutual interfertilization among the different species of many different genera of plants, and even among different individuals of many hermaphrodite animals.

(d) *Reaction of Male and Female Parent*.—Mr. Darwin has collected numerous facts showing the power of the pollen to modify not only the germ of the mother plant but also the parts contiguous to it (*Animals and Plants under Domestication*, i., ch. xi.; ii., 437). This action is seen not alone when the pollen comes from a plant of the same species, but also in crossing with different species. This principle extends to the animal kingdom. A female that has produced offspring by a given male transmits some peculiarities of this male to all her other offspring by other males. This curious fact is authenticated by considerable observation. Quite analogous with this mode of reaction is that of a bud or graft of one species of plant introduced into the organism of another species. Many cases of this kind have been collected by Mr. Darwin. (See Burdach: *Traité de Physiologie*, ii., 243; *Bulletin de la Société d'Anthropologie*, tome i., p. 291.)

(e) *Morphological and Unexplained Variations*.—It is well known that variations among plants and animals frequently arise in a manner which, so far as we perceive, is entirely capricious. Mr. Darwin says, "We are profoundly ignorant of the causes producing slight and unimportant variations" (*Origin of Species*, Am. ed., 176). We cannot refer them to the influence of the environment nor any other known cause. A remarkable case of this kind was the Aucon breed of sheep. The well-known "sports" of the nurseryman must generally be placed here. Very

many structures now useful to their possessors must, in their incipency, for many generations, have been functionally useless, and yet they continued to develop. The phenomena known as dimorphism and trimorphism, particularly among plants, will have to be referred to this category. It is known that many species of plants are of two varieties in the wild state, one bearing colored flowers and the other white. *Viola cucullata*, with ordinary violet flowers, not unfrequently exhibits a plant with flowers variegated. (See Mr. Darwin's numerous papers on phenomena of this class.) The nectarine sprang from the peach, after the latter had been cultivated for thousands of years, under all conceivable circumstances, without exhibiting any such variation. Among Lepidoptera, dimorphism is in some cases a seasonal character, and, as Dr. Aug. Weismann insists, purely morphological, excepting in case of mimicry and protective uniform coloring. (*Studies in the Theory of Descent*, with Notes and Additions by the Author. Translated and edited with notes by Raphael Meldola, etc. 2 vols., 8vo., pp. 729, London, 1882. Views on dimorphism are reproduced in *Nature*, xxii., 141). The inapplicability of the principle of usefulness to certain classes of variations was first distinctly urged by Nägeli (*Entstehung und Begriff der Naturhistorischen Art*, Sitzungsberichte der Bairischen Akad. der Wissensch. 1865). Some naturalists, like Cope and Mivart, go so far as to affirm that most organic modifications are not adaptive; and most agree that there exists a large residue which do not arise on the principle of harmony with the environment.

(2) *Correlation of Variations*.—Mr. Darwin has called attention to the fact that when, under any conditions, one part or organ assumes a variant character, some other part, perhaps a structurally homologous or functionally correlated part, assumes correspondingly a variation (*Animals and Plants under Domestication*, i. 207, ii. 387; *Origin of Species*, Am. ed., 130). Thus, when the bird-fancier succeeds in elongating the beak of the pigeon, the tongue also becomes elongated, though sometimes in greater or less ratio. So the elongated nostril slit becomes more elongated, and the length of the eyelids increased. Similarly the wings and tail of the pigeon tend to undergo a correlated variation. So, also, "when the feet are much feathered, the roots of the feathers are connected by a web of skin, and, apparently in correlation with this, the two outer toes become connected for a considerable space by skin." The number of cases and forms of correlated variations cited by Darwin in his works shows that correlation is a widely influential law in the inception of variations from whatever cause. In the contrary direction, the abortion of the visual organs in cave animals is accompanied by increased development of the organs of palpation.

(3) *Augmentation and Diminution of Variations*.—In considering the circumstances of the inception of variations we were led to conceive the variation rather as a changed relation of the old structures than the addition of any new structure, though we admit that in many cases the old structure may not yet have emerged into a state of functional or even distinctly structural existence, and may even have existed only as an undeveloped, prepotent, morphological element. But that it existed essentially and materially is manifest from the general principle of continuity at the foundation of derivative doctrine. Its development into a changed condition is therefore only an effect of increased use either of the organ or of the nutritive instrumentalities which sustain its life and activity. Mr. Spencer truly says: "Adaptive change of function is the primary and ever-acting cause of that change of structure which constitutes variation." The augmentation of the variation is only a continuance of the work begun in its inception. Use promotes augmentation. The illustrations of this principle are familiar. On the contrary, disuse promotes

diminution, as the blind eyes of cave animals testify. The functional uselessness of the wings of the penguin, the ostrich, the loggerhead duck, and the apteryx, at least for purposes of flight, is believed to have resulted from the lack of necessity for their use. (Yet it might, on the other hand, be reasonably conceived that such wingless forms represent the phylogenetic transition from the wingless reptile.) Of 550 species of beetles inhabiting Madeira, 200 "are so far deficient in wings that they cannot fly," and this is because individuals little addicted to flight have been for thousands of generations least likely to be blown out to sea and destroyed. The whole class of so-called "rudimental organs," excepting those of a sexual character, has resulted from the cessation of demands for use, followed by abbreviations, atrophy, or abortion; while those of a sexual character depend on similar conditions in one sex. Most of the examples of the class just cited illustrate not the amount of variation possible to be induced in single individuals, but the total amount accumulated under continued influences during many generations, and belong more appropriately under the head of "Selection."

2. *Heredity and the Conservation of Variations.*—(Darwin: *Origin of Species*, Am. ed., 18, 103, etc.; *Anim. and Plants under Domestic.*, ii., ch. xii.-xiv.; Spencer: *Biology*, i., ch. viii., Am. ed., p. 238; Ribot: *Heredity; a psychological study of its phenomena, laws, causes, and consequences*. Translation, New York, 1875; Galton: *Hereditary Genius, an inquiry into its laws and consequences*, 8vo., 390 pp., London, 1869.)

The remarkable organic law under which the characteristics of the parent reappear in the offspring is the means of conservation of any variation induced in the individual, and the extension of it to numerous individuals. Those influences exerted on the procreative powers of the parent, or upon the embryo during its development, and which resist to a greater or less extent the transmission of identity, are not factors in the law of inheritance, but perturbations of it. Inheritance is effectuated by means of reproduction. We generally recognize three forms of reproduction, sexual, gemmiparous and fissiparous. The asexual forms are commonly regarded as fundamentally distinct from the sexual, but Mr. Darwin thinks the distinctions are not fundamental (*Animals and Plants under Domestication*, ii., ch. xxvii., Pt. i.). Sexual reproduction and heredity are laws common to all biotic existence; and neither in the comparison of higher and lower animals, nor in that of animals and plants, do we discover any essential difference in the nature of the generative action. Inheritance extends to all the departments of the being's nature—its material organism, its moral faculties, its emotional susceptibilities, its instincts, and its intelligence. This is the view which must be held on the ground of derivative doctrine.

The phases of heredity may be generalized as three:

(1) *Direct heredity*, or the transmission of parental characteristics to immediate offspring. The phenomena present many interesting aspects and suggestions which may be studied in the works of Darwin, Ribot, and others.

(2) *Reversional heredity or atavism*, which is the development of the physical or psychical qualities of remoter ancestors. In the general sense it is simply direct heredity repeated one or more times. The term is, however, commonly understood to signify the development of some characteristic of an ancestor more strongly than it existed in the immediate parent. The phenomena are full of interest, but they do not need to be cited in this connection.

(3) *Collateral heredity*, or development of characteristics of a relative of a remote generation but not standing in the direct line of descent. Thus an individual may possess a resemblance to an uncle or aunt, great-uncle or great-aunt. While many authorities have pronounced such resemblances fanciful or acci-

dental, there is no reason to doubt that they are cases of real heredity, and constitute merely a phase of atavism. The peculiarity has simply descended from some remoter ancestor in which the two genealogical lines converge.

The modern discussion of the phenomena of derivation has presented in a very clear light the importance of the problem of the mechanical explanation of heredity. Several important theories have been advanced, all of which agree in supposing some ultimate organic unit to pervade the organism, to be capable of indefinite multiplication, and to be transmissible to a new being through the male and female elements in the act of generation.

(1) *The Hypothesis of "Physiological Units."*—Mr. Spencer (*Principles of Biology*, i., pt. ii., ch. x., Am. ed., p. 253 seq., 277 seq.) supposes the existence of "physiological units" having a complex atomic constitution, but nevertheless almost inconceivably small. These are continually thrown off from all parts of the organism, and find within it the conditions of their existence. They are capable of conjugation and reproduction. They are transmitted from generation to generation; and the potency of the sexual elements depends on their serving as "vehicles" for the transmission of "these highly plastic units." "In the fertilized germ we have two groups of physiological units slightly differing in their structures. These slightly different units severally multiply at the expense of the nutriment supplied to the unfolding germ—each kind moulding this nutriment into units of its own type. Throughout the process of evolution, the two kinds of units, mainly agreeing in their polarities and in the form which they tend to build themselves into, but having minor differences, work in unison to produce an organism of the species from which they were derived, but work in antagonism to produce copies of their respective parent organisms. And hence ultimately results an organism in which traits of the one are mixed with traits of the other."

(2) *The Hypothesis of Pangenesis.*—Mr. Darwin (*Animals and Plants under Domestication*, 1868, vol. ii., ch. xxvii., pt. ii., Am. ed., p. 448 seq. With ampler statement and some modifications in 2d. ed., 1875, vol. ii., p. 369 seq.) has been led to suggest the following hypothesis: (1) That the cells of the organism "throw off minute granules or atoms which circulate freely through the system, and when supplied with proper nutriment multiply by self-division, subsequently becoming developed into cells like those from which they are derived." (2) That these so-called gemmules collect together from all parts of the body and compound the sexual elements, and their development in the next generation forms a new being. But they are also capable of remaining dormant until transmitted to some remoter generation and then developed. (3) That their development depends "on their union with other partially developed cells or gemmules which precede them in the regular course of growth." (4) That "the gemmules are thrown off by every cell or unit not only during its adult state but during every stage of development of every organism." (5) That the gemmules "in their dormant state have a mutual affinity for each other, leading to their aggregation either into buds or into the sexual elements."

Darwin and Spencer have both shown in detail the application of their hypothesis to the phenomena of genesis, variation and heredity.

Mr. Darwin has suggested a comparison of his theory with the views of others, as Buffon, *Hist. Nat. Gen.*, ed. 1740, tome ii., pp. 54, 62, 329, 333, 420, 425, where the conception of "organic molecules" is distinctly broached in connection with his theory of generation and elsewhere; also Charles Bonnet, *Œuvres d'Hist. Nat.*, tome v., pt. i., 1781, 4to ed., p. 334; and Richard Owen, *Parthenogenesis*, 1849, p. 5-8. Darwin's and kindred theories are opposed by the results of Gratton's experiments on the transfusion of blood

from certain varieties of rabbits into the veins of the silver-gray rabbit, since no effects were produced.

See criticisms of Mr. Darwin's hypothesis by G. H. Lewes, *Fortnightly Review*, New Ser., iii., 352, April, 1868; Delpino, *Revista Contemporanea Nazionale Italiana*, translation in *Scientific Opinion* for Sept. 29, Oct. 6, and Oct. 13, 1869, pp. 365, 391, 407. See also Darwin's reply to latter in *Scientific Opinion*, Oct. 20, 1869.

(3) *The Plastidule Hypothesis of Elsberg.*—(*Regeneration or the preservation of organic molecules*, Proc. Amer. Assoc., 1874, B., p. 87; *On the Plastidule Hypothesis*, *ib.*, 1876, p. 178. See also *London Microscopical Journal*, 1872, p. 182. Elsberg's hypothesis has been criticised by Mr. E. Ray Lankester in *Nature*, July 13, 1876, but Elsberg's conception has not been understood by Lankester.) This hypothesis promulgated with much ingenuity is similar to the preceding. The ultimate organic units or "plastidules" are the smallest organizable portions of the "plastid" or "form-elements"—that is, cells in the most general sense, whether with walls and nuclei or without them. These are not, like gemmules, supposed to be thrown off from existing cells, but are primary formations from ultimate atoms, existing before cell-organization, and tributary to it. They come into existence continually from primitive plasson (protoplasm); and the various grades of organic life are indices of the remoteness of the initial point of the genealogical line. Every germ contains plastidules inherited from the line of ancestral organisms back to a remote period. Mr. Elsberg distinctly describes the plastidule as "a centre or bundle of force" quite as much as a material centre; and indeed seems indifferent whether the plastidule is viewed from the dynamical or the material standpoint, since, "whenever we deal in science, exclusively with either matter or force, we have to do with but one of two aspects of one and the same thing." This Haeckelian phrase leads us to the next.

(4) *The Perigenesis Hypothesis of Haeckel.*—With Prof. Ernst Haeckel the plastidule is itself possessed of a psychic nature; and not only the plastidule, but every inorganic molecule, and not only molecules but every atom of the material world, which, with him, is the only world that exists. "Every atom," he says, "possesses an inherent sum of force, and in this sense is endowed with a soul (beseelt). Without the recognition of an atom soul, all the commonest and most general phenomena of chemistry are inexplicable. Like and dislike, desire and aversion, attraction and repulsion, must be common to all atoms; since the movements of the atoms which must take place in the formation and dissolution of every chemical union can only be explained by ascribing to them *perception* and *volition*. . . . But the organic molecule is more highly endowed than the inorganic. It possesses the power of reproduction or memory. . . . All plastidules possess memory; this capacity is wanting in all other molecules. . . . Without the recognition of an unconscious memory in living matter, the most important vital functions remain totally inexplicable" (*Die Perigenesis der Plastidule, oder die Wellenzeugung der Lebewesen*, Berlin, 1876, pp. 36-41). These views are also distinctly uttered in his famous Munich address (*Die heutige Entwicklungslehre in Verhältnisse zur Gesamtwissenschaft*, Stuttgart, 1877, pp. 12, 13. Translated in *Nature*, Oct. 4, 1877, and republished in *Pop. Sci. Monthly Supplement*. See also Haeckel, *Studien über Moneren und andere Protisten*). Without quoting further we reproduce a concluding passage: "Accordingly we must suppose that the cell-soul, the foundation of empirical psychology, is a compound itself, namely, the total result of the psychic activities of the protoplasm molecules which we briefly style plastidules. The plastidule soul would therefore be the last factor of organic soul-life." Thus, in the Haeckelian conception of the world we recede toward Leibnitz, Bruno, and Empedocles.

The more immediate application of this conception

will now be shown. Haeckel supposes the ultimate atoms of matter to unite to form (inorganic) molecules and (organic) plastidules. The plastidules constitute the ultimate life-substance, the primitive form of which is *archiplasson*. The first developmental stage is *monoplasson*, seen in cytodes or non-nucleated cells. The third is *protoplasm*, seen in the cell-substance after differentiation of the nucleus; and the fourth is *coccoplasma*, or the nuclear substance itself. The cells and the cytodes are collectively plastids. Only the plastidules possess memory, which is a reproductive power. Reproduction confers the distinctive property of growth, which is fed by the continual assimilation (intussusception) of new material from the inorganic realm; and the latter depends on the consistency of the organic substance as its condition, and on the molecular structure of carbon compounds as its cause. Growth through intussusception conditions those most important factors of life-phenomena, reproduction and inheritance. Reproduction in the simplest sense is merely the overgrowth of the individual in an eliminated or isolated aggregate of plastidules. Inheritance is a necessary consequence of the continuity of the original in its eliminated part.

The plastidules, however, are subject to influences external to themselves. They tend to adapt themselves to the varying conditions, and thus develop variations which are transmitted to their posterity. Thus natural selection exists among the plastidules (molecules) as Pfaunder in 1870 suggested, and Huxley before him in 1869. (See *The Genealogy of Animals*, The Academy, 1869.) Thus, also, the variation of organic tissues and finally of organic forms and their adaptation to the changing environment are but the integrations of the infinitesimal plastidule phenomena. As the plastids in progressively higher structures acquire not only changed forms and movements but specialized work, and this division of labor develops into the widest specialization of organs seen in highest animals, it is division of labor among the ultimate plastidules which stands at the originative point of all this class of phenomena.

One of the distinctions resulting from this progressive differentiation is the sexual. Between simple (monogonic or asexual) reproduction and sexual (amphigonic) reproduction, no abrupt distinction exists, as is shown by the phenomena of conjugation and copulation among numerous lower organisms, and of parthenogenesis among various groups of higher animals and plants. In sexual reproduction, two cells with their respective plastidule movements are blended together, and the offspring represents the diagonal in the theorem of the parallelogram of forces. Thus sexual reproduction is nothing but a special form of growth of the individual, and the phenomena of genesis, inheritance, and atavism cease to be mysteries. Finally, the biogenetic process presents itself to us as a periodic movement; its nearest analogue is wave-motion. In the genealogical descent of each individual (plastidule or other organic form) we see the representation of wave progress. This is perigenesis, or the periodic wave-production of the life-particles.

Here the principle of inheritance is the *memory* of the plastidule, and the principle of variability is the *understanding* of the plastidule co-ordinating its movements to the environment.

In a later hypothesis emitted by Charles Morris (*Amer. Nat.*, xvi., 559 seq., July, 1882) leucocytes or white corpuscles of the blood are the true germinal particles. With power of feeding on the nutrient particles in the blood (described by Beale and Max Schultze), of growth and reproduction, like real protozoa, they become each a generalized representative of all parts of the body. W. K. Brooks in *The Law of Heredity. A study of the cause of Variation and the Origin of Living Organisms* (1883, pp. 336) maintains with Darwin the emission of gemmules, but only on occasion of a change in environment. The male cell has the peculiar power of gathering and storing them up, and is thus the originating factor, while the ovum is the perpetuating factor. The

ovum tends to exact heredity, the spermatozoon to variation and adaptation.

3. *Selection and the Accumulation of Variations.*—According to the profound suggestion of Mr. Darwin, the struggle for existence which we have contemplated as arising under circumstances of discord with the environment (taken in its widest sense) and which furnishes the occasions for those variations in the action of the nutritive organs which induce variations in organic structure, is also a struggle which, in connection with the law of inheritance, leads to the secular *accumulation* of organic variations, and their usurpation of the place of the older structures. Those individuals in which structural variation responds most promptly and most perfectly to changes in the environment acquire advantages over others, and in the struggles for existence and comfort prevail over them. The variant type tends, therefore, to perpetuate itself, and the old type tends to extermination. Nature thus selects the individuals best fitted to fulfil the functions of life, and secures to them the office of perpetuating the genetic line. The forms which the struggle for existence takes are those which we have already contemplated in connection with the inception of variations. They are conflicts of individuals with each other, and conflicts with physical surroundings. Among these the conflicts of males for the possession of females have led by selection to wide sexual divergences in most of the higher species, as it is supposed the females have manifested preferences for males possessing certain characters, and have thus secured them advantages. Mr. Darwin lays great stress on sexual selection, and has illustrated it copiously (*Origin of Species*, Am. ed., 83; *The Descent of Man*, parts II. and III.).

(1) *Usefulness to the Individual.*—But the selection and preservation of a structural variation implies that the variation confers some advantages. If conferring advantages in the struggles of life, natural selection would lead to its disappearance. All variations begun, perpetuated, or accumulated through discord with the environment and natural selection must necessarily be variations securing advantages to the individual. Mr. Darwin, as is well known, insists on the point, and, in his first work, maintains that no other new structures could have arisen than those elicited into development by natural selection for the good of the individual; and he says, "if it could be proved that any structure of any one species had been formed for the exclusive good of another species it would annihilate my theory, for such could not have been produced through natural selection." It has been pointed out, however, by Nägeli, Broca, and many others, that variations do originate which are "neither beneficial nor injurious;" and Mr. Darwin has been over-facile in magnifying the importance of his first error in formulating an induction in terms too absolute. Undoubtedly variations arise, like the disappearance of the forefinger in the Potts monkey (*Perodicticus*), and are perpetuated, which sustain no discoverable relation of usefulness to the individual. But such facts, instead of breaking down the principle of natural selection, show simply that it does not explain *all* variations and *all* structures.

(2) *Minuteness of Variations.*—Mr. Darwin also emphasizes frequently the statement that variations progress by minutely graduated steps. "As natural selection acts solely by accumulating slight, successive, favorable variations, it can produce no great or sudden modification." "If it could be demonstrated that any complex organ existed which could not possibly have been formed by numerous, successive, slight modifications, my theory would absolutely break down" (*Origin of Species*, Am. ed., 408, 169). Now, as natural selection has nothing to do with the origination of a variation, but only with its preservation, it is manifest at once that the principle is effective when it preserves a large variation as well as in the case of a small one. If then there be causes which produce sudden

and considerable variations, we may qualify Mr. Darwin's too hasty admission without impairing the principle of natural selection as a real law of nature. Now, it is perfectly notorious that abrupt variations frequently arise, and Mr. Darwin has himself cited many of them. As Mr. Huxley also says, "we greatly suspect that she [nature] does make considerable jumps in the way of variation now and then, and that these saltations give rise to some of the gaps which appear to exist in the series of known forms." But it seems disingenuous to urge such needed qualifications of Mr. Darwin's views as something having a destructive tendency.

(3) *How is the Ascendency of a Variety Acquired?*—The importance of isolation was recognized by Darwin (*Origin of Species*, Am. ed., p. 97), and it is at once apparent, as was powerfully argued by an oft-quoted writer, in the *North British Review*, that a single individual, coming into existence with some new modification of structure—even if a highly advantageous one—would be unable to confer his peculiarity in any important degree of development upon the whole membership of a species. As well expect a white man cast upon a continent of blacks to transform the black race into a white one simply by virtue of some superior advantages possessed by him in the struggle for existence. Evidently some principle, different from the simple increase of population, must be active, if the peculiarity ever becomes the common property of a numerous progeny.

This necessity has often been urged as a failure of the principle of natural selection to explain the cumulation of variations of a particular kind, and their ultimate wide dispersion among many individuals. Mr. Darwin seems to have trusted to a persistent tendency of the peculiarity to reproduce itself and displace old characteristics, and to the probability that an environment which could condition a useful peculiarity in one individual would condition it in many, and predispose to the conservation and restoration of it in many more which may have received but a diminished representation of it through inheritance. Numerous biological facts demonstrate the operation of some such tendencies. We do know that the same peculiarity recurs again and again, in a succession of generations, in a full state of development, in spite of crossings with individuals destitute of such peculiarities. Still, the case seemed to require the intervention of some special principle, and Moritz Wagner, a devoted Darwinian, suggested what he styled the "law of migration." "The migration of organisms," he says, "and the formation of colonies by them, is the necessary condition of natural selection" (*Die Darwin'sche Theorie und das Migrationsgesetz der Organismen*, 1868). The isolation of those individuals in which a peculiarity of structure appears and the prevention of crossings with their stationary congeners is, he thinks, indispensable. It is easy to understand the tendency of isolation, though on the simple principle of inheritance the peculiarity of one individual would, in any event, become reduced in transmission to any number of individuals, however small. Many considerations show, moreover, that such isolation is not essential. In the first place, isolation is unnecessary throughout the whole range of lower forms in which asexual propagation takes place. Again, the phenomena of dimorphism among plants and butterflies exemplify the persistence of morphological variations in the midst of differing conspecific forms, even where the peculiarity confers no conceivable advantage. Further, the remarkable case of the lake of Steinheim exhibits the slow formation of new and divergent species, in the progress of many generations, even while the unaltered or variously altered forms densely populated the same situation (Hilgendorf: *Ueber Planorbis multiformis in Steinheimer Süßwasserkalk*, Monatsb. K. P. Akad., Berlin, July, 1855, 474, with plate; A. Hyatt: *Transformations of Planorbis*, etc., Proc. Amer.

Assoc. Adv. Sci., 1880, 527-50, plate; and *Genesis of Planorbis at Steinheim*, Ann. Mem. Boston Soc. Nat. Hist., 1880. It cannot be doubted that a patient study of the recorded facts of palæontology would prove the existence of many similar cases. Nägeli has even insisted that "gregariousness of merely allied species and their varieties proves more favorable to the formation of a species than isolation." "The associate forms of certain Alpine plants have, as it were, reciprocally modified one another; they exhibit, to express myself thus, a specific social type, which is different in each assemblage, and therefore in every neighborhood. This fact incontrovertibly shows that the forms have altered since they were associated" (*Sitzungsber. der Math.-physikal. Klasse der Münchener Akad.*, 1872, p. 305). It would seem, therefore, that some conservative and reproductive force exists which modifies the absolute sway of the law of inheritance. Mr. Darwin, with phenomenal self-forgetfulness, not only allows the exceptions of Nägeli, Broca, and others, but impugns his principle of natural selection with far greater severity than the case demands. His acknowledgments have even been made a ground for asserting his abandonment of all which is characteristic in Darwinism. But this is a conclusion which will not stand. It is not necessary to explain *all* variations by the principle of natural selection, nor to explain any variation *completely* by this principle.

(4) *Coördinative Selection*.—As the inception of variations frequently reveals itself simultaneously in homologous parts, so the conservation and cumulation of variations is modified by homologies of parts. But more especially is a coördination of accumulated variations noticeable in the growth of internal parts. Here a process of selection manifests itself: 1st, in the selection of appropriate material out of the mass of crude nutriment supplied by ingestion; 2d, in the collocation of the organic molecules after such fashion as to result in fabrics of definite kinds—cells, fibres, membranes, vessels, and various tissues; 3d, the collocation of these parts for economy of space and for functional interaction and co-action; 4th, the determination of these selections and actions in changed channels in correlation with changes in the environment. Thus coördination of selection is a phase of selection which must not be overlooked in a merely descriptive statement.

(5) *Natural Selection not a Causal Agency*.—Natural selection is a means of conserving something which exists. The origin of the thing conserved is quite apart. This discrimination seems so obvious that one feels surprise at the language employed by some writers. Haeckel speaks of natural selection as a "*causale Fundament*," and as "*die wirkenden Ursachen der Veränderungen*;" and natural selection is commonly referred to as a "true cause" of variations, and of the origin of species. Mr. Darwin himself sometimes loosely implies conceptions of this kind, but in other passages a due discrimination is maintained. Attempts have been made to discredit Darwinism on the ground that it assumes to explain the origin of species by a principle which is only modal, not causal. But Mr. Darwin nowhere assumes that "natural selection is the origin of species." He shows that natural selection is a "*means*" by which new specific forms arise, and we are left to seek the *cause* which employs the *means*.

C. NATURAL SELECTION IN A GENERAL SENSE.—Mr. Darwin conceived of natural selection almost exclusively in its relation to organic beings. He does, indeed, illustrate its action by reference to the evolution of languages and dialects, and in a retrospective view of the discussion says: "In the distant future I see open fields for far more important researches. Psychology will be based on a new foundation, that of the necessary acquirement of each mental power and capacity by gradation. Light will be thrown on the origin of man and his history." There is no reason, therefore, for assuming that he was ignorant of the

breadth of application of the principle which he so richly elucidated. Manifestly, the most generalized conception of the survival of the fittest as progress through antagonism expresses a universal truth. It was an induction reached by the earliest thinkers of the human species. Herakleitos (about 500 B. C.), by his doctrine of the perpetual flux of things and the unceasing conflict between opposites, in the midst of which individual things maintain themselves against the universal processes of destruction and renovation, seems to have glimpsed dimly the abstract conception which Darwin's doctrine has clothed in concrete form. The fundamental thought of the whole atomic philosophy was the survival of forms which proved worthy to survive, and the extinction of others. In our own times, however, the application of the principle has been admirably worked out by various writers in various fields. The triumph of Darwinism itself is a striking illustration of the survival of the fittest in the realm of theoretical science. Language, anthropology, psychology, art, society, forms and systems of religion, cosmogony, are so many fields in which the operation of the struggle for existence and natural selection has been traced out by a band of brilliant thinkers. [See *ENCYCLOPÆDIA BRITANNICA*, Article *EVOLUTION*, Part II., *Evolution in Philosophy*.]

II. DARWINISM AS THE EQUIVALENT OF THE DOCTRINE OF DESCENT.—Natural selection implies a progressive and unlimited tendency to structural change. The susceptibility to variation, and the certainty of the conservation and augmentation of beneficial variations, guarantee a perpetual flux of characters. That which we have defined as a specific form is only the momentary value of a variable quantity. It was something different at a former period; it will be something else in the future. The old conception of the species is erroneous. Races and varieties are early stadia in progressive divergence from a given point, and species are only more advanced stadia in the same progress. Of genera and all the higher groups we must reason in the same way. The implications of natural selection, therefore, involve the derivative origin of all organic forms. Mr. Darwin, as he tells us, held for years to the derivative theory before he fixed on the principle of natural selection as an explanation of the mode of derivation. Undoubtedly many other scientists were half persuaded of the soundness of derivative theory, but it cannot be denied that Mr. Darwin's presentation of so probable a mode of derivation made rapid converts to the doctrine of descent. His vast accumulations of facts not only illustrated his special principle, but furnished the strongest evidence ever presented of the truth of the doctrine of descent. Darwinism may therefore be defined, in a just sense, as a phase of the doctrine of descent which holds that natural selection is the main condition of the survival and accumulation of variations. Mr. Darwin was at first strongly persuaded "that natural selection has been the main but not exclusive means of modification;" but in a later work he admits that he "probably attributed too much to the action of natural selection or the survival of the fittest." Again, he speaks of the influence of "the constitution of the varying organism," and the "action of those unknown agencies which occasionally induce strongly marked and abrupt deviations of structure." Again, speaking of structures now useless, he says: "Such structures cannot be accounted for by any form of selection, or by the inherited effects of the use and disuse of parts." Many passages of similar purport might be quoted from his later works. But the proper inference to be drawn is *not* that the author abandoned his theory, nor that natural selection is *not* a potent factor in the derivative origination of species, but simply that criticism has shown it to be less sufficient than was at first concluded. While, therefore, the peculiar conception of Darwinism has contributed so powerfully to the establishment of derivative doctrine, it must not

be supposed that derivative doctrine stands or falls with it. The derivation of species may be a fact, even if the Darwinian explanation does not contain a word of truth. This is important to be borne in mind, since many writers imagine that when they have impugned Mr. Darwin's positions on natural selection, or sexual selection, or pangenesis, they have dealt a destructive blow against derivative theory in general.

Mr. Darwin's theory is only one of many speculations offered with a view to explaining the preassumed fact of a derivative origin of species. The fact of such origin being established or presumptively established, the speculative mind looks about in search of the causes, conditions, and instrumentalities of variation. Are variations always insensible, or sometimes saltative? Are they impressed upon the organism by influences exerted from without, or do they arise from actions seated within? To what extent is the seat of assumed internal actions located in the reproductive elements, and to what extent in the embryo? What part is played by parthenogenesis and by extraordinary births?

Are influences exerted upon the embryo through the prolongation or shortening of its period, or through acceleration and retardation of its rate of development, or exclusively through the reaction of the mother on the embryo? Is there any inherent nîsus or tendency in the organism to vary in any particular direction, or to vary at random? and if the latter, what determines variation according to definite methods? Finally, is there any manifestation of force in the growing, changing aspects of the organism and in its coördinative phenomena, which cannot be referred to matter and its inherent potencies? These are the questions which various theorists have endeavored to answer; and the various theories, Darwin's included, lie within this domain. Every theory may prove false, and yet the derivative origin of species remain a fact. The general evidence in support of the theory of derivation is presented in the article EVOLUTION, already referred to. Here we simply correlate the principal phases of theory in a compact tabular exhibit:

Conspectus of Theories of the Origin of Species.

I. IMMEDIATE CREATION (Material Discontinuity).

1. In single Pairs.....This popular opinion was held by *Linnæus, Cuvier, etc.*
2. In Colonies.....*L. Agassiz, etc.*

II. MEDIATE CREATION OR DERIVATION (Material Continuity or Evolution).

1. Through a Force which is a mode of the unknowable.....*Herbert Spencer.*
2. Through so-called external influences or forces, acting on the organism.
 - (1) Physical surroundings (Transmutation).....*De Maillet.*
 - (2) The same, and conflicts of individuals (Natural Selection), with use and disuse.
 - (a) With isolation of changed individuals.....*Moritz Wagner.*
 - (b) Without isolation of changed individuals.
 - (a') Embracing the psychic nature of man.
 - (a'') By insensible gradations (Variative).....*Darwin, Haeckel.*
 - (b'') With occasional leaps (Saltative) and with a molecular selection.. *Huxley, etc.*
 - (b') Perhaps excluding the body and mind of man.....*Wallace.*
3. Through an internal force, conditioned by the environment, and by use and disuse.
 - (1) An inherent nîsus toward improvement (Conative-variative).....*Lamarck, St. Hilaire.*
 - (2) Genetic processes exclusively (Filiative).
 - (a) Prolonged embryonic development (Variative-filiative)... *R. Chambers in "Vestiges."*
 - (b) Extraordinary births (Saltative-thaumogene).
 - (a') Heterogeneous generation.....*Kölliker, Ferris.*
 - (b') Homogeneous generation.....*Parsons, Owen.*
 - (3) An immaterial Force, genetic processes being the instrument, saltations admitted.
 - (a) Excluding the psychic nature of man.....*Mivart.*
 - (b) Including the psychic nature of man.
 - (a') Through ordinary generation.....*Huxley.*
 - (b') Accelerated development.....*Hyatt.*
 - (c') Accelerated and retarded development.....*Cope.*

III. DARWINISM AS THE EQUIVALENT OF EVOLUTION.—This conception of Darwinism is merely a popular misapprehension. If Darwinism in the sense last considered is a straining of terms, Darwinism in the present sense must be disallowed. (See EVOLUTION, in the *ENCYCLOPÆDIA BRITANNICA*.)

IV. DARWINISM IN RELATION TO PHILOSOPHY.—The relations of Evolution and of Lamarckism to the history of philosophic thought and to the content of philosophy are considered under EVOLUTION (*ubisupra*). Here we simply state briefly some views on the relation of these theories to the principle of causality. It is worthy of remark, first of all, that the question of evolution, either in organic or inorganic nature, is simply a question of fact, and the answer is to be sought by observation. Do phenomena actually emerge into existence in material continuity with antecedents? We may discover ground for answering this question in the affirmative without considering either the finitude or infinitude of the series, or the nature of the efficiency concerned, or the question whether the efficiency has been propagated from the beginning—even if an infinite beginning—or inheres in the matter which is transformed,

or is an immanent efficiency external to matter. Nor does this question of fact concern the nature of matter, nor the unity or duality of substance. Endless diversities of opinion may be entertained on these ulterior questions by those who maintain unanimously the reality of a method of evolution in nature. This discrimination is most fundamental, and exposes the error of those who think the recognition of a universal method of evolution is the adoption of a theory of self-evolution, or the rejection of the doctrine of absolute originations, or the endowment of matter with all-sufficient potencies. For our present purpose it is not necessary to adopt any one of the divergent views entertained by the body of evolutionists on the speculative questions indicated, since the relation of evolution to causality is shown when we indicate clearly the fact that evolution concerns only the nature of the succession of passing events, not their origin or their causal connection with each other or with an external cause momentarily acting.

If the essential system of evolution as a whole is thus unencumbered by questions of ontology and ætiology, still less do such questions necessarily connect

themselves with the recognition of the subordinate principle of natural selection. This is not the name of a force in evolution, but only of the result or outcome of the action of those forces which secure the survival of the fittest. It is the name of an effect, and not of a cause. The gradually transformed condition of the genetic line is not the effect of natural selection, but only an aspect of natural selection viewed in its relation to time. It is therefore a philosophic misapprehension to speak of natural selection as something substantive, which acts as a causal or even a conditioning factor. We may speak of variations (not as originating, but) as accumulating, and aggregating to the extent of specific transformations, under the law of natural selection; but we cannot discriminatingly speak of the law as effecting such transformations. He who holds to the reality of a process of natural selection in nature is not bound to any theory of causation whatever.

But further, the environment of an organism cannot in any philosophic sense be regarded as causative in relation to the structures which arise in coördination with it. These structures are growths, and growths are results produced by the action of forces in the organism. The environment furnishes occasions for particular modes of action of the forces of growth. So far as conditions may by any be embraced in the conception of cause, the environment may enter into the cause but the ultimate productive causality reveals itself in the organism. It is a philosophic error, therefore, to conceive the conditions of existence as producing any given modification of organic structure.

In regard to the nature and the subjective ground of the forces of growth a diversity of opinion may be entertained. Some hold that these forces are only the forces inherent in matter as such; some maintain still the existence of a special vital force; and some, denying the inherency of forces in matter, maintain the existence of some force metaphysically external to the organism, and acting within the organism; some posit the discernment revealed in the mode of action of these forces in the unconscious organic molecules, or in these and the ultimate atoms, or in a separate will or unconscious intelligence as a *tertium quid*, while others discern a distinct conscious spiritual entity present, exerting the forces of growth and guiding their action by its own discernment.

Even the question of teleology is not touched by these doctrines, since the pure mechanical theorist may still maintain that every event takes place without purpose; and the teleologist may maintain that intention is likely to seek its end through the use of means, and that the more orderly and uniform we find the succession of events, the greater the evidence of the regulative principle of purposeful intelligence; and that in any event it is impossible to show that the whole system of evolution does not exist for a purpose.

Hence, on all the ulterior questions concerning the unity or the nature of substance, and the proper views of causality in nature, evolutionists may entertain beliefs as divergent as existed before the epoch of Darwin. The ranks of the evolutionists, and even of the Darwinians, as a fact, embrace believers in monism and dualism; in materialism and idealism; in the eternity of the world and in the finite origination of the world; in the eternity of matter and the finite origination of matter; in the derivation of man and the separate origin of man; in atheism, or in primordial creation, or in immanent creative causation.

In addition to the works already cited we mention the following by Mr. Darwin: *On the Fertilization of Orchids by Insects* (365 pp., 1862); *On the Movements and Habits of Climbing Plants*, Jour. Linn. Soc., 1867 (Bot.), 1-118, as a separate work in 1875; *The Descent of Man and Selection in Relation to Sex* (2 vols., 1875); *The Expression of the Emotions in Man and Animals* (304 pp., 1872); *Insectivorous Plants* (462 pp., 1875); *The Effects of Cross-and Self-Fertil-*

ization in the Vegetable Kingdom (182 pp., 1876); *The Formation of Vegetable Mould through the Action of Worms* (1881); and the scientific journals contain over twenty important articles dating from 1858.

The following works may also be consulted: A. R. Wallace: *Contributions to the Theory of Natural Selection* (Am. ed., 1871); Asa Gray: *Darwiniana* (1878); T. H. Huxley: *On the Origin of Species, or the Causes of the Phenomena of Organic Nature*; G. J. Romanes: *The Scientific Evidences of Organic Evolution* (London, 1882); St. George Mivart: *Man and Apes* (Am. ed., 1874); Karl Semper: *Animal Life as Affected by the Natural Conditions of Existence*, Internat. Scient. Series; E. R. Lankester: *Degeneration, a Chapter in Darwinism* (London, 1880); Lindsay: *Mind in the Lower Animals* (London, 1879); G. J. Romanes: *Animal Intelligence* (London, 1882, New York, 1883); E. Haeckel: *Anthropogenie, Entwicklungsgeschichte des Menschen* (Leipzig, 1874, also an English translation); *Ziele und Wege der Heutigen Entwicklungsgeschichte* (99 pp., Jena, 1875); Arnold Dodel: *Die neuere Schöpfungsgeschichte* (518 pp., Leipzig, 1875); C. Semper: *Die Verwandtschaftsbeziehungen der gegliederten Thiere* (16 plates, 8 vo., 367 pp., Wurtzburg, 1875); A. Kölliker: *Entwicklungsgeschichte des Menschen und der höheren Thiere 1ste Hälfte* (399 pp., Leipzig, 1876); Georg Seidlitz: *Beiträge zur Descendenz-Theorie* (176 pp., Leipzig, 1876); Hermann Müller: *The Fertilization of Flowers* (Transl., London, 1883, 669 pp.); Fritz Müller: *Für Darwin* (91 pp., Leipzig, 1864); A. Müller: *Ueber die erste Entstehung organischen Wesen u. deren Spaltung in Arten* (Berlin, 1866); Otto Zacharias: *Zur Entwicklungstheorie* (127 pp., Jena, 1876); Francis Galton: *Inquiries into Human Faculty and its Development* (1883, 8vo., 380 pp.); W. Roux: *Der Kampf der Theile im Organismus* (244 pp., Leipzig, 1881); Gustav Jäger: *In Sachen Darwin's insbesondere contra Wigand* (264 pp., Stuttgart, 1874); P. Jacoby: *Etudes sur la Sélection dans ses rapports avec l'hérédité chez l'homme*. On the philosophic aspects of Darwinism: G. H. Schneider: *Der thierischen Wille* (xx. and 447 pp., Leipzig, 1880); Eugen Dreher: *Der Darwinismus und seine Stellung in der Philosophie* (160 pp., Berlin, 1877); George Henslow: *The Theory of Evolution of Living Things, and the Application of the Principle of Evolution to Religion* (220 pp., New York, 1873); Joseph Leconte: *Religion and Science* (324 pp., New York, 1874); Georg Von Gizycki: *Philosophische Konsequenzen der Lamarck-Darwin'schen Entwicklungstheorie* (97 pp., Leipzig and Heidelberg, 1876); Fritz Schultze: *Kant und Darwin, ein Beitrag zur Geschichte der Entwicklungslehre* (279 pp., Jena, 1875); Rudolf Schmid: *Die Darwin'schen Theorien und ihre Stellung zur Philosophie, Religion und Morals* (403 pp., Stuttgart, 1876); Edith Simcox: *Natural Law, an Essay in Ethics* (361 pp., Boston, 1877); Chauncey Wright: *Philosophical Discussions* (434 pp., especially pp. 97-266); J. L. Diman: *The Theistic Argument, as Affected by Recent Theories* (Boston, 1882). Works of a critical and adverse character: A. Wigand: *Der Darwinismus und die Naturforschung Newtons und Cuviers* (3 vols., 1874-7, pp. 462, 516, 320); E. Von Hartmann: *Wahrheit und Irrthum in Darwinismus* (177 pp., Berlin, 1875); R. Virchow: *Die Freiheit der Wissenschaft im modernen Staat* (32 pp., Berlin, 1877); C. Semper: *Haeckelismus in der Zoölogie* (36 pp., Hamburg, 1876); F. Michaelis: *Anti-Darwinistische Beobachtungen* (85 pp., Bonn, 1877); St. George Mivart: *On the Genesis of Species* (Am. ed., 1871, 314 pp.); *Lessons from Nature as Manifested in Mind and Matter* (Am. ed., 462 pp., New York, 1876); *Contemporary Evolution* (254 pp., Am. ed., New York, 1876); G. Canestrini: *La Teoria di Darwin criticamente esposta*, Biblioteca Scientifica Internazionale (350 pp., Milano, 1880); C. Elam: *Winds of Doctrine, being an examination of the modern Theories of Atomism and Evolution* (163 pp., London, 1877); L. Agassiz: *Contributions to the Natural History of the United States*, vol. i. "Essay on Classification;" also Amer. Jour. Sci., July, 1860; J. W. Dawson: *The Story of the Earth and Man* (403 pp., 1873); Charles Hodge: *What is Darwinism?* (New York, 1874); J. Barrande: *Trilobites* (282 pp., 1871), a Supplement to *Système Silurien du Centre de la Bohême*, and compare also *Distribution des Céphalopodes* (480 pp., 1870), *Céphalopodes* (253 pp., 1877), and *Brachiopodes* (355 pp., 1879). A journal of highest ability devoted to evolution is *Kosmos, Zeitschrift für einheitliche Weltanschauung auf Grund der Entwicklungslehre, in Verbindung mit Charles Darwin und Ernst Haeckel, sowie einer Reihe hervorragenden Forscher auf den Gebieten des Darwinismus* (monthly, 80 pp., since 1876).

(A. W.)

DASENT, SIR GEORGE WEBBE, D.C.L., an English author, was born in 1820 in the island of St. Vin-

cent, West Indies, where his father was treasurer-general. He was educated at King's College, London, and at Oxford, taking his degree in 1840. He was called to the bar at the Middle Temple in 1852, and has held various official positions. He was also active in literary work, and for many years was a steady contributor to the *London Times*, of which he became assistant editor. He was also for several years the editor of *Fraser's Magazine*. He has been a diligent student of Norse literature and is best known by his translations from that language. The earliest of these was *The Prose or Younger Edda* (1842), which was followed by *Theophilus Eutychianus* (1845), a polyglot account of the legend of Bishop Theophilus. He also published *The Norsemen in Iceland* (1855), and *Popular Tales from the Norse*, with an introductory essay (1859). The last were translations from the *Tales* of P. C. Asbjørnsen, and from the same source he has taken *Tales from the Fjeld* (1873). His *Story of Burnt Njal* (1861) is a translation of the finest family saga of Iceland, with an introduction on Icelandic laws and customs. Daset has also published some novels: *Annals of an Eventful Life* (1871); *Three to One, or Lady Sweetapple* (1872); *Half a Life* (1874); and the *Vikings of the Baltic* (1875), a tale of the tenth century, founded on the *Jornsvikinga Saga*. He has collected a number of his essays into two volumes under the title *Jest and Earnest* (1875). In 1876 he received the honor of knighthood.

DAUDET, ALPHONSE, a French dramatist and novelist, was born at Nîmes, May 13, 1840. His father was a merchant of that city, who, after some years of prosperity, failed in 1848. But, though reduced to poverty, he gave his sons good facilities for education. Alphonse went to Paris in 1857 with his brother Ernest, and in the next year published a volume of poems, *Les Amoureuses*, which was followed by a second in 1861. Then he began to write for the stage, to which he contributed several comedies, dramas, and operas, some of which still retain their place. His first play was *La Dernière Idole*, produced at the Odéon in 1862. Others were *Le Frère aîné*, a drama in one act; *Le Sacrifice*, a comedy in three acts; *Le Char*, a comic opera. Meantime he composed several novels, and gradually adopted the plan, which finally gave him wide popularity, of mingling with his fiction the facts of the day. The first short stories of this kind were *Lettres de mon Molin* (1869) and *Lettres à un Absent* (1871). Growing more expert with practice, he published *Le petit Chose* (1868), a story founded on his own childhood; then *Fromont jeune et Risler aîné* (1874), which was crowned by the French Academy and dramatized by the author. This work established his reputation, but it has been surpassed in popularity by his later novels. *Jack*, a story of a workingman, appeared in 1876, and, finally, in 1878, *Le Nabab*, which at once achieved a remarkable success. This was due in great measure to its vivid presentation of the most prominent persons connected with the Second French Empire, the Nabob himself being the duc de Morny, in whose employ Daudet had been for some years. A fierce discussion took place in the Parisian journals on various literary and moral questions involved, and the author added to later editions of his novel a declaration of his object in writing. Pessimism pervades the whole work. Not only is vice shown in all its deformity, but it is presented as a natural condition of human society. Daudet is admitted by critics who have censured his works most strongly to be one of the most powerful writers of the present day. In 1874 he became dramatic editor of the *Journal officiel*.—His wife, MADAME DAUDET (née ALLARD), has contributed literary articles and criticisms to several journals, and has published a selection of these under the title *Impressions de Nature et d'Art* (1879).

DAUDET, ERNEST, a French journalist, novelist, and historian, brother of the preceding, was born at Nîmes, May 31, 1837. Removing to Paris in 1857, he became secretary to M. de Morny, president of the

Legislative Assembly, afterwards editorial secretary of the proceedings of the Assembly, and finally chief clerk of the Senate. While holding these positions he was a constant contributor to various journals in Paris, in the departments, and in foreign countries. In May, 1873, he was appointed director of the *Journal officiel*. After holding this position three years, in 1877, in company with M. de Villemessant, he founded the journal *L'Estafette*, of which he has since been chief editor. He was admitted to the Legion of Honor in 1868. His novels are numerous: the first, *Thérèse*, was published in 1859; among the rest are *La Succession Chavanet* (1867), *Le Missionnaire* (1867), *Fleur de Péché* (1872), *Les Aventures de Raymond Rocheray* (1875), *Zarah Marsy* (1878), *Le Mari* (1880), *Pervestis* (1881), *La Carmélite* (1882). His other works have generally been discussions of the political questions of the day, though in later years they have risen to the dignity of history. Among them are—*Les Journaux religieux et les Journalistes catholiques* (1860), *La Vérité sur l'Essai de Restauration monarchique* (1873), *La Terreur blanche* (1876), *L'Histoire des Conspirations royalistes du Midi sous la Révolution* (1881). The last has been crowned by the French Academy and a prize granted to the author. Since 1877, M. Daudet has been authorized to make researches among the state papers in preparation for his *Histoire de la Réaction thermidorienne*. He has also written an attractive autobiographical sketch under the title *Mon Frère et Moi* (1881), and in conjunction with G. A. Thierry has prepared a play called *Fouché*.

DAUMER, GEORG FRIEDRICH (1800–1875), a German poet and philosopher, born at Nuremberg, March 5, 1800; studied at the gymnasium of that town, then under the rectorship of Hegel, and at Erlangen took the courses in divinity and philosophy, where Schelling was his master. After a year in Leipzig he became in 1822 a preparatory teacher, and afterwards was a professor in the gymnasium of his native city. Among his early works are *Urgeschichte des Menschengesistes* (1827); *Andeutungen eines Systems der Spekulativen Philosophie* (1831); *Philosophie, Religion und Alterthum* (1833); *Züge zu einer neuen Philosophie der Religion* (1835); *Der Feuer und Molochdienst der Hebräer* (1842), and *Die Geheimnisse des christlichen Alterthums* (1847). The more lately written of these works show a wide departure from the Christian view of history and philosophy; and Daumer soon after became the advocate and herald of a new religion, "the religion of love and peace." His *Religion des neuen Weltalters* (3 vols., 1850) was, however, followed by a reaction which took him in 1858 into the Roman Catholic church. He died at Würzburg, Dec. 14, 1875. Among his numerous later works are *Meine Konversion* (1859); *Aus des Mansarde* (6 parts, 1860–62); *Das Christenthum und sein Urheber* (1864); *Christin Mirabilis und Joseph von Copertino* (1864); *Marianische Legenden und Gedichte* (1859); and a polemic against the teachings of Strauss. He also published several volumes of poems, in part the fruit of his oriental studies. He also published a series (1832, 1859, 1873) of writings designed to show that Kaspar Hauser was a kidnapped son of the Grand Duke of Baden; but official records published in 1875 have shown that this opinion was not correct.

DAVENPORT, a city of Iowa, county-seat of Scott co., on the Mississippi River, opposite Rock Island, Ill. It is 181 miles by rail W. by p. 736 Am. S. of Chicago, and 240 miles N. by W. of ed. (p. 836 St. Louis. Through it pass the Chicago, Edin. ed.). Rock Island, and Pacific, the Chicago, Milwaukee, and St. Paul, and the Chicago, Burlington, and Quincy Railroads. A noble wrought-iron bridge here crosses the Mississippi, and serves for railway purposes and for carriage travel. The city stands chiefly on a space near the river, partly surrounded by high bluffs, which are themselves built up with handsome residences. Davenport has a very valuable and well-utilized water-power, afforded by the rapids of

the Mississippi. It is the seat of the bishop of Iowa (Episcopalian), and of the Roman Catholic bishop of Davenport. Among its important buildings are the city hall, Burtis opera-hall, and the Episcopal cathedral. It has 20 churches, a State home for orphans, 3 Catholic hospitals, 2 Catholic academies, and a convent. It is the seat of Griswold college (Episcopalian), to which are attached preparatory and theological schools. The city has a well-managed system of public schools, including a normal school. The manufactures are extensive, and include lumber, farm-implements, glucose, flour, woollens, cordage, tools, castings, and furniture. It has 3 national and 2 other banks, and 3 weekly and 3 daily newspapers. It is lighted with gas and electricity, and has street-railways and a water supply. It was settled in 1836. The surrounding country affords bituminous coal and is very fertile. The city itself is one of the handsomest in the United States. Davenport has long been a noted point for the reception and sale of farm-products, and for the distribution of merchandise. It has a property valuation of \$7,500,000, and a public debt of \$270,000. Population, 21,831.

DAVID. The article in the *ENCYCLOPÆDIA BRITANICA* takes the view that the Hebrew text of those parts of the Old Testament which contain the history of David is in very bad condition, so that much of the account is historically uncertain. This opinion does not seem greatly to influence the author's impressions concerning David, but it is a matter in itself important. The main specification is that a part of the story of David and Goliath as it stands in Hebrew copies (1 Sam. xvii. 12-31 and xvii. 55-xviii. 5) has been interpolated into the narrative at a comparatively late date. It is affirmed that this part of the story is not in the Septuagint, and has been inserted in the Hebrew copies since the Greek translation was made, and that it is inconsistent with the rest of the narrative. If this allegation is true, it is seriously disparaging to the Hebrew text as showing that in the centuries just before the Christian era it was very carelessly treated.

But even if we here concede that there were two original accounts, from which the Hebrew text was compiled, it does not necessarily follow that one of the accounts is less accurate than the other, nor that the Hebrew text has been changed since it was first written. On this theory it is entirely conceivable that the original sources were yet in existence when the Greek was translated, and that for some reason the translator here substituted one of these for the compiled account of the Hebrew Scriptural text.

We cannot, however, be very sure that the text which omits the parts of the story is the true Septuagint text. The omissions occur in the original hand in the Vatican Codex, but not in the other best copies.

Again, if the Septuagint translator, or some previous copyist or translator of this passage, whose work the Septuagint translator here adopted, had desired to abbreviate the story, for the purpose of reducing it to the right length for some use, or that it might just fill up the piece of parchment on which he was writing, he could hardly have abridged more skilfully than he has done. Try the experiment. Suppose a minister wishes to read, in connection with some sermon, the account of Saul's early relations with David, as given in 1st Samuel, xvi. 14 to xviii. 30. Here are about 100 verses. Could he cut out about 40 verses, so as to reduce the account to a manageable length for reading, any better than by omitting just what is omitted in this Greek copy? For it is necessary to notice that this copy not merely omits these two passages, but makes a considerable number of shorter omissions in this part of the narrative. Besides this account of David's coming from the sheepfold to the army, it leaves out of the account the jealousy of Saul concerning the kingdom, and his attempts to kill David (xviii. 8, last clause, to 11), and that of the proposed marriage between Merab

and David (xviii. 17-19, and the last half of 21), as well as many of the details of the fight with Goliath, and many examples of Saul's hatred for David (xvii. 41, 50, and parts of 48, 51; xviii., parts of 12, 29, 30).

It is evident that we have here the results, not of accident, but of deliberate design. Either some one produced the shorter narrative from the longer, by intentional abridgment, or some one expanded the shorter narrative into the longer. Are there any marks whereby we can decide which process was actually used?

No one would dispute that the external evidence is in favor of the longer text. That is to say, even those who place the lowest estimate upon the Massoretic Hebrew regard it as of higher textual authority than the Septuagint translation. The omitted fragments themselves are consistent with the view that the shorter text is an abridgment. An advocate of the other view says "it is not credible that, if the Septuagint translators had set themselves arbitrarily to cut down a narrative originally homogeneous, the verses which they omit would have palpably hung together as bits of a different and self-consistent account of the whole story." Now if the omitted parts made a complete account, or if they distinctly pointed to some completion of the account different from that here given, there might be some force in this reasoning. But they do neither of these. They show no other homogeneity than would appear in any case where the parts of a story relating to one or two particular phases of it had been omitted, for the purpose of abbreviating the story. This is true, even if we confine our attention to the longer omitted fragments, and emphatically true if we look also at the shorter.

There is no difficulty in the Hebrew account as it stands. The peculiarities upon which most stress has been laid are that Abner and Saul are here represented as not knowing David, although he had already been in court, and become a favorite there; and that no explanation is given of his being absent from court at this particular time. Taking up the second of these difficulties first. An eminent author says: "We learn, without any explanation, that David, although he was Saul's armor-bearer, did not follow him to the field." He also speaks of a "fragment of an independent account of the affair, according to which David had never been at court, but was a mere shepherd boy." These and like statements are mistaken. The account carefully explains why David did not follow Saul to the field; and the omitted verses, instead of representing that David had never been at court, expressly mention that he had been there. Verse 15, beginning as it does with a circumstantial clause, informs us: "Now David had gone and returned from upon Saul, to shepherd the flock of his father." This is mentioned immediately after the statement that his three older brothers were in the army. Could anything be more explicit or more natural? Saul taking the field reduced his peace establishment, sending home his minstrel boy; and instead, he increased his war establishment, by taking three of the minstrel boy's older brothers, while the boy himself did what he could to fill their place at home. What if Saul had already, in time of peace, gratified his dainty-fingered harp-player by giving him a military commission as armor-bearer? He none the less naturally preferred to have veterans about him when it came to actual fighting.

As to the other difficulty, all despots are freaky in their attachments. Saul was peculiarly so. However much of a favorite David may have been as a clever musician and a handy page, in the palace, it does not follow that Saul had ever cared enough about him to recognize his face when he saw him elsewhere and in different dress. Or, he may have preferred not to recognize David, as one who had been a member of his household, in that dress, and engaged in that fool-hardy enterprise.

And we may rest assured that if the king, in the circumstances, had forgotten David, or chose not to

know him, Abner was too good a courtier to remember ever having seen him before. Indeed, if Abner had really been ignorant as to who David was, we should have expected that he would have asked somebody and found out, and answered the king's question. He did no such thing. He was contented that himself and the king should suffer the pangs of ungratified curiosity in the matter till David got back and could tell his own story. Abner at least acts precisely as if he and the king were ignoring David, rather than ignorant of him.

The same author says that his elder brothers treated David "with a degree of petulance not likely to be displayed even by elder brothers to a youth who already stood well at court." But it was the most natural thing in the world that they should snub a younger brother, who, having been brilliantly received at court, was now, for some reason, retired. This view gives all the more meaning to their sneers, instead of the contrary.

On the supposition, then, that 1 Sam. xvi. 21, 22, 23, is to be regarded as describing events which strictly occurred earlier than the events described in the following chapter, the supposed difficulties of the case not only vanish on examination, but turn into picturesque strokes, making the narrative far more graphic, and far more true to life. They show that David was even then living a life of vicissitude, of great ups and downs, instead of the comparatively tame life which the other view would assign to him. But even were this not the case, there is a different cast of the narrative, quite probable in itself, which would entirely dispose of all the difficulties, and which at the same time fits in with the view already taken, in such a way that the two confirm one another instead of standing as separate hypotheses, either of which might be independently adopted. It is very common in the Bible to mention in brief some group of events, following this up by a detailed account of some of the events thus epitomized. It is very easy to consider the narrative now under consideration as of this sort. In xvi. 21-23 is a general description of the honors David attained to, and the services he rendered while at the court of Saul. What follows may be regarded as the fuller recital of some of the incidents already alluded to in the epitome. If this be the case, David may have been known in court, previous to the affair of Goliath, only as a minstrel, his appointment as armor-bearer coming along later.

With or without this view of the passage, all of the difficulties of the Hebrew account vanish as soon as we look carefully at them. But if we take the shorter account by itself, it presents some difficulties which do not so readily disappear. If David had been serving as Saul's armor-bearer without interval and was present in camp in that capacity, how did it happen that he was there without equipment? How did it happen that he was there with his shepherd's wallet? (xvii. 40). The parts of this narrative which are retained in the Septuagint distinctly imply that there had been an interval between David's service at court and his appearance in camp. This implication so exactly fits the account given of that interval, in the Hebrew text, that the one has great weight to prove the historical truth of the other.

(W. J. B.)

DAVIDS, THOMAS WILLIAM RHYS, a British Orientalist, was born at Colchester, England, May 12, 1843. He was educated at the University of Breslau; entered the civil service in Ceylon, and held various judicial appointments in that colony; was called to the bar at the Middle Temple in 1877. He is the author of a work on *Buddhism* (1877), and has translated from the Pāli parts of *The Jātaka* (1877). He has also written various papers on Buddhistic, Jain, and Pāli subjects. His works include *Buddhism* (1878), *a Translation of the Fausböll collection of Buddhist Birth-Stories* (1880); *Buddhist Suttas from the Pāli*

(1881); *Hibbert Lectures* (1881). In 1883 there was published a translation of the Vinaya Texts from the Pāli by Mr. Davids and Hermann Oldenberg.

DAVIDSON, LUCRETIA MARIA (1808-1825), an American poetess, was born at Plattsburg, N. Y., Sept. 27, 1808. Her parents were well educated, her father being a physician and her mother a poetess. From infancy Lucretia was subject to frequent attacks of sickness. When four years of age she learned to read, and soon took delight in making little books containing rude pictures and explanations in rhyme. These the child carefully concealed, and finally destroyed when they attracted attention in the family. The earliest of her compositions that has been preserved was written at the age of nine. In 1824, at the suggestion and expense of a friend of the family, she was sent to Mrs. Emma Willard's famous academy at Troy to complete her education. Here, however, her severe study, especially in preparing for a public examination, undermined her health, and being injudiciously allowed to continue her studies, she fell a victim to consumption, dying at Plattsburg, Aug. 27, 1825. Her poetical writings which have been preserved amount to 278 pieces, some of them of great length. Prof. S. F. B. Morse edited part of them in 1829 under the title *Amir Khan, and Other Poems*, adding a memoir of the author. The work was very favorably reviewed by Southey in the *Quarterly Review*. Another edition was published, with a *Life*, by Miss C. M. Sedgwick in 1843, and an illustrated edition in 1871.

DAVIDSON, MARGARET MILLER (1823-1838), an American poetess, was born at Plattsburg, March 26, 1823. Her career closely resembled that of her sister, Lucretia M. Davidson. Her education was conducted by her mother, the family frequently changing their residence for the sake of health. When she was ten years old she wrote in two days *The Tragedy of Alethia* for performance by herself and some little friends. Washington Irving says: "It contained within it sufficient of high character and astounding and bloody incident to furnish out a drama of five times its size." Her earnest desire was to fill her sister's place, and one of her most touching poems is addressed to Lucretia. Symptoms of consumption manifested themselves when she was twelve years old, and the disease pursued its course till her death, at Saratoga, Nov. 25, 1838. Her poems were published, with an interesting memoir, by Washington Irving, and the works of both sisters were collected in one volume in 1850.

DAVIDSON, SAMUEL, D. D., LL.D., an English theologian and biblical critic, was born near Ballymena, Ireland, in 1807. He entered the Royal College at Belfast in 1825, and was a diligent student in philosophy and biblical literature. Having been ordained as a Presbyterian minister, he was in 1835 appointed professor of biblical criticism and literature in the college from which he had graduated. A few years later he changed his views with regard to church government, and in 1842, when the Lancashire Independent College was founded at Manchester, he was called to fill the chair of biblical literature and the Oriental languages. He had already published a work on *Biblical Criticism*, and in 1843 he added to this his *Sacred Hermeneutics*. He was one of the contributors to the *Cyclopædia of Biblical Literature*, first issued in 1845 by Dr. John Kitto. His rapidly-increasing acquaintance with German writers led him to translate Gieseler's *Ecclesiastical History*, and the translation has been republished in America. In 1848 he issued a volume on *The Ecclesiastical Polity of the New Testament*, and this was followed by his greatest work, *An Introduction to the New Testament* (3 vols., 1848-51). In its successive editions this work indicates the negative tendency of his mind, his greater familiarity with German critical investigations, and his adoption of their results. In 1852 he rewrote his first book on *Biblical Criticism*, and in 1855 published another book on *The Hebrew Text of the Old Testament*

Revised. He was now requested by the publishers of *Horne's Introduction to the Sacred Scriptures* to prepare a treatise to take the place of the second volume of that work, which had become in a measure obsolete. The result of this was a thorough discussion of *The Text of the Old Testament and the Interpretation of the Bible*, which appeared in 1856. A fierce attack was at once made upon it on account of its freedom in treating the Scriptures, though the author still held orthodox views in theology. The religious papers called for the removal of the professor from his chair, and as the college depended for its support on voluntary contributions the committee in charge of it became alarmed. Prof. Davidson resigned, and has since resided in London, devoting himself to study and authorship. His next work was an *Introduction to the Old Testament* (3 vols.), and in 1868 he published a revised edition of his *Introduction to the New Testament*. A still later edition appeared in 1882. He has also translated *Fürst's Hebrew Lexicon*, adding a new preface. In 1873 an essay *On a Fresh Revision of the English Old Testament* appeared from his pen, and in 1875 he translated the New Testament from the latest Greek text of Tischendorf. An article which he contributed to the *Encyclopædia Britannica* was afterwards enlarged and published separately under the title *The Canon of the Bible, its Formation, History, and Fluctuations*, and has reached its third edition. His latest work is *The Doctrine of Last Things contained in the New Testament, compared with the Notions of the Jews and the Statements of the Church Creeds* (1882). Dr. Davidson's works continue to present the latest results of the investigations of German scholars as well as of his own researches. He is the only English theologian that has ever received the degree of D. D. from the University of Halle.

DAVIDSON, THOMAS, a Scottish-American philosopher, born near Fetterangus, Aberdeenshire, Oct. 25, 1840. He graduated in 1860 at the Aberdeen University, with high honors in classics, and became a teacher. He removed in 1866 to Canada, and in the following year to St. Louis, Mo., where he edited the *Western Educational Monthly*, afterward called *The Western*. In 1875 he removed to Cambridge, Mass., and undertook a complete translation of the extant writings of Aristotle. He has since resided in Rome, where he has been engaged in the study of recent Italian philosophy.

DAVIDSON, WILLIAM (1746-1781), a North Carolina general in the Revolution, was born in Lancaster co., Pa., in 1746. His father, who was of Irish birth, removed with his family to Rowan co., N. C., in 1750. William was educated at an academy at Charlotte, Mecklenburg county, and married a sister of Ephraim Brevard, the author of the Mecklenburg Declaration of Independence. When the war broke out he became major in one of the four regiments raised in North Carolina, fought at Monmouth and in other battles with distinction, and was promoted to the command of his regiment. After three years' service in the North he returned to his native State, and was made brigadier-general of the militia. Gen. Greene, during his famous retreat through the Carolinas in 1781, wishing Lord Cornwallis to be delayed at the Catawba River, requested Davidson's assistance, who called out the militia and posted them at the fords. A detachment of the British army, however, succeeded in crossing just below Cowan's Ford, where he himself was on guard with 300 men, and a fight ensued, in which both commanders were killed, Feb. 1, 1781. His name is perpetuated in Davidson College, founded by Presbyterians in 1837 near the spot where he fell.

DAVIES, JOHN LLEWELYN, an English clergyman and author, was born at Chichester, Feb. 26, 1826. He received his education at Repton School and Trinity College, Cambridge, graduating from the latter in 1848, and becoming a fellow of the college in 1850. Having been ordained in 1852, he was appointed incumbent of St. Mark's Church, Whitechapel, London,

and four years later became rector of Christ Church, Marylebone. He is also chaplain in ordinary to the queen. He has been a follower of Maurice both in theology and practice. He took an active part in the London School Board, and was for some years principal of Queen's College, London. He assisted Dr. Vaughan in a translation of *Plato's Republic*, and has been a frequent contributor to periodical literature. Besides some volumes of sermons and a *Commentary on Ephesians, Colossians, and Philemon*, he has published *Theology and Morality, Belief and Practice* (1873), and *The Christian Calling* (1875). He was a contributor to Dr. William Smith's *Dictionary of the Bible* and *Dictionary of Christian Biography*.

DAVIES, SAMUEL, D. D. (1723-1761), an American Presbyterian minister, was born at Summit Ridge, Del., Nov. 3, 1723. He was of Welsh descent, and was educated by Rev. Samuel Blair (1712-1751) in his classical school at Fogg's Manor, Pa. Mr. Davies was licensed to preach in 1746, and in the following February was ordained as an evangelist to labor in Virginia. At that time nonconformists to the Established Church were much restricted in regard to worship, but Mr. Davies obtained a license to officiate. He soon received a call to be pastor in Hanover county, and accepted it, although his health was in a very precarious state. He had charge of seven places of worship in five counties. His glowing zeal, exemplary prudence, and impressive eloquence made his labors effectual in building up the Church. He had a controversy with Attorney-general Peyton Randolph, who maintained that the Act of Toleration did not extend to Virginia, but Mr. Davies's view was sustained by the king's council. In 1753 he was commissioned by the Synod of New York, in company with Rev. Gilbert Tennent, to visit Europe and solicit donations for the College of New Jersey. They visited Scotland together, and afterwards Mr. Tennent went to Ireland, while Mr. Davies made a tour through the principal cities of England. They were received with great favor, and were very successful in their mission. When Mr. Davies returned to Virginia in February, 1755, he found the colony in a great state of excitement, which was increased by the defeat of Gen. Braddock in July. On this subject he preached a sermon in August, and when publishing it added a note which has become famous by its reference to "that heroic youth, Col. Washington, whom I cannot but hope Providence has hitherto preserved for some important service to his country." When fears were entertained that the negroes might join the French and Indians, Mr. Davies exerted himself to prevent such a movement. His labors in Virginia resulted in the formation of the Presbytery of Hanover in December, 1755, which originally comprised the whole of Virginia and North Carolina. In 1758 he was elected president of the College of New Jersey at Princeton, and declined the position, but in the following year, being again elected, he resigned his charge and removed to Princeton, entering upon his duties as president July 26, 1759, though he was not formally inducted until Sept. 26. He brought to the college a high reputation for wisdom, piety, and eloquence, which he fully sustained during his brief connection with it. He died at Princeton, Feb. 4, 1761. He published several sermons and some *Letters on the State of Religion in Virginia, particularly among the Negroes*. His sermons were afterwards collected and published in five volumes (London, 1767). Several editions have since been issued in England and America; that of New York (1851) contains an essay on the *Life and Times of Davies*, by Rev. Albert Barnes.

DAVIESS, JOSEPH HAMILTON (1744-1811), an eccentric American lawyer, born in Bedford county, Va., March 4, 1774. His parents removed to Kentucky in 1779. He was educated in academy at Harrodsburg; served six months (1793) in an Indian war; entered upon an active legal practice at Danville in 1795, and acquired a national reputation as a lawyer.

He married a sister of Chief-Justice Marshall, and was afterwards United States attorney for Kentucky. The failure (Nov. 25, 1806) of his action against Aaron Burr, for making war against a foreign nation in time of peace (Henry Clay being Burr's counsel), was a serious blow to Daviess' popularity, which already had suffered from his determined Federalism. He afterwards entered the army, and, as colonel, commanded two troops of dragoons at the battle of Tippecanoe (Nov. 7, 1811), where he was shot through the body and mortally wounded, while leading a successful assault against the Indians. He died Nov. 8, 1811. He published *A View of the President's Conduct concerning the Conspiracy of 1806*.

DAVIS, ANDREW JACKSON, an American clairvoyant and author, was born in Blooming Grove, Orange co., N. Y., Aug. 11, 1826. His only instruction was received in five months at a primary school. Until his twelfth year he was employed on a farm; then his father removed to Poughkeepsie, N. Y., where young Davis was for five years a shoemaker's apprentice. In 1843, Mr. William Levingston of Poughkeepsie magnetized him by mesmeric passes, and immediately his remarkable clairvoyant powers were developed. He soon became widely known as the "Poughkeepsie seer," and for some years was much resorted to for medical examinations and prescriptions. He claimed that while in the clairvoyant state his mind seemed to expand so as to comprehend the most difficult subjects, and these he was able to treat in appropriate language. He afterwards found a new magnetizer in Dr. S. S. Lyons of Bridgeport, Conn., and in Nov., 1845, began the dictation of a series of discourses, which Mr. William Fishbough recorded. These lectures, 157 in number, were published in 1847 under the title *The Principles of Nature, Her Divine Revelations, and a Voice to Mankind*. After the publication of this work he separated himself from the magnetic control of others, and has since claimed to enter the clairvoyant state by will. He teaches that this condition is superior to the superinduced trance state, as in the latter the individuality is suppressed, while in the voluntary trance the faculties are expanded and exalted. Mr. Davis has published thirty volumes, among which are—*The Great Harmonia* (5 vols.), *Stellar Key to the Summer Land*, *Arabula*, *Harbinger of Health*, *Death and the After-Life*, *Views of our Heavenly Home*. These are expansions and applications of the doctrines contained in his first volume. His system is called the "harmonial philosophy." One of his volumes, *The Magic Staff*, is an autobiography. Most of his works have been translated into German under the patronage of a wealthy Russian, Alexander Aksakof, aided by Prof. Wittig of Breslau and Wilhelm Besser of Leipsic. Mr. Davis is now president and lecturer of an harmonial association in New York (incorporated May, 1881), and delivers discourses the principles of which he professes to obtain by independent clairvoyance.

DAVIS, CHARLES HENRY (1807–1877), an American admiral, was born in Boston, Jan. 16, 1807. His father, Daniel Davis, was solicitor-general of Massachusetts, and his mother a sister of Rev. James Freeman of King's Chapel. He entered Harvard College in 1821, but remained only two years. Having been appointed acting midshipman in 1823, he served on a three-years' cruise in the Pacific, was then ordered to the West Indies, and in 1829 sailed on a two-years' cruise in the Mediterranean. After further service in the Pacific he was commissioned lieutenant in 1834. In 1842 he became connected with the U. S. Coast Survey, and passed seven years in this duty, rendering specially important service to the commercial interests of the country by his discovery and survey of dangerous shoals off the southern coast of New England. He was subsequently engaged in the survey of the harbors of Boston, New York, Charleston, and other places. His mathematical ability caused him to be placed in charge of the new *American Ephemeris and*

Nautical Almanac. In 1854 he was promoted to the grade of commander, and in 1856 commanded the sloop St. Mary's on the Pacific station. During this cruise he received the surrender of the filibuster Gen. Walker at Rivas, and took possession for the United States of some islands in the Pacific. At the outbreak of the Civil War, Commander Davis was stationed at Cambridge, Mass. He was ordered to Washington, and appointed on a board of military and naval officers to report on the condition of the Southern coast with a view to offensive operations. The result was the expedition to Port Royal, S. C., in which Davis sailed as chief of staff to Captain S. F. Dupont, and rendered valuable assistance by his intimate knowledge of the hydrography of the Southern coast. He commanded the expedition to close the entrance to Charleston harbor by sinking the stone fleet in the main channel, and served on the expeditions against Fort Pulaski and Fernandina. Being next placed in command of the Mississippi gunboat flotilla in April, 1862, he defeated a fleet of gunboats off Fort Pillow, May 10, and on June 6th destroyed the Confederate fleet and captured the city of Memphis. Then joining Farragut at Vicksburg, he served in various expeditions until July, 1862, when he was appointed chief of the newly-established bureau of navigation in Washington. In Feb., 1863, he received the thanks of Congress and was promoted to rear-admiral. In 1865 he became superintendent of the Naval Observatory, but in 1867 was placed in command of the Brazil squadron, and after two years' service at sea took charge of the navy-yard at Norfolk. In 1874 he again assumed the direction of the Naval Observatory. He died at Washington, Feb. 18, 1877. He was distinguished for his scientific attainments, and was a member of the National Academy of Sciences and other scientific associations. Harvard College conferred on him the degree of A. M. in 1841, and that of LL.D. in 1868. Among his publications are *The Coast Survey of the United States* (1849), a translation of Gauss's *Theoria Motus Corporum Coelestium* (Boston, 1857), several astronomical memoirs and tables, and the *Narrative of the North Polar Expedition of the U. S. S. Polar* (1876).

DAVIS, DAVID, LL.D., an American statesman, was born in Cecil co., Md., March 9, 1815. He was educated at Kenyon College, Gambier, O., and studied law at Lenox, Mass., and at Yale College law-school, Conn. He removed in 1836 to Bloomington, Ill.; served in the State legislature, 1844–45; was in the convention of 1847 for framing a new State constitution; served, 1848–62, as a judge in a State court, being twice re-elected during his term of service. He was appointed by President Lincoln in 1862 an associate justice of the United States Supreme Court. He resigned this office in 1877 on being elected United States Senator from Illinois. When in 1881 Mr. Arthur became President, Senator Davis was chosen president of the Senate, and was thus acting vice-president of the United States. On the expiry of his term in 1883 he retired to private life.

DAVIS, GARRET (1801–1872), an American lawyer and statesman, was born at Mount Stirling, Ky., Sept. 10, 1801. He received a classical education, and was employed as a writer in the courts of his district. He was admitted to the bar in 1823, and soon acquired distinction and an extensive practice. In 1833 he was elected to the State legislature, and in 1839 was a member of the State constitutional convention. In the same year he was elected to Congress, where he remained till 1847. He was an intimate personal and political friend of Henry Clay, and an active member of the Whig party. In 1845 he defeated Thomas F. Marshall after a hard-fought campaign. At the close of this term he devoted himself to agriculture, in regard to which he was a high authority in his State. At the outbreak of the Civil War he exerted himself to prevent the secession of Kentucky, and was elected to the United States Senate as an Old-Line Whig.

succeeding John C. Breckinridge. He served on the committees on foreign relations and on the Territories. Though small and delicate, he was noted for his powers of endurance, and often spoke for hours. He was passionate, enthusiastic, and fierce in invectives. He remained a Senator till his death, which took place at Paris, Ky., Sept. 22, 1872.

DAVIS, HENRY WINTER (1817-1865), an American statesman, was born at Annapolis, Md., Aug. 16, 1817. His father, Rev. Henry Lyon Davis, an Episcopal clergyman, was then president of St. John's College, Annapolis, but was afterward removed from his position on account of his Federal politics. He was a man of ability and learning, fluent in conversation and writing, but without the least pretension to oratory. Henry was taught chiefly by his father till he went to Kenyon College, Ohio, where he graduated in 1837. His father, having died in the previous year, had left him a few slaves, but he refused to receive any profit in this way, and tendered to each one of them a deed of manumission whenever the law would allow. After graduating he sought employment as a tutor, and in Oct., 1839, having received some assistance from his aunt, went to the University of Virginia, where he followed its higher course and studied law. Having commenced practice at Alexandria, Va., in 1841, he soon became known as an able lawyer. In 1850 he removed to Baltimore, and at once secured a foremost place at its bar. He was elected to Congress as a Whig in 1854, and in 1856 and 1858 as a member of the American party. In 1859 he ended the long contest for the Speakership of the House of Representatives by voting for Mr. Pennington, the Republican candidate. In the presidential campaign of 1860 he supported John Bell, the "Constitutional Union" candidate, but when Pres. Lincoln, immediately after the attack on Fort Sumter, called an extra session of Congress, Davis announced himself as a candidate for Congress on the basis of "the unconditional maintenance of the Union," and exerted himself against a secessionist mob that had gathered in Baltimore. He was defeated as a candidate, but his efforts did much to prevent the secession of his State. In 1863 he published an address to the people of Maryland, urging upon them immediate emancipation of their slaves by an amendment of the State constitution; and he followed this up in a remarkable campaign, allowing himself no reprieve from labor till the object was accomplished. In that year he was again elected to Congress, where he was made chairman of the committee on foreign affairs. In May, 1864, he joined with Senator Benjamin F. Wade in a public protest against Pres. Lincoln's refusal to sign a bill with regard to reconstruction, as being an infringement of the rights of Congress. At the close of the war he urged that the right of suffrage should be given to the negroes. He died after a brief illness, at Baltimore, Dec. 30, 1865. He was an orator of remarkable ability, always speaking to instruct, and always securing the charmed attention of his hearers. His most striking characteristics were devotion to principle and indomitable courage. In 1853 he published *The War of Ormuzd and Ahriman in the Nineteenth Century*. In 1867 a memorial volume of his *Speeches and Addresses* was published, with an oration giving a sketch of his life and services, by Hon. J. A. J. Cresswell.

DAVIS, JEFFERSON, was born in Christian co., Ky., June 3, 1808, was graduated at West Point in 1828, and resigned from the army in 1835. In 1845 he entered Congress from Mississippi, his adopted State, but resigned to take command of the First Mississippi rifle regiment in the Mexican War, which he retained until hostilities were at an end. In 1847 he became United States Senator, but in 1851 resigned to become the secession candidate for governor of his State against Henry S. Foote. In this contest he was defeated, but was at once re-elected to the Senate. He again resigned, became Secretary of War under Pierce (1853-57), and was

then re-elected to the Senate. Jan. 21, 1861, he left the Senate on the secession of his State, and during the next month became President of the Southern Confederacy (see CONFEDERATE STATES). At the downfall of the rebellion he was captured by a cavalry force in Georgia, May 10, 1865, and was imprisoned for two years in Fortress Monroe, but was then released on bail, and has not been tried.

Davis's career in the Senate laps on and completes Calhoun's, and involves the whole extreme Southern view of the relations of the Federal Government to slavery in the Territories. The Calhoun theory, as perfected after 1833, held that the Constitution was a compact formed by States only; that these entered the "convention of 1787," which framed the Constitution, as sovereign States, and came out of it as sovereign States; that any new territory acquired was not "national" territory, to be governed absolutely by Congress, but "the common property of all the States," to be governed in such a manner as to maintain the rights of all the States in it; that Congress had no right so to legislate as to exclude either free-State settlers or slave-State settlers from the territory; and that the Wilmot proviso, or any similar legislation, was therefore unconstitutional (see FREE-SOIL PARTY). Two awkward facts, as yet unimpeached, stood in the way: the Congress of the Confederation had in 1787 prohibited slavery in the territory north-west of the Ohio; and in 1820, at the admission of Missouri as a State, Congress had prohibited slavery in the rest of the territory west of the Mississippi and north of latitude 36° 30', the "Missouri-compromise line." The last was particularly awkward, since Calhoun was then in the Cabinet and advised the President to sign the bill thus prohibiting slavery; but this circumstance was unknown when Calhoun's Senate resolutions of Dec. 27, 1837, put his theory into settled form, and was usually ignored afterward. Of course it would follow from the theory that the ordinance of 1787 and the Missouri restriction of 1820 were both invalid, and so the Supreme Court in effect decided, twenty years afterward, when it adopted Calhoun's theory; but at first this consequence was unthought of. Accepting as facts what had been done, the Southern leader aimed only at preventing interference with slavery in the remaining territory, the District of Columbia. One object was so to demonstrate the incapacity of Congress to abolish slavery in the District as to make out a case for refusing to receive petitions for such action; and when Congress, after 1842, yielded as far as to receive the petitions, the Calhoun theory slumbered with the agitation until the Mexican annexation in 1848.

When the preliminaries to negotiations with Mexico in 1846-47 showed that territory was to be acquired from Mexico as the price of peace, a proviso forbidding slavery therein was at once brought in, and for four years became the central point of politics. Again Calhoun introduced his resolutions of 1837 in a more succinct form (Feb. 19, 1847). He did not now venture to press them to a vote, but within three years the question-begging phrase, "common property of all the States," had brought the whole South into line with Calhoun and had made Northern Democrats chary of opposition to him. Finally, the compromise of 1850 was elaborated: it comprised a fugitive-slave law to satisfy the South, the admission of California as a free State to satisfy the North, an evasion of any provision as to slavery in the other newly-acquired Territories (Utah and New Mexico) to satisfy both sections, a prohibition of the slave-trade, but not of slavery, in the District of Columbia, as a sop to the abolitionists, and a grant of \$10,000,000 to Texas in order to gain votes generally from members interested in Texas bonds. Calhoun's original theory was thus at last successful: Congress had *not* so legislated as to "proscribe" any citizen of a slave State from going to a Territory with his property.

But before this was settled Calhoun had added an

extension to his original edifice—the assertion that the Constitution extended to the Territories as well as to the States, and that the slaveholding immigrant was entitled to be *protected* in the enjoyment of his “property.” On Feb. 20, 1849, while the Territorial question was still unsettled, Senator Walker of Wisconsin moved to amend an appropriation bill by providing that the Constitution should be “extended over and given full force and efficacy” in the Territories. Webster at once informed him that “the thing was utterly impossible,” that the Constitution was made for States, not for Territories, and that the Territories were not a part of the political United States. Calhoun reminded him that the Constitution pronounced itself to be the supreme law of the land, to which Webster only answered, “What land?” Calhoun, after arguing that it was the territorial not the political land, remarked that he had been told that some decision of a United States court sustained Webster’s doctrine, but that he was “incredulous of the fact.” Webster replied briefly that he could “remove the gentleman’s incredulity very easily, for he could assure him that the same thing had been decided by the United States courts over and over again for the last thirty years.” In all his many conflicts with Webster, Calhoun never showed to so little advantage as in this; and though the motion was carried in the Senate by an almost entirely sectional vote, the whole weight of argument was against it. The Senate amendment was lost in the House, but it remained the Southern doctrine that the Constitution, with its compromises, its protection to property, its prohibition of depriving any person of “property” without due process of law, and its implied obligation upon Congress to legislate for the protection of “property,” extended to the Territories *proprio vigore*. It mattered not that the Senate amendment had failed or that the compromise of 1850 had not recognized its principle: both these were only failures to pass declarative acts, and could not affect the essential nature of the Constitution itself. If Congress had failed to pass a proper declarative act in 1850, it had at least pursued a middle line, and had not unconstitutionally legislated against the Calhoun theory with its new extension. It only remained to seize the first opportunity to extort from Congress a plain declaration of the existence and supremacy of the Constitution in the Territories; and in this Jefferson Davis was Calhoun’s Elisha. He had stated his *ultimatum* in round terms in Jan., 1850, as follows: “We maintain that it is the right of the people of the South to carry this species of property to any portion of the Territories of the United States—that it rests, under the Constitution, upon the same basis as other property; but we are willing, in a spirit of compromise and in compliance with the past acquiescence of the States, to restrict it by the parallel of 36° 30’ north” [that is, to extend the Missouri-compromise line to the Pacific]. And though, when the *ultimatum* had been refused, he was defeated by Foote in Mississippi on a platform of secession as an answer to the refusal; though McDonald was defeated by Howell Cobb in Georgia on the same issue; though any secession candidate would have been similarly defeated in any State outside of South Carolina,—there was a weakness in the Southern mind for this view, that the Constitution, as a protector of “property,” was in full force in the Territories. The platforms adopted by Southern conventions, particularly those of Georgia, and by the Nashville convention, all assert a “right” to carry slavery into the Territories, without expressly basing it on the extension of the Constitution to the Territories. All that was necessary was to harp upon the constitutional assertion long enough, and the hearers would in time accept it.

The passage of the Kansas-Nebraska bill in 1854 promised general non-intervention by Congress with slavery in the Territories; but if the promise was kept to the ear, it was broken to the hope of the mass of Southerners, and particularly of their leaders. Intervention by immigration was more effective than Con-

gressional intervention. Kansas was not only to be a free State instead of a slave State; it was to be a Republican State instead of a Democratic State. From the moment that this result became certain the Calhoun-Davis theory was the only alternative for the leaders to adopt, and their political existence depended upon its ratification by their people. Most opportunely—so opportunely that the case was widely but mistakenly considered a factitious one—the decision of the Supreme Court in the “Dred Scott case” came to their assistance. Dred Scott was a Missouri slave whose owner took him in 1834 to Illinois, where slavery was prohibited by the ordinance of 1787 and by the State constitution, and in 1836 to Upper Louisiana, or Wisconsin (now Minnesota), where slavery was prohibited by the Missouri compromise. Having been taken back to Missouri, and there whipped for some offence, Dred brought suit for assault and battery, claiming to have become a free man by his residence in free territory. He obtained a verdict, but the State supreme court reversed it on appeal. In the mean time, the owner had sold him to John F. A. Sandford of New York, and Dred brought suit in a Federal court, as the parties were now “of different States.” Thence by writ of error the case went to the Supreme Court, whose decision was given in March, 1857. It sustained the original Calhoun theory firmly, that negroes were no part of the political “people of the United States” in the view of the framers of the Constitution; that they were “property,” not persons, with no more rights than the white race chose to allow them; that, a Territory being a part of the United States, the Government and the citizen both enter it under the authority of the Constitution, with their respective rights defined and marked out; and that the Federal Government “can exercise no power over his [the citizen’s] person or property beyond what that instrument confers, nor lawfully deny any right which it has reserved.” It follows from this that, as far as prohibitions of slavery went, the ordinance of 1787 had become a dead letter at the adoption of the Constitution, and that the Missouri compromise of 1820 was unconstitutional and void. So far, Calhoun’s original theory was followed in all its consequences. But it does not need a very close scrutiny of the paragraph specially quoted above to show that the final Calhoun-Davis theory, if it was not here in full flower, was at least sprouting. Grant that slaves were property, that the right to such property was reserved to the citizen by the Constitution, and that the Federal Government could not lawfully deny his right in the Territories, and no great headway is needed to carry the court to the assertion that the Government may not allow others to deny his right; and that means nothing less than protection to slavery in the Territories.

On this decision Southern leaders took firm hold. Hardly any three of the members of the court had agreed on any one point, and the opinions above given were outside of the question which the court was to decide; but it was sufficient that the court had decided against Dred Scott, and that the nominal opinion of the court contained quotable paragraphs to make the Constitution the law of the Territories. Before the close of Buchanan’s term the *ultimatum* which Davis had presented in 1850 was offered again by him in seven resolutions, which were passed by the Senate, May 24–25, 1860. They were much like those of 1837 and 1847, except the fifth, which declared that “if experience should at any time prove that the judicial and executive authority do not possess means to ensure adequate protection to constitutional rights in a Territory, and if the Territorial government should fail or refuse to provide the necessary remedies for that purpose, it will be the duty of Congress to supply such deficiency.” The whole made up the new Southern programme: (1) that neither Congress nor a Territorial legislature could prohibit slavery in a Territory; (2) that both were bound to protect slavery; (3) that the right of the people of the Territory to prohibit slavery only accrued when they came to form

a State constitution; and (4) that Congress was then bound to admit the State with or without slavery as its people should elect. This was the platform upon which the Cotton-State delegates insisted at the Charleston convention; and the refusal of the convention to adopt it led to their withdrawal and the breaking up of the convention (see DEMOCRATIC PARTY, II.). Indeed, Mr. Davis's resolutions, when introduced, March 1, 1860, were as much an *ultimatum* to the convention of the following month as to the country at large.

Was Jefferson Davis a traitor? The question of course includes the status of all other persons who took part in the rebellion. Rebels they certainly were—success or failure distinguishes revolution from rebellion—but, as far as the essential elements of treason are concerned, the answer must be hesitating. It must be remembered that the doctrine of State sovereignty acknowledged no primary allegiance of the citizen to the United States: his primary allegiance was due to his State, and his *obedience* was due to the United States because his State commanded it. When the State seceded the citizen's allegiance was still due to his State, and he obeyed his State both in becoming a citizen of the Confederate States and in making war on the United States. The Constitution's definition of treason, "making war against" the United States or "adhering to their enemies, giving them aid and comfort," must be conceded to have some moral limitations in its application to men who conscientiously maintained the allegiance which they believed to be due to their State. The war was waged by the United States for the purpose of maintaining the allegiance due the nation; and if it is an evil that no executions for treason took place, the nation must accept it as the penalty for an eighty years' *laches* in permitting that undisputed impeachment of the allegiance due to it which was the basis of secession. Future experimenters have had fair warning: Jefferson Davis had less than none. The case is thus strongly put by Dr. Brownson: "Treason is the highest crime and deserves exemplary punishment, but not where there has been no treasonable intent; where they who committed it did not believe it was treason, and on principles held by the majority of their countrymen, and by the party that had generally held the Government, there really was no treason. Concede State sovereignty, and Jefferson Davis was no traitor in the war he made on the United States, for he made none till his State seceded. He could not then be arraigned for his acts after secession, and at most only for conspiracy, if at all, before secession." It was the consciousness of its own previous shortcoming that led the nation to refrain from treason trials after the suppression of the rebellion.

See Alfriend's *Life of Davis*; Craven's *Prison-Life of Davis*; Pollard's *Life of Davis and Secret History of the Confederacy*; Davis's *Rise and Fall of the Confederate Government*; 3 Calhoun's *Works*, 140-202 (resolutions of 1837); 4 Calhoun's *Works*, 339-382 (resolutions of 1847); 16 Benton's *Debates of Congress*, 306, 396; Cluskey's *Political Text-Book*, 595-600 (Southern convention platforms of 1850); *Dred Scott vs. Emerson*, 15 *Mo.*, 682; *Dred Scott vs. Sandford*, 19 *How.*, 393; Benton's *Examination of the Dred Scott Decision*; 2 B. R. Curtis's *Works*, 213; Greeley's *Political Text-Book* (Senate resolutions of 1860), and 31 (Southern platform at Charleston); Brownson's *American Republic*, 338; "Centz's" *Republic of Republics*, 408-424; Schucker's *Life of Chase*, 534-545; and authorities under DEMOCRATIC PARTY, II., III., and FREE-SOIL PARTY. (A. J.)

DAVIS, JOHN CHANDLER BANCROFT, an American jurist and diplomatist, was born at Worcester, Mass., Dec. 29, 1822. His father, John Davis, LL.D., was for three terms United States Senator from Massachusetts, and was noted for his advocacy of a protective tariff. The son graduated at Harvard College in 1840, and having studied law commenced practice. In 1849 he went to London as secretary of legation, his uncle, Hon. George Bancroft, the historian, being at that time minister to England, but resigning soon after. Mr. Davis acted as *chargé d'affaires* until Mr. Abbott Lawrence was appointed, when he again became secre-

tary of legation, and remained until Dec., 1852. He then settled in New York as a lawyer, and in 1854 became the American correspondent of the *London Times*, and served as such until Nov., 1861, when he was compelled to leave America on account of ill-health caused by overwork. After a few years he resumed the practice of his profession, and in 1869 was elected to the legislature of New York. At the commencement of Pres. Grant's administration Mr. Davis was appointed assistant Secretary of State, and became American secretary in the joint commission which concluded the Treaty of Washington in the spring of 1871. In the summer of that year he prepared the American case for submission to the tribunal of arbitration for the settlement of the Alabama claims. In the autumn he went to Geneva as the agent of the United States at the meeting of the tribunal, and acted in that capacity throughout its proceedings. Returning to the United States in Jan., 1873, he resumed his place as assistant Secretary of State, and in July, 1874, was appointed United States minister to Germany. This position he resigned in the spring of 1877, though at the request of the Government he remained in Berlin until the autumn. On his return to the United States he was appointed a judge of the court of claims, taking his seat on the bench in Jan., 1878. In Dec., 1881, he again became assistant Secretary of State, but resigned after holding the position six months. His publications are—a law-book called *The Massachusetts Justice* (Worcester, 1847), *The Case of the United States at Geneva* (1872), *Mr. Sumner, the Alabama Claims, and their Settlement* (New York, 1878), *Les Tribunaux de Proces des États Unis* (Paris, 1878). He has also contributed to *Fraser's Magazine* and the *Edinburgh Review*, and furnished notes to a *Revised Edition of the Treaties of the United States* (1873).

DAVIS, NATHAN SMITH, LL.D., an American physician and author, was born at Greene, Chenango co., N. Y., Jan. 9, 1817. He spent his early years on a farm, attending school in the winter. At sixteen he went to Cazenovia Seminary, and at seventeen began his medical studies. He graduated from Fairfield Medical College in Jan., 1834, and soon after settled as a physician at Binghamton, N. Y. Besides attending to his practice, he lectured at Binghamton Academy and wrote for the medical journals. In 1838 and 1841 he won prizes offered by the New York State medical society for essays on *Diseases of the Spinal Column* and *The Physiology of the Nervous System*. His article on the *Physiology of the Brain*, which appeared in the *American Journal of Insanity* for 1844, attracted attention in Europe. Dr. Davis was secretary of the Broome county medical society and delegate to the State medical society, and it was largely due to his efforts that a national medical convention was called in 1846. He is therefore regarded as the father of the American Medical Association, and has twice been its president—in 1864 and 1865. In July, 1849, he was elected professor of physiology and pathology in Rush Medical College, Chicago, and removed to that city in September. A year later he was transferred to the chair of the practice of medicine, and besides his duties at the college was active in forming the Chicago medical society and the Illinois State medical society. He also labored diligently to promote the general welfare of Chicago. In 1859 he founded the Chicago Medical College, on the principle of graded classes, a six months' lecture-term, and a three years' course before graduation. This principle has been found successful, and has since been adopted by five other American institutions. The college founded by Dr. Davis now forms the medical department of the North-western University, and he is still its president. He also aided in founding the Chicago Academy of Sciences and the Washington Home for Inebriates, of which he was president till 1861. He received the honorary degree of A. M. in 1871, and that of LL.D.

in 1880, from the Illinois Wesleyan University. Dr. Davis became editor of the *North-western Medical Journal* in 1855, and in 1860 he started the *Medical Examiner*, of which he is still editor. He has published *A Text-book of Agriculture* (N. Y., 1840); *Lectures on Free Medical Schools* (Chicago, 1849); *History of Medical Education and Institutions in the United States* (Chicago, 1851); *Assimilation, Nutrition, and Animal Heat, Effects of Alcoholic Drinks on the Human System* (Chicago, 1851); *History of the American Medical Association* (Philada., 1855); *Clinical Lectures* (Chicago, 1873); *The Practice of Medicine* (Chicago, 1882), the last a volume of more than 1000 pages.

DAWKINS, WILLIAM BOYD, F. R. S., an English geologist and palæontologist, was born at Buttington parsonage, Welshpool, Montgomeryshire, Dec. 26, 1838. He is the son of Rev. Richard Dawkins, and was at first intended for the Church. After a preliminary training at a school in Lancashire he entered Jesus College, Oxford, where he soon showed a special fondness for natural science, especially geology. For nearly two years he pursued a course of medical study, but in 1859 he was led by the discovery of fossil bones in Wookey Hole into that course of investigation which has given him fame. He thoroughly explored that cave, and in 1860 laid the results before the Geological Society, of which he was elected a fellow. This was the first of a series of explorations which have since been carried on in various parts of Great Britain, and have led to a great increase of knowledge of pre-historic times. Mr. Dawkins in 1861 was appointed on the staff of the geological survey of Great Britain, and for eight years was engaged chiefly in the south-eastern part of England. In 1869 he was appointed lecturer on geology in Owens College, Manchester, and curator of the museum in that city. In 1873 he was made professor of geology and palæontology in Owens College, which now forms part of Victoria University. In discharge of his duties he has instituted and carried out a system of field lectures by which students are trained in practical geology. After a thorough examination of the fossil collections in the museums of continental Europe, Prof. Dawkins published his interesting work on *Cave-Hunting: Researches on the Evidences of Caves respecting the Early Inhabitants of Europe* (1874). He had also been active as a consulting geologist, and in 1875 visited Australia and the United States to examine the gold- and silver-mines. Further researches in the caves of Great Britain led to his second important publication, *Early Man in Britain, and his Place in the Tertiary Period* (1880). In that year he returned to the United States to deliver a course of lectures before the Lowell Institute of Boston, and visited the important museums of the Eastern States, especially those made by Profs. Agassiz, Marsh, and Cope. He has consolidated and thoroughly organized the natural-history collections in Manchester. Besides his contributions to the publications of the Geological Society, Prof. Dawkins has written many articles for the literary reviews and magazines, and has lectured in all the principal towns of England and Scotland. He is a member of various scientific societies in England, Germany, and America. Throughout his career he has shown not only devotion to science, but excellent administrative and business capacity. He has taken part in many important public enterprises, and is one of the principal supporters of the building of a tunnel under the English Channel.

DAWSON, SIR JOHN WILLIAM, LL.D., F.R.S., a Canadian geologist and naturalist, was born at Pictou, Nova Scotia, in Oct., 1820. During his academic training at the College of Pictou he made extensive collections in the natural history of his native province. Having devoted himself to geological research he accompanied Sir Charles Lyell during his tour in Nova Scotia in 1842. He afterwards attended the University of Edinburgh for the purpose of studying more thoroughly the natural sciences, and graduated there in 1847. During his stay in Scotland and after his

return he published a number of valuable papers embodying the results of his researches. Being appointed superintendent of education for Nova Scotia in 1850, he took part in establishing a normal school and in improving the other schools and institutions of learning. In 1855 he was appointed principal and professor of natural history in McGill College and University at Montreal. He had also charge of a normal school, and had much to do with moulding the school-system of his country. The latter position he resigned in 1870, but he still retains the former, in which he has been remarkably successful. In 1855 he published *Acadian Geology*, a full account of the geology of the maritime provinces of British North America. An enlarged and improved edition appeared in 1868. He continued his researches in Nova Scotia, examining the silurian and Devonian rocks, and devoting much attention to fossil botany. Besides numerous scientific papers he published *Archæia, or Studies on the Cosmogony and Natural History of the Hebrew Scriptures* (1859), a work which shows familiarity with the Hebrew language and Biblical literature. In his work on *The Air-Breathers of the Cold Period* (1863) he gives an account of fossil reptiles found in Nova Scotia. In connection with his educational work he prepared a *Hand-book of Scientific Agriculture* (1864). In the same year he made his most interesting scientific discovery, that of *Eozoon Canadense*, by which he proved that the rocks of the Laurentian age, heretofore supposed to be devoid of animal remains, really contained the oldest forms of animal life. For the name Azoic, previously applied to them, he now proposed Eozoic. He has since continued his investigations, and by his labors the number of known species of Post-pliocene fossils has been raised from about 30 to more than 200. In 1870, during his visit to England, he lectured before the Royal Institution and presented papers to scientific societies. In the same year his *Hand-book of Canadian Zoölogy* appeared, being followed by a *Report on the Silurian and Devonian Flora of Canada*, and another on the geology of Prince Edward Island. *The Story of the Earth and Man* (1873) is a popular view of the geological ages, with incidental discussion of the various theories and questions connected therewith. A course of six lectures delivered in New York in the winter of 1874-75 was published under the title *Science and the Bible* (1875). In *The Dawn of Life* (1875) the facts relating to the oldest fossils are set forth in popular style. Principal Dawson's later works are *The Origin of the World* (1877), *The Chain of Life* (1880), *Fossil Men* (1880), *Facts and Fancies in Science* (1882). While his original researches have contributed largely to the progress of geological science, his popular lectures and writings have promoted a more extensive interest in the subject. Being a firm believer in Divine revelation, he has maintained at all times the harmony between the teachings of the Bible and science. While accepting the doctrine of evolution to a certain extent, he has opposed with vigor the extreme materialistic views of some of its supporters. He has received from McGill University the degree of LL.D., and has been elected a member of many scientific societies on both sides of the Atlantic. In 1882 he was chosen president of the American Association for the Advancement of Science, and also president of the Royal Society of Canada. In 1884 he received the honor of knighthood.

DAY, HENRY NOBLE, D. D., LL.D., an American educator and author, was born in New Preston, Conn., Aug. 4, 1808. He graduated at Yale College in 1828, and after spending several years in teaching, during three of which he was tutor in Yale College, and over a year in European travel, he was ordained pastor of the First Congregational Church in Waterbury, Conn., in 1836. This charge he resigned to undertake that of professor of sacred rhetoric in Western Reserve College, Ohio. In 1850 he became president of the Ohio Female College, near Cincinnati. In 1864 he resigned this office

and removed to New Haven, Conn., where he has devoted himself to literary work. Besides numerous contributions to educational, literary, and theological periodical publications, he has published a considerable number of text-books for the advanced stages of study. Of these may be mentioned—*The Art of Elocution* (1844; revised in 1860); *The Art of Rhetoric* (1850; revised under the name of *The Art of Discourse*, 1867); *Rhetorical Praxis* (1860), *Logic* (1867); *The Art of Composition* (1867); *English Literature* (1869); *Logical Praxis* (1872); *Æsthetics* (1872); *Psychology* (1876); *Ethics* (1876); *Ontology, or Philosophy of Knowledge and Being* (1878). He has received the degrees of doctor of theology and doctor of laws from several colleges. Dr. Day's rhetorical works may be briefly characterized by saying that he makes expression or style subordinate to invention or thought. In his *Logic* he endeavors first to determine the essential attributes of thought, and from these to deduce its laws and forms. In his *Ethics* he recognizes as three co-ordinate elements in all morality, love in the agent, beneficence in the object, and rectitude in the action, and then arranges the forms of duty in their scientific order. His works on these subjects are more profound and metaphysical than the usual text-books. His latest work, *Ontology*, is a philosophical treatment of the nature of knowledge, with its determining conditions and tests—first, of thought itself, then of the conscious spirit, of God, and of the material universe.

DAYTON, a town of Campbell co., Ky., is on the south side of the Ohio River, opposite Cincinnati, and 1½ miles east of Newport. It is reached by street-cars from Newport and by ferry from Cincinnati. It has 6 churches, a high-school, and other schools. Its principal industry is the manufacture of ropes. It was laid out as a town in 1850, and was formerly called Brooklyn. Population, 3210.

DAYTON, a city of Ohio, county-seat of Montgomery co., on the E. bank of the Great Miami River, at the confluence of Mad River, 60 miles by rail N.N.E. of Cincinnati. The following railways accommodate the business of the town: the Cincinnati, Hamilton, and Dayton; the Cincinnati Northern; the Cleveland, Columbus, Cincinnati, and Indianapolis; the Dayton and Union; the Dayton and Michigan; the New York, Pennsylvania, and Ohio; the Pittsburg, Cincinnati, and St. Louis; and three divisions of the Toledo, Cincinnati, and St. Louis; the Ohio Canal passes through the town. From Dayton some 36 macadamized or well-metalled roads radiate. The streets are 100 feet wide. The court-house is built of white limestone. There is a costly stone jail, a city orphanage, a county alms-house, a State lunatic asylum, some 50 churches, a high-school, St. Mary's Institute (Roman Catholic), the divinity school of the United Brethren in Christ, the Cooper Academy for Ladies, a music-hall, an opera-house, a free public-school library of 15,000 volumes. There are several large Catholic institutions, including parish schools and a commodious hospital. The city school-system is very complete. Mad River affords a great amount of water-power, utilized in extensive manufactories, turning out railroad-cars, farm-implements, paper, hollow-ware, stoves, cotton-goods, linseed oil, woollens, flour, machinery, doors, sash, blinds, and other goods in great variety. Several of the churches are of noteworthy architecture. In the vicinity are important quarries of building-stone. Not far from the city is a national soldiers' home, a large and important institution. Dayton has a very large local trade. There are 2 national banks and 2 State banks; 2 daily, 4 weekly, besides other periodicals are issued here. Dayton was founded in 1796, incorporated in 1805, and chartered as a city in 1841. Population in 1870, 30,473; in 1880, 38,678.

DAYTON, WILLIAM LEWIS (1807–1864), an American statesman, was born at Baskingridge, N. J., Feb. 17, 1807. He graduated at Princeton College in 1825, and was admitted to the bar in 1830. In 1837

he was elected to the State Senate, and in 1838 was made a justice of the State Supreme Court. He was United States Senator from 1842 to 1851, and attorney-general of New Jersey from 1857 to 1861. He had been a Whig, but was firmly opposed to the extension of slavery in the Territories. He was in 1856 the Republican candidate for the Vice-Presidency. In 1861 he was appointed by President Lincoln minister to France. He died in Paris Dec. 1, 1864.

DEACONESSES, an order of women in the early Church corresponding to that of deacons. See Vol. VII. p. 3. In the West the office was shorn of its clerical character in the fifth century, but was continued in the Eastern Church down to the twelfth or thirteenth. During the Middle Ages the duties appertaining to the office, such as caring for the poor, nursing, teaching, etc., were performed by the nuns and Sisters of Charity. In the revival within the present century which we propose to consider in connection with the Lutheran Church, the Church of England, and the Episcopal Church in this country, the office is not strictly identical with that in the primitive Church. In the latter it was a regular standing office in every Christian congregation, but in modern times it has assumed the form of associations. In Germany and France these associations, as a rule, have borne the name of deaconesses, but in England and America that of sisterhoods. The two act in a like capacity as servants of the Church, but differ somewhat in point of organization, government, and discipline. Speaking in a general way, a band of deaconesses is more flexible and simple, and is directly responsible to the pastor or bishop. A sisterhood, on the other hand, is more highly organized and rather assumes the form of an autonomy.

A representative and by far the largest deaconess institution connected with the Lutheran Church is that at Kaiserswerth on the Rhine, founded by the Rev. Theodore Fliedner. After making himself familiar with religious and charitable institutions by travelling in England and Holland, he opened an asylum for discharged female prisoners in 1833. This was the beginning of a group of institutions which came to include a deaconess or mother-house, where the sisters live, a hospital, a deaconess school, to which girls who wish to become deaconesses are received after confirmation, an infant school, an orphan asylum for girls, an asylum for fallen women, a seminary for teachers, a house of rest for infirm and sick sisters, together with out-stations in all parts of the world.

In 1836 the deaconess house was opened without deaconesses, a single sister, however, offering herself the same year. Other aspirants to the office soon followed, and such were the additions that in 1867 some five hundred sisters belonged to the institution. Of these, over three hundred were deaconesses and the others probationers. Of the whole number, about ninety were employed as teaching sisters, and the rest as nursing sisters. As a rule, the seminary course of training for the teaching office in the infant school embraces one year; for the office of elementary teaching, two years; for that of teaching in the higher girls' school, three years. In thirty years over eleven hundred pupils had been instructed, and the demand was three times greater than the supply. The course of probation and instruction for the office of nursing sisters embraced from six to twelve months, and, if required, two or three years. For admission to the office of deaconess in either department certain conditions are required in the way of Christian character and experience, mental qualifications, bodily health, etc., together with such special gifts and dispositions as the office may require. Probationers who have proven acceptable must pledge themselves to continue in the office at least five years. They are also required to declare before admission that they intend to adopt the office for life. The consecration service, which was drawn up by Pastor Fliedner, consists of a short dis-

course on the history and duties of the office, a promise to faithfully fulfil its requirements, which is confirmed by giving the right hand, a form of benediction by the pastor, the candidates kneeling, a prayer in their behalf by the pastor and congregation, a short exhortation, concluding with the Lord's Supper, in which the newly-consecrated members partake. After the consecration they are required to sign the rule and give a pledge to keep it faithfully, to maintain a Christian and dignified demeanor, to avoid making or continuing any intimate acquaintance with men or contracting other earthly ties, not to indulge in unbecoming and even unnecessary correspondence, and to devote themselves with all their powers exclusively to their office.

The Rhenish Westphalian Society, so called, for the training and employment of evangelical deaconesses, was formally recognized, and the laws fixing its constitution approved, by the king of Prussia in 1846. It is governed by a council consisting of members of the Lutheran or Evangelical Church, the internal management of the institution, however, being in the hands of an inspector and superintendent or mother, as the latter is called. According to the report of the triennial conference held at Kaiserswerth in 1868, institutions, mostly in association with the mother-house, had been opened at Paris in 1841; at Strasburg and Echallens in French Switzerland in 1842; at Dresden and Utrecht in 1844; at Bethanie, in Berlin, in 1847; at Pittsburg, America, in 1849; at Bethanie in Breslau and Königsberg, in Prussia, in 1850; at Stettin, Ludwigslust, Stockholm, and Carlsruhe in 1851; at Riehen, near Basle, in 1852; at Neuendettelsau and Stuttgart in 1854; at Augsburg in 1856; at Halle in 1857; at Darmstadt and Zurich in 1858; at Hamburg, Berne, and Hanover in 1859; in London in 1861; and at Copenhagen and Dantzic in 1862. In addition to these and several others, four institutions have been opened in Asia, and one each in Jerusalem and Africa. The number of mother-houses in 1868 was 42, and the total number of deaconesses, 2106. Of these, more than a fourth part belonged to the institution at Kaiserswerth. The number of establishments of various kinds, including mother-houses, with which the deaconesses were connected, amounted to 566. The important institution at Neuendettelsau, Bavaria, founded by Father Löhe, includes two girls' reformatories, a Magdalen institution, a house for incurables, the largest asylum for idiots in Bavaria, and in the village a district hospital and mission-house. Self-abnegation is practised by the sisters as a rule of life.

In addition to thirty or forty sisterhoods connected with the Church of England, centres of Church deaconess work now exist at Maidstone, Chester, Bedford, Salisbury, Farnham, and Hackney. Representative of the work is the London Diocesan Deaconess Institution, opened in Burton Crescent in 1861, and removed twelve years later to Westbourne Park. The object of the institution, as stated in its last annual report, is to train educated women to serve as deaconesses, with commission from the bishop, in the Church of England. In the various departments of labor the deaconesses are assisted by churchwomen and communicants, who act as associates. As many of the deaconesses as can possibly be spared work with success and favor in seven or eight parishes, while other unattached members of the order, trained in the institution, are employed in five or six parishes elsewhere. The institution is under the immediate control of the bishop of London, and grants are made towards the support of deaconesses by the Bishop of London's Fund. The movement is warmly advocated by the archbishop of Canterbury and the bishops of London, Durham, Winchester, Salisbury, Peterborough, and Bedford. Some ten years since a conference of bishops was held in London, when general principles and proposed rules were set forth and concurred in by which the various deaconess institutions should be guided.

A much larger and very successful institution, but not so strictly under episcopal control, is the Deaconess

Home at Mildmay Park, organized in 1860, and now under the management of Mrs. Pennefather. Connected with the institution is the deaconess house, six houses for probationers, a nursing home, cottage hospital, invalids' home, orphanage, invalids' kitchen, and various societies and missions. In 1873, from one hundred and fifty to two hundred women had been trained in the institution for various spheres of mission work in England, Scotland and Ireland, as also in India, China, and Japan. In 1880 the home had one hundred and fifty deaconesses and fifty nurses under training. In London the sisters do work among the most degraded classes in the way of house visitation, supplying dinners, nursing, teaching, etc. Bodily and spiritual wants are equally cared for. In its general spirit the Mildmay institution follows the system observed at Kaiserswerth, but admits of great freedom and simplicity. No vow is required but that of punctuality. The sum annually required to carry on the work is from \$111,000 to \$120,000, of which about \$60,000 are received in voluntary gifts from the "Christian Church."

Of deaconess institutions connected with the Protestant Episcopal Church in the United States there are three, together with nine or ten sisterhoods. Of the former, by far the largest is the order of deaconesses for the diocese of Long Island, established in 1872. It now numbers seventeen deaconesses and one associate, all of whom are under the immediate direction of the bishop. The community has charge of the Church Charity Foundation in Brooklyn, an institution which includes a hospital, an orphanage, and a home for the aged. It also has charge of St. Catharine's Hall, a boarding and day school for girls, the Homœopathic Hospital, Brooklyn, while a number of sisters are "loaned" to carry on a home and orphanage in Buffalo, N. Y. Other sisters do work under the missionary committee of the diocese of Long Island, while others again do missionary work in several Brooklyn parishes under the direction of their rectors. At the end of a year probationers, if they so desire and are approved of, are received into full fellowship. While perpetual vows are not required, there is an understanding that the work is to be for life. The other institutions are the order of deaconesses for the diocese of Maryland, having its head-quarters at Baltimore, and a similar order in the diocese of Alabama, which was organized at Mobile in 1864. In all these institutions, as at Kaiserswerth and in connection with the English Church, probationers are consecrated to the office according to a prescribed form which answers as a kind of ordination. (L. M. D.)

DEADWOOD, the county-seat of Lawrence co., Dakota, is among the Black Hills, 250 miles S.W. of Bismarck, and 250 miles N.N.E. of Cheyenne, Wyoming. It has a fine court-house, 8 hotels, 2 national banks, 2 daily and 2 weekly newspapers, 4 churches, and 3 schools. Gold and silver were discovered in this vicinity in 1874, and soon large numbers of adventurers moved to Deadwood. It was settled in 1876, and incorporated in 1881. It has grown rapidly, and is the chief city of the Black Hills. Its property is valued at \$1,200,000, and it is free of debt. It has water-works, but no manufactures of importance. Population, 3777.

DEAF-MUTES, EDUCATION OF. The first attempt, of which any record now appears, to teach the deaf in America, was made by Rev. John Stanford, about the year 1810. He was then acting as chaplain to the almshouse of the city of New York, and found in that establishment several deaf-mute children, whom he undertook to teach by causing them to write the names of familiar objects on slates. Finding the work of imparting a knowledge of language to the deaf and dumb more difficult than he had expected, demanding more time than he could afford, he was compelled to relinquish his undertaking. His interest, however, in the

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education of the deaf continued, and he was a few years later one of the founders of the New York Institution for the Instruction of the Deaf and Dumb.

The first effort to teach deaf-mutes in the United States in any systematic manner was made in Goochland co., Va., in 1812, in the family of Col. William Bolling, who had three deaf children, and whose brother and sister had been taught some years before in Edinburgh, in the school established by Thomas Braidwood, and carried on there by the Braidwood family. John Braidwood, a grandson of Thomas, came to America in 1812, with the design of establishing an institution for the instruction of the deaf on a large scale. Col. Bolling invited young Braidwood to take charge of the training of his three children, and later advanced funds to aid in the organization of a permanent school in Baltimore. But Braidwood, though possessed of skill and ability as a teacher, squandered the funds intrusted to him in an irregular manner of life. He was twice assisted by Col. Bolling in efforts to set up a private school in Virginia; he made a feeble attempt at carrying on a school in New York city, and finally died a victim to intemperance.

The establishment of the first actual school for the deaf in America grew out of the interest manifested by the late Rev. Thomas H. Gallaudet, LL.D., of Hartford, Conn., in a deaf-mute daughter of Dr. Mason F. Cogswell, of that city, in 1814. Dr. Gallaudet had just graduated from the Andover Theological Seminary, and was expecting to enter the Congregational ministry. Having some months of leisure during the winter of 1814-15, he devoted considerable time to the instruction of the child, Alice Cogswell, and succeeded in imparting to her a knowledge of many simple words and sentences. This success led her father, Dr. M. F. Cogswell, to entertain the idea of the establishment of a school for the deaf in his own town, where his child, with others similarly afflicted, might be educated. A number of gentlemen met at Dr. Cogswell's house, March 13, 1815, to consider the suggestion, and these gentlemen appointed Dr. Cogswell and Mr. Ward Woodbridge a committee to raise funds to defray the expense of sending a suitable person to Europe for the purpose of acquiring the art of teaching deaf-mutes. Mr. Woodbridge, heading the list with a liberal subscription, secured the pledge of a sufficient sum in a single day. Dr. Gallaudet was urged to undertake the labor of establishing the proposed institution, and after some hesitation consented to do so. He sailed for Europe on the 25th of April, 1815, was unsuccessful in his efforts to obtain the necessary training in Great Britain, but was cordially received by the Abbé Sicard, the Director of the Institution for Deaf-mutes in Paris. After acquainting himself with the method pursued by that eminent teacher Dr. Gallaudet returned to Hartford in August, 1816.

He devoted his time during the following autumn and winter to the collection of funds for the new institution, and the school was opened April 15, 1817, in Hartford, with about twenty pupils. The first grant of public funds in behalf of the education of the deaf in this country was an appropriation made in October, 1816, by the legislature of Connecticut, of \$5000 in aid of the new institution. During the winter of 1818-19 the Congress of the United States made a grant of a township of land (more than 23,000 acres) to the institution. This was sold to good advantage, yielding a fund of more than \$300,000, the income from which has accrued to the benefit, mainly, of the New England States, by diminishing the *per capita* cost of educating the deaf of that section of the country. The institution thus established remained under the management of Dr. Gallaudet fourteen years. It has been sustained in a course of unbroken prosperity, and holds a place at the present time of highest rank among the local schools of the country. More than 2000 children have been educated to lives of usefulness within its walls,

many of its teachers have been called upon to organize and take charge of schools in various parts of the country, many persons have come to it to fit themselves to become teachers of the deaf, and this now venerable institution is justly looked up to and honored as the *mother school* of the fifty-five in which the education of the deaf is provided for in the United States at the present time.

The second school for the education of the deaf in America was opened in New York city, in May, 1818. The suggestion for its establishment came from the unsuccessful effort of John Braidwood, already referred to, in which the interest of Dr. Samuel Akerly was excited. With the co-operation of Dr. Samuel L. Mitchell, a society was organized with the distinguished De Witt Clinton at its head, which was incorporated by the legislature of New York, April 15, 1817, under the name of the New York Institution for the Instruction of the Deaf and Dumb.

The means for the support of the institution were, at first, subscriptions and donations, with payments from such parents of pupils as had means. The city of New York soon provided for ten day-scholars, and the legislature of the State promptly followed, first with donations of money, but soon (in 1821) with a permanent and specific provision for thirty-two State pupils. The liberality of the legislature has continued without interruption, increasing from year to year, and now embraces six institutions located within the limits of the State, in which more than 1200 children are receiving education.

The New York institution was for several years after its opening under the charge of Dr. Akerly. In 1821 Mr. Horace Loofborrow became the principal teacher and occupied that position for ten years.

The work of the institution had many difficulties and drawbacks, arising in part from the lack of well-qualified and competent teachers, and from the irregular attendance of pupils, a large proportion of whom were day-scholars. But in 1831 the institution made a new departure by securing the services of the late Harvey P. Peet, LL.D., as principal, in which office were united the duties previously delegated to the superintendent and the principal teacher.

Dr. Peet had been for seven years connected with the institution at Hartford, in the capacity of steward, and possessed qualifications, both natural and acquired, which well fitted him to assume the direction of such an establishment. As an assistant of Dr. Gallaudet, at Hartford, he had come to understand that the task of teaching the deaf demanded for its successful performance persons of exceptional ability and zeal. And the excellent results that followed his administration were owing in a large degree to his selection of his assistants. Among them were a number of young men of great talent, several of whom, after devoting years to teaching the deaf, left the profession to become distinguished in science, literature, and the work of general education.

The institution remained under the able and energetic control of Dr. Peet for nearly thirty-six years, and at the time of his resignation in 1867 the institution had educated nearly 2000 children. Under the management of Dr. Isaac Lewis Peet, who succeeded his father in the office of principal, the New York institution has held its place in public esteem, and for many years enjoyed the distinction of being the largest school for the deaf in the world. Within a short time, however, the numbers of the Illinois institution have exceeded those of the New York, the latter recording 481 as present in December, 1881, while the former reported 508.

Massachusetts was the next State to provide for the education of the deaf at public expense; making an appropriation, in 1819, for the support of twenty beneficiaries in the school at Hartford. Pennsylvania followed the example of her eastern sisters in 1820. The Board of Directors of the Pennsylvania Institu-

tion for the Deaf and Dumb was organized April 20, 1820, under the presidency of the Right Rev. William White, D. D. Some months previously Mr. David G. Seixas had opened a private day-school for the deaf, in his own house in Philadelphia. Among his first pupils was John Carlin, who has attained distinction as an artist, and as the only congenital deaf-mute who has ever succeeded in composing poetry. This school was adopted by the organization just alluded to. Mr. Seixas was appointed principal; funds were freely advanced by benevolent persons in Philadelphia, and the infant institution well provided for during the summer, fall, and winter of 1820-21. In February, 1821, the legislature of Pennsylvania passed an act incorporating the institution, and authorized the education of fifty children at the expense of the State.

Mr. Seixas, after filling the office of principal for eighteen months, was succeeded temporarily by Mr. Laurent Clerc, the distinguished deaf-mute pupil of Sicard, who accompanied Dr. Gallaudet on his return from France, and rendered valuable services for many years as a teacher in the institution at Hartford. Mr. Clerc, after remaining seven months in Philadelphia, systematizing the work and methods of the school, returned to his labors at Hartford, and was succeeded by Mr. Lewis Weld, who had acquired the art of teaching the deaf as an assistant of Dr. Gallaudet at Hartford. Under the management of Mr. Weld, which continued until 1830, when he was called to succeed Dr. Gallaudet as principal of the Hartford school, the institution became well established. Its usefulness has increased during the years of its existence, and it now has accommodations for more than 300 pupils.

The State of New Hampshire made provision in 1821 for the education of ten deaf-mutes in the Hartford institution; and in the same year the legislature of New Jersey passed an act making an annual appropriation for the education of the deaf and dumb of the State "in some suitable and convenient institution." Under the provisions of this law the deaf of New Jersey have been educated at New York and Philadelphia up to the present time.

In Kentucky the fourth school was established in 1823. The legislature passed an act, Dec. 7, 1822, establishing a school for deaf-mutes, and providing for its support. The passage of this act was mainly due to the efforts of Gen. Elias Barbee. The school was opened for pupils at Danville, April 27, 1823, and placed in charge of Rev. John R. Kerr, a gentleman of good education, but without experience in teaching the deaf. Two deaf-mutes, young men, were successively employed as teachers, but were found to be incompetent. The board of directors, finding it impossible to secure the services of an experienced instructor of deaf-mutes, engaged John A. Jacobs, a young man of unusual ability, who was then pursuing his studies at Centre College, Danville, Ky. Mr. Jacobs went to Hartford to seek the aid of Dr. Gallaudet and his assistants, in acquiring the art of teaching the deaf. He remained an inmate of the Hartford institution for eighteen months, and then, before he had completed his twentieth year, returned to Kentucky to assume the direction of the school at Danville. He conducted the affairs of the Kentucky institution with marked ability and success for a period of forty-four years.

In this connection we take occasion to condemn the mistake of placing at the head of institutions for the deaf, men without previous knowledge of the art of teaching that class of persons. No censure can be too severe on such action, at once seriously injurious to the interests of pupils, and insulting to the body of teachers employed in the various institutions, among whom may be found men fitted by experience and natural ability to assume the direction of an institution. If, indeed, it prove a matter of difficulty to secure the services of such a man, then let the wise example of the directors of the Kentucky institution be followed,

and the crime avoided of appointing, for political or personal considerations, inexperienced men to positions which can only be properly filled by specialists.

Maine and Vermont were the next States to provide for the education of the deaf, each making appropriations in 1825, to maintain beneficiaries at the Hartford institution. During the same year a school for the deaf was opened in Canajoharie, N. Y., the establishment of which was authorized by an act of the legislature, passed in 1822. Mr. Wm. Reid, a graduate of Union College, spent some time at the New York institution in 1825, preparing himself to be principal of this school, and assumed the direction of it at its opening. This institution was kept up until the year 1836, when it was discontinued and its pupils, together with Mr. Oran W. Morris, were transferred to the New York institution, Mr. Morris becoming an instructor therein. Mr. Levi S. Backus, one of the earliest pupils of the Hartford institution, was an instructor in this school, and, when it was closed, Mr. Backus became the editor of *The Radii*, a weekly newspaper published at Fort Plain, N. Y., and for many years was the only deaf-mute editor in the world.

In December, 1825, an act was passed by the legislature of New Jersey to "incorporate and endow the New Jersey Institution for the Deaf and Dumb," but the institution was never organized, the provision by the State, previously made for maintaining beneficiaries in the New York and Philadelphia schools, being deemed adequate to the wants of the deaf of New Jersey. In 1882, however, measures were inaugurated for the establishment of a school for the deaf in New Jersey, which will probably prove successful.

In May, 1827, a school for the deaf was opened at Tallmadge, Summit co., Ohio, where in the family of Mr. Justus Bradley were three deaf-mute girls. These with eight other deaf-mutes were placed under the instruction of Mr. C. Smith, a deaf-mute, who had been for six years a pupil in the Hartford institution. The school was sustained by private charity, with the exception of \$100 granted by the legislature of Ohio in 1828. An unsuccessful effort had been made in Ohio to provide for the education of the deaf by citizens of Cincinnati in 1821, who went so far as to send the Rev. James Chute to Hartford to acquire the art of teaching from Dr. Gallaudet.

This enterprise was opposed in the legislature mainly on account of the proposed location of the school, which was not a central one. In January, 1827, the legislature of Ohio passed an act providing for the establishment of an institution for the deaf. The organization of the board of directors was effected in July following, with Rev. James Hoge, D.D., as president. In March, 1828, Mr. Horatio N. Hubbell, who had been chosen principal, went to Hartford to secure a knowledge of the art of teaching the deaf, remaining there about a year and a half. In January, 1829, the legislature located the institution at Columbus, and it was opened for pupils in October of that year. This school has continued in successful operation, and now stands third in the country in point of numbers. Mr. Hubbell, the first principal, presided over the institution with honor and success for twenty-four years, when he voluntarily retired.

In 1835 the States of South Carolina and Georgia made provision for the maintenance of beneficiaries at the Hartford institution, continuing to send pupils thither until schools were organized within their own limits; the latter State establishing an institution in 1846, and the former in 1849.

In 1839 an institution for the education, under the same roof, of the two classes, the deaf and the blind, was opened at Staunton, Va., receiving the bounty of the State from the outset. The department for deaf-mutes was placed under the charge of Rev. Joseph D. Tyler, who had been for seven years an instructor in the Hartford institution. Mr. Tyler's able management, which continued until his death, in 1851,

did much to settle the institution on firm foundations. During the civil war its operations were restricted by lack of funds, and by the diversion of its buildings to the uses of a military hospital.

In the year 1842 a deaf-mute young man, who had been a pupil in the school at New York, collected a half dozen deaf-mutes in Parke co., Indiana, and began teaching them. Not being well fitted for the work, his school was continued only a year. Attention was, however, directed by his undertaking to the importance of deaf-mute education in Indiana, and the legislature voted him \$200 as a compensation for his services.

In 1843 a law was enacted with great unanimity, as a preliminary measure, by which a tax was levied of two mills on each \$100, for the purpose of supporting an institution for the education of the deaf. In May of that year Mr. William Willard, a well-educated deaf-mute, who had been an instructor for twelve years in the school at Columbus, visited Indianapolis and interested himself in the organization of the new institution. With the indorsement of prominent citizens of the State Mr. Willard spent the summer in travelling over the State in search of pupils, and in October a school was opened under his direction with 16 pupils. An act incorporating the new institution was passed Jan. 15, 1844, and a board of directors was organized. Mr. Willard's school was adopted by the board, and he remained in charge a second year, when Mr. James S. Brown, who had been for four years an instructor in the Ohio institution, was placed at the head of the institution. Mr. Willard continued to teach for many years. Under Mr. Brown's management the institution enjoyed a healthy and rapid development. Liberal appropriations were judiciously expended under his direction, and by the end of 1851 commodious buildings, capable of accommodating 200 pupils, were completed.

In 1845 Rhode Island made provision for the education of her deaf-mutes in the Hartford institution.

The Tennessee school for the deaf and dumb was incorporated in the winter of 1843-4. Rev. R. B. McMullen was the first president of the board of trustees. The organization of the institution was due to the strong rivalry then existing between Middle and East Tennessee. A bill was proposed to the legislature by a member from Middle Tennessee for the establishment of an institution for the blind at Nashville, when Gen. Cocke, a prominent member from East Tennessee, immediately arose and proposed an amendment providing for a school for the deaf, to be located at Knoxville. Rev. Thomas MacIntire, Ph. D., for four years previously an instructor in the Ohio institution, was appointed principal, Jan. 1, 1845, and the school was opened at Knoxville April 14, but no pupil applied for admission. This was partly owing to the fact that payment for board and tuition was expected, but mainly to an indisposition on the part of parents to allow their deaf children to leave home. After waiting a month, without obtaining pupils, the board determined to issue new circulars offering free board and tuition to a limited number. This brought six pupils, whose instruction was commenced early in June. The number of pupils increased to ten, and the school was closed in February, 1846, for lack of funds. In the absence of funds from the State private benevolence was successfully appealed to, and during the summer of 1846 suitable grounds and buildings were secured, and the school was reopened with thirteen pupils. Circumstances led Dr. MacIntire, since become well known as the successful superintendent for many years of the Indiana institution, and later of the Michigan institution, to resign in August, 1850, after having done much to build up the school in Tennessee. This institution has passed through many vicissitudes, being suspended and much injured during the civil war; but it was reopened after the war, and has since received

liberal aid from the State. It is now in a flourishing condition.

During the summer of 1843 Mr. William D. Cooke, then connected with the school at Staunton, Va., made a tour in North Carolina accompanied by a young deaf-mute, for the purpose of exciting an interest in the education of the deaf. He gave exhibitions of the manner of teaching, and urged in a number of public meetings the importance of providing for the instruction of the deaf. As a result of his efforts the legislature passed an act in January, 1845, establishing an institution and providing for its support. Mr. Cooke was appointed principal, and the school was opened May 1, 1845, with seven pupils, which number increased to seventeen before the close of the session. In April, 1848, the corner-stone of a permanent building was laid by the Masonic fraternity, and Dr. Peet, the principal of the New York institution, delivered an address. This institution was continued without interruption during the civil war, and is now in a flourishing condition.

The legislature of Illinois passed an act establishing an institution for the deaf Feb. 23, 1839, and appropriating one quarter per cent. of the interest upon the school, college, and seminary fund to the institution. The board of directors was organized under the presidency of Joseph Duncan, Esq., June 29, 1839, but owing to a variety of causes, especially the disturbance in the value of bank currency which was widespread at that period, the completion of the buildings of the institution was delayed until the autumn of 1845. The school was located at Jacksonville, and was opened for pupils Dec. 1, 1845. Mr. Thomas Officer, for five years previous an instructor in the Ohio institution, was appointed principal. In the first year the number of pupils was 9, and in the following year 14. Mr. Officer proved an eminently capable principal, and during the ten years he continued in charge of the institution its growth was rapid and healthy. At the time of his resignation in 1855 permanent buildings for the institution were completed, and the number of pupils had risen beyond 150. Philip G. Gillett, LL.D., was appointed principal of the institution in 1856, and is still in office. Dr. Gillett had been for four years an instructor in the Indiana institution. Under his very energetic and able management the Illinois institution has had a growth unparalleled in the history of schools for the deaf. Liberal appropriations from the State have provided for the improvement and enlargement of the buildings; the moneys granted have been so well expended that the school at Jacksonville is to-day probably superior in the convenience of its arrangements and appointments to any other establishment for the education of the deaf; and in the number of its pupils it leads the world, 508 being reported in December, 1881.

Of the institutions, the story of whose origin has now been briefly sketched, 10 are in full operation, and these 10 were established within 30 years from the time when Dr. Thomas H. Gallaudet began his pioneer work at Hartford.

During the 35 years which have followed the opening of the Illinois institution more than 50 schools for the deaf have been established in our country, and 45 of them are now in operation, as will appear from the tables.

Of these 50 schools 3 are deserving of particular notice for the reason that in connection with their development new and important features in deaf-mute education have been perfected.

In 1856 an adventurer from the city of New York brought with him to Washington, D. C., 5 little deaf-mute children whom he had gathered from the almshouses and streets of the metropolis. With the aid of a number of benevolent citizens he succeeded in setting up a school and in collecting half a score of deaf and blind children belonging to the District of Columbia. Most prominent among the friends of the

school was the Hon. Amos Kendall, who soon discovered that the would-be founder of the new institution was a man wholly unworthy of confidence. A little investigation showed that he had been maltreating the children under his care, and misusing the funds intrusted to his hands. Mr. Kendall preferred charges against him in the criminal court of the District, and was constituted by the court the legal guardian of the children brought from New York. The others having been removed from the school by their parents, Mr. Kendall took measures for the organization of an institution in due and proper form. An act of Congress was approved Feb. 16, 1857, incorporating the Columbia institution for the instruction of the deaf and dumb and the blind, naming a provisional board of directors, with Mr. Kendall as its president. In May of the same year the board appointed Edward M. Gallaudet and Mrs. Sophia Gallaudet, the youngest son and the widow of Dr. Gallaudet, of Hartford, as superintendent and matron of the new institution. Mr. Gallaudet had been for eighteen months an instructor in the Hartford school. On the 13th of June, in temporary buildings provided by the liberality of Mr. Kendall, the school was opened with five pupils. In the spring of 1859 Mr. Kendall added to his former benefactions by erecting a substantial brick structure, and deeding this, together with two acres of ground, to the institution. The total value of his gifts to the institution amounted to about \$13,000. In 1862 Congress appropriated \$9,000 for the enlargement of buildings, and by this act enabled the institution to provide fully for the education of the deaf and blind of the district.

In their report for 1862 the directors laid before Congress a proposal for the enlargement of the scope of the institution by the establishment of a collegiate department, which might afford the deaf of the country an opportunity to engage in the higher courses of study open to other youth in colleges. The desirableness of providing a college for the deaf had been urged for several years by prominent instructors, foremost among whom was the Rev. Wm. W. Turner, for many years an instructor in the Hartford institution, and for ten years its principal. Congress acted favorably on the suggestion of the directors of the Columbia institution, and in 1864 passed an act authorizing the board to confer collegiate degrees. An addition of \$3100 was made to the annual grant of Congress for the support of the institution, and the sum of \$26,000 was appropriated to enlarge the grounds and buildings.

The collegiate department, under the name of the *National Deaf-Mute College*, was publicly inaugurated June 28, 1864—the honorary degree of Master of Arts being conferred on John Carlin, to whom reference has been made. Mr. Carlin delivered an oration on this occasion, as did also the venerable and distinguished deaf-mute, Laurent Clerc, M. A., who had assisted the elder Dr. Gallaudet in organizing the Hartford school. At the same time Edward M. Gallaudet, who had filled the office of superintendent of the institution from its opening in 1857, was installed as president of the corporation and of the board of directors.

The development of the College for the Deaf, still the only one in the world, has been most gratifying. Opening with 7 students in September, 1864, it had during the year last reported 62, representing 26 States and the Federal district. More than 300 young men have availed themselves of its advantages, leaving its walls to enter upon lives of usefulness as teachers, editors, lawyers, farmers, business men, specialists in science, and officials in government departments. Private benevolence in the cities of Washington, Philadelphia, Boston, and Hartford, Conn., responded liberally to appeals in behalf of the college in its early days, upwards of \$15,000 having been contributed in these cities by individuals. Congress has supplemented these private benefactions by liberal appropriations for buildings and grounds, besides granting an annual sum for the payment of the salaries of the professors and

for the assistance of students unable to meet their own expenses. An able faculty of seven professors affords the students an opportunity of pursuing study in the several courses usually open in colleges. The primary department of the Columbia institution has flourished, although its numbers are naturally small.

The department for the blind, organized when the institution was opened in 1857, and never containing more than ten pupils, was discontinued in 1865, Congress making provision for the education of the blind of the District in the Maryland institution at Baltimore.

During the first half century of deaf-mute education the method pursued was, with very inconsiderable exceptions, that derived by the elder Dr. Gallaudet from the Abbé Sicard in Paris. This was the manual which is well described by Prof. E. A. Fay as "The course of instruction which employs the sign-language, the manual alphabet, and writing as the chief means in the education of the deaf, and has facility in the comprehension and use of written language as the principal object. The degree of relative importance given to these three means varies in different schools, but it is a difference only of degree, and the end aimed at is the same in all. If the pupils have some power of speech before coming to school, or if they possess a considerable degree of hearing, their teachers usually try to improve their utterance by practice; but no special teachers are employed for this purpose, and comparatively little attention is given to articulation."

Prior to the year 1867 the importance and feasibility of teaching deaf-mutes to speak orally had been urged by several American writers, notably by Horace Mann, who made a tour of Europe in 1843, when he visited some of the German schools for the deaf, in which articulation was the prominent feature. Mr. Mann urged the superiority of the German method over that pursued in America. His report excited so much interest that the Hartford and New York schools sent gentlemen abroad, who visited many schools where the oral method was practised. They reported that the manual method produced better results than the oral. Some little effort was, however, made to teach articulation to semi-mute and semi-deaf pupils; but this was not long continued. Although the suggestions of Horace Mann led to no immediate practical result, they were not forgotten. Dr. Samuel G. Howe, the distinguished teacher of the blind (still better known as the instructor of the blind deaf-mutes Laura Bridgman and Oliver Caswell), was Mann's travelling companion in Europe in 1843, and shared his views as to the importance of oral teaching for the deaf. In 1864, seconded by Mr. Gardiner Green Hubbard, of Cambridge, one of whose children was deaf, by Frank B. Sanborn and others, Dr. Howe made an effort to secure the incorporation of an oral school for the deaf in Massachusetts. This was successfully opposed by the friends of the Hartford school, in which the beneficiaries of Massachusetts were then educated, on the ground that for the mass of deaf-mutes, if one method were to be chosen to the exclusion of the other, which was what the oralists urged, the manual method would accomplish the most beneficial results. The controversy between these two parties was brought to an end, as many a similar struggle has been, by the discovery that each was demanding too much, and that a *juste milieu* of practicability could be found. In the autumn of 1864 Miss Harriet B. Rogers, a sister of the lady who, under Dr. Howe's direction, taught Laura Bridgman and Oliver Caswell, undertook to teach a deaf-mute child to speak. Meeting with encouraging success, she advertised in November, 1865, for other pupils, limiting the number to seven. In June, 1866, she opened her school at Chelmsford, Mass., with five scholars. In 1866 and 1867 the board of State charities, of which Dr. Howe was chairman, and F. B. Sanborn secretary, continued to press the importance of oral teaching for the deaf upon the atten-

tion of the legislature of Massachusetts. At this juncture John Clarke, Esq., of Northampton, Mass., proposed to contribute towards the endowment of a school for deaf-mutes in Massachusetts. His generous offer was communicated to the legislature by Gov. Bullock in January, 1867. In June following the Clarke Institution for the Instruction of Deaf-Mutes, at Northampton, was incorporated, and organized on the 15th of July with G. G. Hubbard as president. Miss Rogers, of Chelmsford, accepted an invitation to take charge of the new institution, and, having transferred her pupils to Northampton, the Clarke Institution was formally opened Oct. 1, and at the date of the first annual report—Jan. 21, 1868—had 20 pupils. The purpose, as to method and scope, as to the kind of pupils desired, of the institution, was made clear in the first report: "The Clarke Institution differs from all other American institutions [for the deaf] in this, that it receives pupils at as early an age as they are admitted in our common schools, and in teaching by articulation and lip-reading only." "This institution is especially adapted for the education of the semi-deaf and semi-mute pupils, but others may be admitted."

The success of the Clarke Institution has been marked in every particular. Never having claimed to be able to teach *all* deaf-mutes to speak and read from the lips, it has developed the speech of the semi-deaf and the semi-mute, besides imparting the power of speech to many congenital deaf-mutes in a very satisfactory manner. The endowment of the school by Mr. Clarke was munificent, and in 1877 the value of its real and personal estate was reported to be over \$350,000. The number of its pupils in December, 1881, was 88.

In the city of New York during the year 1866 Mr. Bernhard Engelsmann, who had had several years' experience as an instructor in the Hebrew (oral) school for the deaf in Vienna, undertook to instruct a few deaf-mute children by the German or oral method. The parents of these children, together with a number of prominent Hebrew gentlemen of the city, met on Feb. 27, 1867, at the residence of Mr. Isaac Rosenfeld with the purpose of extending the advantages of Mr. Engelsmann's school to the children of parents who might be unable to pay the necessary expenses. So promptly were measures taken for the raising of funds that Mr. Engelsmann's school, under a formal organization, was opened with ten pupils on March 1, 1867, at No. 134 West Twenty-seventh street, antedating the opening of the Clarke institution by exactly seven months. The school, which was sustained wholly by private subscriptions and the payment of tuition by parents until 1870, was not incorporated, however, until Jan. 11, 1869. In 1870 the legislature of New York provided for the education of beneficiaries in the institution on the same terms and conditions as those prescribed for the old New York institution, making also a special appropriation to enable the institution to prepare for the reception of State and county pupils. In 1871 another special appropriation, this time of \$25,000, was made by the legislature. Mr. Engelsmann was succeeded in 1869 by Mr. F. A. Rising, and he in 1873 by Mr. D. Greenberger, who, like Mr. Engelsmann, had been a teacher in the Hebrew School for the Deaf at Vienna.

The growth of the institution has been rapid and healthy. The number of pupils reported as present in December, 1881, was 137. The permanent buildings of the institution, erected at a cost of \$134,904.53, on Lexington Avenue between Sixty-seventh and Sixty-eighth Streets, were formally dedicated Nov. 29, 1881.

Still a third event, which gave an added and most influential impetus to the movement in favor of oral teaching, occurred during the year 1867. The directors of the Columbia institution at Washington, having their attention called to the movements on foot in Massachusetts, in behalf of the oral method, and the persistent assertions there made that the oral method

was to be preferred to the manual, which claims were stoutly disputed by the authorities of the Hartford institution, decided to send their president, Edward M. Gallaudet, LL. D., to Europe, for the purpose of making a thorough examination of all the methods pursued in that part of the world. President Gallaudet spent six months abroad and visited about forty institutions, including in his tour all the countries of Europe except Spain, Portugal, Greece, and Turkey.

In his report to the board of directors, Oct. 23, 1867, President Gallaudet took very different ground with reference to the oral method from that maintained by the gentlemen who had been sent out by the New York and Hartford schools some twenty years before. Giving the preference, as his father did, to the manual method, if the whole body of the deaf are to be restricted to one kind of instruction, he admitted the practicability of teaching a large proportion of the deaf and dumb to speak and to read from the lips, and advocated the introduction of articulation as a branch of instruction in all the schools of this country. Influenced by the recommendations of President Gallaudet, the directors of the Washington institution authorized the calling together of a conference of the principals of all the American schools for the deaf to be held at Washington in the spring of 1868. In response to this invitation the principals of fifteen institutions out of the twenty-five then existing in the country, together with one vice-principal and two ex-principals (Drs. Peet and Turner), met on May 12, 1868, and remained in session five days. Many subjects of interest and importance to the cause of deaf-mute education were considered by the conference, that of articulation occupying a prominent place. After full discussion the following was unanimously adopted:

"Resolved, That in the opinion of this conference it is the duty of all institutions for the education of the deaf and dumb to provide adequate means for imparting instruction in articulation and in lip-reading, to such of their pupils as may be able to engage with profit in exercises of this nature."

The action of this conference, taken in connection with the establishment at about the same time of the oral schools at Northampton and New York, gave a great impulse to the cause of the oral teaching of the deaf in America.

In nearly all the large schools, and in many of the smaller ones, classes in articulation were soon formed. So rapidly has this branch of instruction found favor in this country that to-day, among the fifty-five schools, only ten are to be found where speech is not taught. And these ten schools contain only 408 pupils out of the 7019 that were under instruction during the year 1881. The strictly oral schools are twelve in number and had in that year 527 pupils. It will be seen therefore that at the present time a majority of the schools in this country sustain the combined system, and that this latter class of schools includes more than six-sevenths of the whole number of pupils under instruction during 1881.

The distinctive features of the "manual method" have already been given. For a brief and clear explanation of the other two we quote again from Professor Fay in the *American Annals of the Deaf and Dumb* (January, 1882).

"By the *oral method* is meant that in which signs are used as little as possible; the manual alphabet is generally discarded altogether; and articulation and lip-reading, together with writing, are made the chief means as well as the end of instruction. Here too there is a difference in different schools in the extent to which the use of signs is allowed in the early part of the course; but it is a difference only of degree, and the end aimed at is the same in all.

"The *combined method* is not so easy to define, as the term is applied to several distinct methods, such as (1) the free use of both signs and articulation, with the same pu-

pils and by the same teachers, throughout the course of instruction; (2) the general instruction of all the pupils by means of the manual method, with the special training of a part of them in articulation and lip-reading as an accomplishment; (3) the instruction of some pupils by the manual method and others by the oral method in the same institution; (4)—though this is rather a combined *system*—the employment of the manual method and the oral method in separate schools under the same general management, pupils being sent to one establishment or the other, as seems best with regard to each individual case."

The following tables will be found to include all the countries of the world where schools for the deaf are in existence. In preparing them, the figures of Professor Fay in the *Annals* (January, 1882) have been followed, with corrections and additions secured from various publications which have become available since January, 1882.

In conclusion it may be stated that in no country of the world is the education of the deaf so well provided for as in the United States, and in no country have public appropriations in aid of this object been as liberal as in our own.

STATISTICS OF THE INSTITUTIONS FOR THE EDUCATION OF THE DEAF.

Location.	Date of Establishment.	Principal.	No. of Pupils.
AUSTRALIA, 1879.			
Sidney, New South Wales	1860	Samuel Watson	53
Melbourne, Victoria	1860	Frederick J. Rose	80
Brighton, S. Australia	1874	Robert Hogg	14
Three schools in Australia.			147
AUSTRIA-HUNGARY, 1878.			
Vienna	1799	Alexander Venus	117
Waizen (Hungary)	1802	M. Feköte	
St. Pölten	1846	Johann Hollrigel	49
Linz	1813	Johann Brandstätter	80
Prague	1786	M. Hemet	135
Hall (Tyrol)	1830	I. Zampredi	36
Lemberg	1830	C. Pogonowsky	70
Gratz	1831	M. Fyringer	86
Görz	1840	M. Pauletie	99
Trent	1843	P. Don Amech	38
Vienna (Hebrew)	1844	J. Deutsch	107
Klagenfurt	1849	Ritt. V. Gallenstein	22
Brünn	1852	E. Partisch	123
Budweis	1859	M. Sedlak	84
Leitmeritz	1867	G. A. Demuth	30
Hütteldorf	1870	A. Lehfeld	16
Buda Pest	1876	L. Grünberger	37
Seventeen schools in Austria-Hungary.			1129
BELGIUM, 1879.			
Ghent (Boys)	1822	Brothers of Charity	50
" (Girls)	1822	Sisters of Charity	54
Liège	1830	Lay Committee	243
Antwerp (Boys)	1835	Society of Family Fathers	46
Brussels (Boys)	1835	Brothers of Charity	99
" (Girls)	1835	Sisters of Charity	112
Bruges	1836	" "	137
Namur	1840	{ Mme. V. Jourdin }	90
		{ Abbé E. Rieffel }	
Maeseyck (Girls)	1840	Sisters of Charity	14
" (Boys)	1844	Brothers of Pity	19
Ten schools in Belgium.			864
BRAZIL, 1879.			
Rio de Janeiro (Boys)	1867	T. R. Leite	32
CANADA, 1881.			
Montreal (Boys)	1848	Rev. A. Belanger	171
(Roman Catholic)			
Montreal (Girls)	1851	Sister Philippe	215
(Roman Catholic)			
Halifax, N. S.	1857	A. F. Woodbridge	76
Belleville, Ont.	1870	R. Mathison	296
Montreal, Mackay Inst. }	1870	Thos. Widd	34
(Protestant)			
Portland, N. B.	1873	A. H. Abell	18
Six schools in Canada.			810
DENMARK, 1880.			
Copenhagen (Royal Inst.)	1807	Rev. R. M. Hansen	142
" (School)	1850	J. Keller	144
" (School for children of the higher classes)	1871	{ J. Keller and Miss }	6
		{ C. A. Mathison }	
Copenhagen (Home for adult girls)	1869		34
Four schools in Denmark.			326
Location.	Date of Establishment.	Principal.	No. of Pupils.
FINLAND, 1882.			
Borga	1846	A. Sirén	30
Abo	1860	A. E. Nordman	66
Kuopio	1862	K. Killinen	19
Redesöre	1863	Anna Heikel	26
Four schools in Finland.			141
FRANCE, 1882.			
Paris (Boys)	1765	Dr. Peyron	270
Angers	1777	Sœur Charuaci	50
Bordeaux (Girls)	1783	G. Huriot	200
Nogent le Rotrou	1808	Abbé Perrebois	50
Auray	1812	Sœurs Sagesse	59
Rhodez	1814	Abbé Roquette	43
St. Etienne (Boys)	1815	Frère Virmire	80
Caen	1817	Aug. Cavé	79
Arras	1817	Mlle Teissier	101
Le Puy	1818	Frère Marie-Pierre	81
Besançon (Girls)	1819	Sœurs Sagesse	70
Marseilles	1819	Abbé Guerin	57
Lyons	1824	C. Forestier	90
Besançon (Boys)	1824	Frère Romule	70
Toulouse	1826	Abbé Duhagon	150
Clermont (Girls)	1827	Sœur Beatrix	22
Nancy	1828	M. Piroux	115
St. Etienne (Girls)	1828	Sœurs de Nevers	108
Laval	1830	Sœur Augustine	71
Albi	1832	Sœur Massol	59
Chaumont	1833	M. A. Hugonnet	27
Ronchin, Lille (Boys)	1834	M. Mesmin	95
Fives (Girls)	1835	Sœur Ste. Synclétique	40
Orléans (Girls)	1835	Sœurs Sagesse	50
Rouen	1835	Mlle Lefebvre	42
St. Brieux	1836	Abbé Bertho	90
Pont l'Abbé	1838	Abbé Ecroun	46
Poitiers (Boys)	1838	Frère Médéric	94
Orléans (Boys)	1839	Frère Joachim-Mie	52
Paris	1840	M. Dubois	6
Saint-Medard lès-Soissons	1840	Chanoine Bourse	178
Grenoble (Boys)	1840	M. Rauh	12
Chambéry	1840	Abbé Jouty	94
Vaujours (Boys)	1843	M. Bidron	6
Déols (Girls)	1846		8
Aurillac	1846	M. Maitin	24
Fougères	1846	M. Brissière	49
Vizille (Girls)	1847	Mlle Lentillon	23
Bourg (Girls)	1847	Sœur Esperance	30
Bron (Girls)	1847	Abbé Convert	40
Larnay (Girls)	1847	Sœurs Sagesse	76
Fontainebleau (Girls)	1848	Mlle Drouville	5
Montpellier	1850	Sœur Charite	70
Alençon	1852	Abbé Lebecq	49
Cahors (Girls)	1854	Sœur Marie-Bernard	15
Paris	1854	Auguste Houdin	20
Bourg (Boys)	1856	Abbé Goyotton	30
St. Hippolyte du-Fort }	1856	Rev. E. Rayroux	55
(Protestant)			
Nantes (Boys)	1856	Frère Louis	70
Gap (Girls)	1856	Sœur Theodosie	10
Embrun	1856	Mlle Guen	8
Bourg-la-Reine	1861	Sœurs N. D. Calvaire	35
Moingt (Girls)	1864	Abbé Dessaignes	35
Veyre-Monton (Girls)	1866	Sœurs St. Dominique	60
Saint Laurent-du-Pont (Boys)	1870	Frère Paul	40
Bordeaux (Boys)	1870	Abbé Gaussens	52
Algiers	1872	M. Chargebœuf	15
Lyons	1872	M. Hugentobler	10
Clermont-Ferrand (Boys)	1873	Frère Jacques	31
Paris	1875	M. Magnat	60
Villeneuve-lès-Avignon		Abbé Grimaud	25
St. Laurent-en-Royans		Sœurs Providence	70
Pupils in 7 common schools under the system of Dr. Blanchet			60
Pupils in 42 common schools under the system of M. Grosselin			88
Ditto			76
Sixty-two schools in France.			3896
GERMANY, 1881.			
PRUSSIA.			
East Prussia.			
Königsberg	1817	Gotsch	85
Angerburg	1833	Stockman	128
Braunsberg	1844	Heinick	77
Königsberg	1873	Schön	108
Tilsit	1881	Richter	13
West Prussia.			
Marienburg	1833	Hollenweger	117
Elbing	1870	Wendt	34
Schlochat	1873	Eimert	72
Graudenz	1876	Radomski	53
Danzig	1881	Hahn	30
Oliva	1881	Spohn	27
Brandenburg.			
Berlin	1788	Dr. Treibel	84
Berlin	1875	Dr. Berndt	136
Wriezen	1881	Walther	33
Pomerania.			
Stralsund	1837	Junge	24
Stettin	1839	Erdmann	96
Cöslin	1861	Oltersdorf	89

Location.	Date of Establish- ment.	Principal.	No. of Pupils.	Location.	Date of Establish- ment.	Principal.	No. of Pupils.
Blütow	1865	Nöske	19	Exeter	1826	J. T. Hobbah	38
Laurenburg	1867	Dehne	23	Aberdeen	1826	Franklin Bill	18
Demmin	1881	Gems	10	Doncaster	1829	James Howard	152
Berlinchen	1881	Marquardt	58	Belfast	1831	Rev. J. Kingham	105
<i>Posen.</i>				Newcastle-on-Tyne	1838	William Neill	95
Posen	1831	Matuszewski	124	Brighton	1842	W. Sleight	85
Schneidmühl	1872	Reimer	111	Bristol	1844	W. B. Smith	43
Bromberg	1881	Lehmann	43	Bath	1844	Miss Elwin (Hon. Sec.)	13
<i>Silesia.</i>				Dublin (R. C.) St. Joseph's (Boys)	1846	Rev. Bro. P. M. Wickham	190
Breslau	1821	Bergmann	160	Dublin (R. C.) St. Mary's (Girls)	1846	The Dominican Sisterhood	207
Liegnitz	1831	Kratz	82	Dundee	1846	James Barland	19
Ratibor	1836	Schwarz	160	Swansea	1847	B. H. Payne	40
<i>Saxony.</i>				Edinburgh (Donaldson's Hosp'l)	1850	Alfred Large	118
Erfurt	1822	Rode	61	London (Finsbury Park, N. Boys)	1856	Rev. W. Stainer	8
Halerstadt	1828	Keil	58	London (Lower Clapton)	1851	D. Murray, B. A.	34
Weissenfels	1829	Köbrück	48	Northampton	1860	Rev. Thomas Arnold	9
Halle-on-the-Saal	1835	Klotz	56	Llandoff	1862	Alex. Melville	19
Osterburg	1878	Kuhne	30	Margate	1862	Richard Elliott, M. A.	241
<i>Schleswig-Holstein.</i>				London, Holland Road	1862	Miss S. E. Hull	12
Schleswig	1787	Engelke	115	London (Inglefield)	1866	John Barber	12
"		Kühler		Walmer Road, W.	1864	S. Schöntheil	25
<i>Hanover.</i>				Hull	1869	Edward Bill	19
Hildesheim	1829	Rössler	101	Bristol	1869	Mrs. Thomas	7
Emden	1844	Frese	43	Boston Spa (Yorkshire)	1870	{ Sisters of Charity of St. Vincent de Paul, under direction of Mgr. De Haerne }	97
Stade	1857	Gude	89	Smyllum Orphanage	1871	Sister Teresa Farrell	27
Osnabrück	1857	Schroder	81	Lanark (R. C.)	1871	Wm. Van Praagh	66
<i>Hessen Nassau.</i>				London, Fitzroy Square, W.	1874-9	Rev. William Stainer	183
Camberg	1820	Wehrheim	84	London School Board	1878	A. A. Kinsey	11
Frankfort-on-the-Main	1827	Vatter	25	" (Ealing)	1878	S. Littlefield	4
Homburg	1837	Kessler	84	Greenock	1878	Miss Rhind	3
<i>Westphalia.</i>				London (Brixton)	1879	Geo. Stephenson	29
Büren	1830	Dornseifer	39	Sheffield	1881	Joseph Morton	20
Soest	1831	Plöger	80	Leeds	1881	Miss Griffiths	9
Petershagen	1839	Bökenkamp	66	Glasgow	1881		
Langenhorst	1841	Stahm	74				
<i>Rhine Province.</i>							
Cologne	1828	Weissweiler	80				
Aachen	1838	Linnartz	73				
Kempen	1841	Kirfel	57				
Brühl	1854	Fieth	86				
Neurweid	1854	Günther	80				
Trier	1881	Cüppers	75				
Elberfeld	1881	Hilger	36				
Essen	1881	Ochs	47				
<i>BAVARIA.</i>							
Bayreuth	1823	Dr. Kraussold	18				
Frankenthal	1825	Johann Reiss	38				
Munich	1826	Rev. Joseph Gunkel	74				
Altdorf	1831	C. A. Zohn	9				
Nuremberg	1832	Pastor Michahelles	33				
Bamberg	1834	Rev. N. Eichhorn	26				
Straubing	1835	Ed. Mutzl	61				
Würzburg	1835	Gregor Fischer	54				
Regensburg	1839	Johann Döring	37				
Dillengen (Girls)	1847	F. S. Wankmüller	52				
Augsburg (Boys)	1851	Sebastian Koch	46				
Zell (Girls)	1872	Johann E. Wagner	56				
Fürth	1875	M. Höchstetter	11				
Hohenwart (Girls)	1877	Mrs. Schmalholz	58				
<i>Saxony.</i>							
Leipsic	1778	Dr. Eichler	128				
Dresden	1828		199				
Plauen	1872	Councillor Jenke	37				
<i>Wurtemberg.</i>							
Gmünd	1817	Wilhelm Hirzel	56				
"	1869		40				
Winnenden	1824	M. Bellen	31				
Esslingen	1825	M. Pfisterer	39				
Wilhelmsdorf	1837	M. Ziegler	39				
Nürtingen	1846	Dr. Gunder	...				
Heiligenbronn	1860	M. Fuchs	24				
<i>Baden.</i>							
Meersburg, formerly							
Pforzheim	1826	Jacob Stein	107				
Gerlachsheim	1874	M. Willareth	101				
<i>Hesse.</i>							
Friedberg	1837	Ludwig Wodäge	68				
Bendheim	1840	Jacob Buchinger	82				
<i>Mecklenburg-Schwerin.</i>							
Ludwigslust	1840	M. Muslow	55				
<i>Oldenburg.</i>							
Wildeshausen	1820		46				
<i>Saxe-Weimar.</i>							
Weimar	1820	Karl Ehlwein	30				
<i>Brunswick.</i>							
Brunswick	1822	Otto Danger	47				
<i>Hamburg</i>	1827	J. H. Süder	63				
<i>Lübeck</i>	1828	J. C. A. Bengue	10				
<i>Bremen</i>	1827		20				
<i>Alsace-Lorraine.</i>							
Ruprechtsau (formerly)	1826	Ch. Jacoutot	92				
Colmar							
Strasbourg	1880	V. Paul	17				
Metz	1875	M. Erbach	46				
Ninety schools in Germany.			5614				
GREAT BRITAIN AND IRELAND, 1882.							
London (Old Kent Road S. E.)	1792	Richard Elliott, M. A.	70				
Edinburgh (Henderson Row)	1810	James Bryden	60				
Birmingham (Edgbaston)	1812	Arthur Hopper, B. A.	108				
Dublin (Claremont)	1816	E. W. Chidley	43				
Glasgow	1819	John Thomson	140				
Manchester	1823	A. Patterson	160				
Liverpool	1825	James Gibbs	107				

chant at Wethersfield, Conn. He was elected to the State legislature in 1768, and became a member of the first Continental Congress in 1774. He served on several important committees, purchased the first vessel for the American navy, and on account of his general ability was sent to France in 1776, ostensibly as a merchant, but really as a commercial and political agent. With the secret aid of the French Government large supplies of military stores were shipped to America. In Jan., 1777, when Franklin and Arthur Lee joined him as commissioners to ask for the recognition of American independence, the king ordered 2,000,000 livres to be paid them as token of his good-will. Deane had exceeded his instructions, and by liberal promises of high positions in the army had induced several officers in the French service to come to America, where their great expectations produced embarrassment to Congress and dissatisfaction in the army. Congress, having ordered his recall Nov. 21, 1777, afterwards added a request for information of the state of affairs in Europe, and directed him to return as soon as possible. He arrived July 10, 1778, and on the 13th reported to Congress, but six weeks passed before any notice was taken of him. In the mean time, Arthur Lee had accused him of extravagance and embezzlement of public funds, and Congress asked for a detailed statement of his financial transactions. This it was impossible for him to give without returning to France, but his honesty was vouched for by Franklin, and he was defended in this country by Robert Morris. In Aug., 1779, he was discharged from further attendance on Congress, and published a letter fiercely attacking his opponents, to which a reply was made by Lee on his return in 1780. Deane went to France, where a person had been appointed by Congress to audit and settle his accounts, but was subjected to many delays. Certain letters written by him to his brother and others, which charged the French court with intrigue and duplicity, were intercepted and published by Rivington, New York, 1781. Deane was in consequence obliged to retire to the Netherlands, where he lived in poverty. In 1784 he published at Hartford *An Address to the Free and Independent Citizens of the United States*; another edition, containing additional matter, was published in London in the same year. Finding his efforts to obtain a settlement of his accounts and payment of what he claimed to be due him entirely fruitless, he went to England, where he died in extreme poverty at Deal, Aug. 23, 1789. His official letters are published in Sparks's *Diplomatic Correspondence of the American Revolution*, vol. i., and Deane's *Narrative* was published in 1855. His heirs presented a memorial to Congress in 1835, and after a thorough investigation his long-disputed claims were adjusted in 1842, and a large sum ordered to be paid to the heirs.

DEARBORN, HENRY (1751-1829), an American general, was born at Hampton, N. H., March, 1751. He was a physician at Portsmouth when he heard of the battle of Lexington, and immediately marched with sixty volunteers, arriving at Cambridge, sixty-five miles off, early the next morning, April 24, 1775. He was a captain in Col. Stark's regiment, and took part in the battle of Bunker's Hill. He accompanied Arnold in his expedition through the woods of Maine to Quebec. He was captured in the attack on that city, Dec. 31, 1775, and after being closely confined was permitted to return on parole, May, 1776, and finally exchanged in March, 1777. He was a major in Gates's army at the capture of Burgoyne, and distinguished himself at the battle of Monmouth, June 28, 1778. He accompanied Sullivan in his expedition against the Indians in 1779, was with the army in New Jersey in 1780, and went with Washington to Yorktown in 1781. After the war he removed to Maine, and in 1789, Washington appointed him marshal of that district. He was elected member of Congress in 1793, and served two terms. In 1801, Jefferson appointed him Secretary of War, which posi-

tion he retained till 1809, when he was made collector of the port of Boston. In 1812 he was commissioned as senior major-general in the United States army, and took command of the department of the North, intending to invade Canada. But as the militia refused to cross the border, and the administration seemed not urgent or earnest in prosecuting the war, Gen. Dearborn accepted, provisionally, the offer of an armistice made by the governor-general, Sir George Prevost, which was rejected by President Madison. In April, 1813, Gen. Dearborn's army was carried across Lake Ontario, and captured York (now Toronto), the capital of Upper Canada. Three days later the town was burned, and the army was transported to the mouth of the Niagara River, where Fort George was taken. In July, Gen. Dearborn was permitted by the Secretary of War to retire from Canada, and was placed in command of the military district of New York City. He resigned his commission in 1815. In 1822, President Monroe appointed him minister to Portugal, but two years later he was recalled at his own request. He died at Roxbury, Mass., June 6, 1829.

DEARBORN, HENRY ALEXANDER SCAMMELL (1783-1851), son of the preceding, was born at Exeter, N. H., March 3, 1783. He was educated partly at Williams College, and graduated at William and Mary College in 1803. Having studied law first in Washington, D. C., and afterwards with Judge Story at Salem, Mass., he commenced practice in Portland, Maine, but was soon after appointed to superintend the erection of forts in Portland harbor. He afterwards became an officer in the Boston custom-house, and in 1812 succeeded his father as collector of the port of Boston. He remained in that office till 1829, when he was elected to the Massachusetts legislature. The next year he became a State senator, and in 1831 was elected to Congress, where he served one term. In 1835 he was made adjutant-general of Massachusetts, and during Dorr's rebellion furnished arms to Rhode Island, for which act he was removed in 1843. He was mayor of Roxbury from 1847 till his death, July 29, 1851. The foundation and remarkable success of the Massachusetts Horticultural Society are due mainly to him. He was also active in establishing Mount Auburn and Forest Hill Cemeteries near Boston. He published a *Memoir on the Commerce and Navigation of the Black Sea*, 1819; *Internal Improvements and Commerce of the West*, 1809. He left a *Memoir of his Father*, a *Biography of Commodore Bainbridge*, and other works in manuscript amounting to forty-five volumes.

DEATH. This word has acquired a variety of meanings; it may signify (1) the time when an organized body loses its characteristic properties. In this sense of the word death implies the opposite of birth, or, more strictly, the time when the organism, as such, commences its existence. (2) The word death may refer to the transformed condition into which an organism passes when the processes which characterized its life have ceased. In this sense of the word death is the opposite of life. (3) It may mean the *act*, or transition stage, of passing from the condition of life to that of death; that is, the act of dying. (4) It may refer in man to the separation of the soul from the body.

In this article will be considered, *first*, the nature of death as a condition opposed to life; *second*, the cause and nature of the act of dying; *third*, the signs by which the near advent of death may be foretold; and *fourth*, the signs by which its actual occurrence may be recognized.

I. *The Nature of Death.*—Death, like life, is a condition which admits of no short definition. For the present we may say that death is the extinction in an organized body of its vital properties; consequently, in the most restricted sense of the word, death means the abolition of all those properties which distinguish animate from inanimate organized matter.

In lower forms of life, both animal and vegetable, the definition applies with considerable strictness. The properties of protoplasm, which we are accustomed to describe as vital properties, depend upon the integrity of the vehicle through which they are manifested; hence, in animals and plants which are composed of simple masses of undifferentiated protoplasm, we can conceive that as long as the elements carbon, hydrogen, oxygen, nitrogen, and sulphur are combined in certain definite proportions and molecular arrangements, the resulting compound possesses the vital properties. That is, it possesses the power of taking foreign material, suitable to its nutritive needs, into its interior, elaborating that matter into protoplasm, throwing out the waste, while the original matter composing the individual breaks up into simpler compounds which are cast off; it is also capable of carrying on the process of respiration, which is essentially a process of oxidation, while carbon dioxide is a constant result of this form of chemical change; it is also reproductive; that is, when the nutritive processes are in excess of activity over the processes of waste, it is capable by fission, or by some other simple process, of reproducing itself in a separate individual; it is finally contractile and capable of automatic movements.

Coincident with the disappearance of these vital properties of such an unit of protoplasm we find that the chemical elements of which it was composed tend to arrange themselves into simpler, more stable forms; but as to whether death—that is, the inability of carrying on these vital processes—depends upon the rearrangement of the molecules of the protoplasm, or whether the decomposition (in a chemical sense), and this is the older view, depends upon the death of the protoplasm, are points which have long been subjects of contention.

It had long been surmised that there existed some difference in the molecular constitution of living and dead protoplasm, but it is only recently that this difference has been demonstrated. It has been found that in living protoplasm the elements carbon, hydrogen, and oxygen are arranged in combination, analogous if not identical with the aldehyde group, and that on the death of the protoplasm this grouping is lost. As a consequence of the presence of this aldehyde group, living protoplasm possesses in the highest degree the property of reducing the noble metals out of alkaline solutions; but when the *life* of the protoplasm is destroyed, as by short exposure to a temperature of only 50° C. for some of the fresh water algæ, this property is lost; life therefore depends upon the presence of this aldehyde group, and its disappearance, as evidenced by the loss of reducing power, is the first sign of death.

We may then logically say that the so-called vital properties of protoplasm depend upon a certain definite arrangement of certain molecules, and that as long as these molecules are so arranged life is present. Under such circumstances protoplasm is a stable compound; for while, if we may admit the paradox, it is continually changing its constituents, replacing the old by new matter, its composition always remains the same, and it is only when no longer manifesting its characteristic properties that protoplasm is an unstable compound. Since, therefore, we never have a certain definite compound without attributing its properties to the elements composing it and to the mode of arrangement of its molecules, we must, to be consistent, attribute the vital properties of protoplasm to its chemical arrangement, plus, in all probability, a certain molecular movement or impact. Death therefore in such simple organism, as in the amoeba, may be said to be simply the rearrangement of its molecules by which its components break up into simpler compounds. Death is therefore decomposition in the strict sense of the word.

Higher forms of animal and vegetable life may be regarded as merely associations of such simple masses

of protoplasm, but so arranged that there is a division of labor; for while every individual cell possesses the vital properties inherent to protoplasm—that is, is capable of carrying on, in a certain sense, its own nutritive, respiratory, and reproductive processes—a number of cells are associated in the form of organs which are specialized to carry on certain functions. These specialized groups of protoplasmic cells receive the name of tissues; thus we have certain cells in which the reproductive functions are exalted, while they depend largely for nutritive material on other tissues whose main function is the elaboration of ingested food; then we have other tissues devoted to respiration; and others in which the contractile element predominates. So we may regard a complex animal as composed of tissues in each one of which one of the general properties of protoplasm has become specialized, the protoplasm in complex as in simple organism being equally the physical basis of life. It follows, therefore, that with this complex association of protoplasmic units, each fulfilling its own separate share of labor as a means of attaining a common end, the preservation of the individual and species, the phenomena of death, or loss of protoplasmic energy, must differ in accordance with the extent and functional importance of the part involved. We are compelled, therefore, to draw a distinction in the higher animals between *molecular death*, or the particular destruction of protoplasm, and *somatic death*, in which the vital properties are extinguished throughout the entire organism.

When an animal is said to be dead, when the last breath has been drawn and the last pulsation of the heart has taken place, even to a superficial observer it is evident that many of the phenomena which are associated with life may still be detected. Thus the muscular fibre, particularly the unstriated muscular fibre of the alimentary canal, may still manifest spontaneous contractions; the blood may continue to move in the blood-vessels; heat may still be produced, glands may secrete, and the nails and hair may be noticed to increase in length.

It is therefore evident that a distinction must be made between the popular and scientific use of the term death. General systemic or somatic death can never exist except as a result of general molecular death. Indeed, if we admit that life is simply a manifestation of the properties of protoplasm, we can conceive of no loss of function without the disorganization of the protoplasm with which that function is normally associated; hence we see that the old distinction between somatic and molecular death, in which the former referred to death occurring in one or more of the vital organs, is simply one of degree of functional importance of the disabled tissue, while general molecular death is the true scientific conception of death. In the representation we have given as to the formation of a complex animal out of a number of associated tissues, each carrying on a definite function, it is evident that the effect produced on the entire organism by the destruction of any tissue will depend upon the importance of the function possessed by that tissue and on the amount of tissue incapacitated. We know that oxidation is essential to the life of all forms of protoplasm; when, therefore, we find that the tissue whose function is to facilitate the supply of oxygen to all the tissues fails to act—in other words, when respiration by the lungs ceases—the other tissues must necessarily die. Or when the tissue, the blood, whose province is to bear this oxygen to the system at large and to carry away the products of waste, ceases to fulfil its office, death *in toto*, or true somatic death, as invariably results. And as the respiratory movements and the pulsation of the heart, the signs by which the functional activities of these two specialized tissues are manifested, are readily discernible; and as we know by experience that neither one nor the other can in the higher animals be arrested without ultimately causing

the death of the organism, we have come to speak of these phenomena, the arrest of the heart or respiration, as systemic or somatic death, though we have already shown that many evidences of vitality may be manifested even after their arrest; cessation of respiration and circulation are, therefore, *per se* only instances of molecular death limited to special tissues.

But when, on the other hand, we have a loss of function in some less essential tissue, the occurrence of general death of the organism, or true somatic death, will depend upon the importance of the tissue and the extent involved. Thus caries of teeth or bone are examples of what is termed loss of molecular vitality; suppuration, as in the production of abscesses, or local gangrene and ulceration—all are instances of the loss of protoplasmic vitality; but the general life of the organism is evidently not threatened unless these changes are so extensive as to react on or implicate some vital organ.

II. *The causes and nature of the act of dying.*—The above considerations naturally lead to the examination of the means by which systemic or somatic death is produced, these terms being retained with the reminder that by somatic death we mean not the popular conception of death, but the entire extinction of vitality in the organism, brought about by the molecular death of those tissues whose functions are to maintain or to govern the functional activity of subordinate tissues. We consequently see that we must divide animal tissues into two classes: *first*, a class whose life depends upon that of the *second*, which, again, is one whose destruction necessitates the death of all other tissues, and whose death may be occasioned by death of the subordinate tissues.

We have therefore one or more governing tissues, upon whose death the death of all subordinate tissues necessarily ultimately follows; and subordinate tissues whose vitality is dependent upon the chief tissues and whose death does not necessarily imply death of that chief tissue. We have already given examples of death occurring in the subordinate tissues; we will now consider the latter more particularly.

According to older views, the maintenance of existence, in the higher forms of life, depended upon the integrity of three factors: the maintenance of the circulation; the functional activity of the respiratory centre; and the constant oxygenation of the hæmoglobin of the blood. Thus Bichat's tripod of life was the heart, the brain, and the lungs; the failure of any one overthrew the life of the organism. In reality, however, the invariable cause of somatic death on close analysis can be found in the stoppage of the heart and the consequent arrest of the circulation. We know that the functions of all tissues depend upon their steady supply with normal arterial blood; interference with that supply necessitates the death of those tissues. And while this result may apparently be directly due to interference with some other mechanism, the final result of that interference and the ultimate cause of death lies invariably in the loss of function of the central organ of the circulation. While, therefore, death invariably is due to the arrest of the circulation, that failure may be due to several causes, any one of which may thus indirectly be the cause of death. We will examine some of these in detail.

As the activities of the body are the result of oxidation processes, there may be three ways in which these processes are interfered with: (1) Deficiency of the material to be oxidized, or want of those organic and inorganic matters which are indispensable to nutrition; hence, *defective nutrition*. (2) Deficiency in supply of oxygenated blood. (3) Absence of the conditions necessary to oxidation. (Hermann.)

1. *Imperfect nutritive changes.*—In all periods of existence there is a constant molecular death and a constant interstitial repair by which the constancy of composition of the protoplasmic molecule is maintained, but it is inherent to the very nature of such action that

it can be sustained throughout only a short space of time. In youth, the nutritive reparative processes are in excess of the waste; youth, therefore, is the season of growth and development. In maturity equilibrium is maintained by a balance between waste and repair; but when old age approaches there is a gradual falling off of reparative energy and a consequent decline in vigor. In maturity there occurs the greatest degree of actual waste because maturity is the time of greatest energy, and there can be no cell energy without cell death; but maturity is also the season of greatest actual nutritive activity, and a nutritive balance is maintained. In old age we have a gradually increasing relative excess of waste over repair; old age is therefore a gradually increasing disease—the disturbed balance between waste and repair, although the waste may be actually less than at any other period. Death from old age will thus fall into the class in which imperfect nutrition constitutes a remote cause of death, life being prolonged until the heart no longer has sufficient vigor to propel the blood into the arteries, and respiratory changes are too sluggish to permit the proper oxygenation of the blood and the removal of all the products of retrograde metamorphosis of the tissues. Death is then finally caused by the arrest of the heart after the functions of the organs of relation have been extinguished one by one.

In old age the organs all decline in functional activity until at last by imperceptible gradation they reach their lowest term. Drowsiness increases with the decline of the powers, life passes into sleep, sleep into death,—death from old age, or *natural death*. Generally the aged individual sinks gradually and silently into death, totally unconscious of all that surrounds him. At other times he may retain his sensorial faculties to the last, and even his locomotive powers, until owing, perhaps, to some oppression of one of the vital functions his sleep becomes the sleep of death. Bichat called attention to a most interesting characteristic of this kind of death, viz., that *animal life* terminates long before *organic life*. Death takes place in detail, the animal functions which connect the aged with the objects around them being destroyed long before those concerned in their nutrition. In other words, death in old age takes place from the circumference towards the centre; in *accidental* or *premature death*, from the centre towards the periphery.

Death from starvation will also fall into this class, in which the remote cause of death is imperfect nutritive supply, the ultimate cause being arrest of the circulation.

2. *Defective supply of arterial blood.*—Death may be caused by an insufficient supply, or entire absence of, oxygenated blood in the tissues. This condition may occur either as a consequence of hemorrhage, by which so much blood is lost that the remainder is insufficient to supply the needs of the organism, the motions of the heart are therefore arrested, and death results; or the circulation may itself be primarily arrested, either by direct arrest of the heart's action, or locally by closure of the arteries going to, or the veins coming from, a part, by ligature, rupture, embolism, or thrombosis, when local death may result; or when such accidents occur in vital organs, or in one of the large vascular trunks, they may react on the heart and so cause its stoppage and general death. Arrest of the heart may be directly due to injury, to defective nutrition of the heart's substance, to obstructed circulation in the coronary arteries, to some failure in function of its inherent or extrinsic nervous mechanism, or to defect in the valvular mechanism of the heart.

Defective supply of oxygenated blood may also result from all causes which hinder the free access and retention of oxygen in the blood. All forms of suffocation will fall into this category, either when there is an absence of oxygen in the inspired air, as when attempts at inspiration are made in a vacuum or under water; or when the proper oxidation of the hæmoglobin is inter-

fered with by changes in the blood, such as are caused by the inhalation of carbon-monoxide, sulphuretted hydrogen, etc.; or the cutaneous or pulmonary respiration may be interrupted; the former by anything which interferes with the functions of the skin, as burns or scalds, or covering the skin with a layer of varnish, etc.; the latter by paralysis of the respiratory centre, as in apoplexy,—by insufficient or abnormal blood, or paralyzing poisons,—by interference with the functions of the respiratory nerves, as in section or compression of the phrenic nerve, or in curare poisoning,—or by paralysis or tetanus (as in strychnia poisoning) of the respiratory muscles; or, finally, by some mechanical obstruction to the expansion of the thorax.

3. *Absence of the conditions necessary to oxidation.*—As regards the production of death from disturbance of the conditions necessary to oxidation, very little can be said; about all that we know is that there are certain conditions essential to such processes. Modifications of these conditions may produce disease or modified vitality; their absence results in death. The most important of these conditions necessary to the proper oxidation of protoplasm is a certain degree of temperature, varying in the most marked degree for different members of the animal and vegetable kingdoms, but marked by strict limitations for each species, beyond which elevations or depressions of temperature must lead to depressed (as in hybernation) or suspended animation. A certain quantity of moisture appears to be also essential to the oxidation processes of protoplasm, a fact not strange to us when we recollect the composition of protoplasm itself, and demonstrated by the altered conditions of vitality which in the lower organisms follows the disturbance of the normal supply of water (latent vitality). Finally, the nutritive processes of oxidation which occur in protoplasm are, in the higher animals, directly under the control of the nervous system, and it is to disturbance of this controlling influence that the remarkable cases of suspended animation in man (trance, catalepsy) may be attributed.

III. *Signs of impending death.*—For some time before death the indications of the fatal event usually become more and more apparent; speech becomes thick and labored; the hands, if raised, fall inertly; the labored respiration causes insufficient oxygenation of the blood, and the distress excites an attempt at inspiration which debility renders nearly ineffectual; hence gasping, sighs, yawning. The heart loses its power to propel the blood into the extremities, they become cold, and a clammy moisture oozes through the skin. Irregular action of the heart and lungs takes place, until at last the contractility of the vital organs is entirely gone. Respiration ceases by a strong expulsion of air from the chest, and in the very act of expiring the person dies. While such is the ordinary sequence of events which precede the death of an individual, they must necessarily vary with the circumstances under which death occurs. Delirium, restlessness, and dementia often occur; or the dying man, as in apoplexy, old age, and many febrile diseases, may remain feelingless, motionless, mindless for many days before the cessation of the organic functions, or perfect consciousness may be possessed up to the last. The process of dying should not necessarily be considered one of physical distress and anguish; for no matter what may have been the previous torture, it must be all over when once those changes begin in which death consists; with the failure of the circulation the function of the brain declines. If the fatal process begins in the respiratory apparatus unconsciousness precedes the arrest of the circulation; and if in the brain, any injury sufficient to affect the lungs and heart fatally must destroy its own consciousness. Convulsion is not the sign of pain; it is an affection of the motific, not of the sensory, part of the nervous system, and is due, under such circumstances, to insufficient supply of oxygen to the medulla oblongata. Temporary faintings and asphyxia, and the convulsions of epilepsy, the

nearest approach to actual death, have nothing formidable in sensation.

IV. *Signs of actual death.*—The recognition of the signs of death is important, in the first place, to enable the determination of the reality of death; and, in the second, on medico-legal grounds, to enable the formation of an opinion as to the length of time during which life has been extinct. We will examine in detail some of the various signs of death.

The *continuous and entire cessation of the circulation* is a positive sign of death: the difficulty, however, lies in obtaining such proof, since mere feeling of the pulse, or auscultation and palpation of the heart, may, from the weakness of pulsation, or some abnormality in situation or character, fail to reveal any action, and a temporary suspension of the heart's action has been known to occur without the production of death. Several accessory tests of the condition of the circulation have therefore been proposed. Thus, when a thread is tied tightly around the finger, if the person be living, the part beyond the ligature will become bluish-red in hue, while a narrow white ring will surround the finger where the ligature was applied: after the cessation of the circulation no such appearance will be found. Then if bright steel needles are thrust into the flesh during life they will become tarnished from oxidation: after death they will retain their brightness unchanged. If ammonia be injected under the skin during life it will cause a deep red congestion of the part: no such change occurs after death.

The *entire and continuous cessation of respiration* is also, when capable of demonstration, an incontestable sign of death, since, as a rule, life is destroyed by any cause which arrests respiration of atmospheric air for more than a few minutes. While auscultation will be generally relied upon for the determination of the existence or absence of respiratory movements, a number of accessory tests have been proposed. Thus, the popular test of holding a mirror before the mouth and nostrils, when the condensation of moisture on its surface is regarded as a sign of the presence of respiration; but this test, as well as the holding of feathers before the nose, or the standing of a glass of water on the chest, are more valuable as furnishing positive proof of life than the absence of the characteristic results is a sign of death, as they may all fail to show the presence of respiratory movements in hibernating animals.

There are certain other signs which may prove of confirmatory value as to the presence or absence of death. Thus, when heat is applied to the skin until a vesicle forms, if the contents of the vesicle contain albumen, and the cutis vera, after removal of the cuticle, appears red, and particularly if a red line forms after a short time around the blister, absolute evidence is furnished as to the life of the part, and hence strong presumptive evidence of the life of the individual. While if the vesicle so formed contains gas-bubbles, and only a little non-albuminous serum, and if the cutis vera appears dry and glazed, and no red line forms, the evidence is strong that the part is dead. So, also, caustic produces a reddish-brown eschar when applied to living skin, while the skin merely turns yellow or transparent without forming an eschar when the part is dead. Certain changes which occur in and about the eye may also be valuable confirmatory signs of death. Thus, at death, the pupil loses its mobility; the cornea loses its transparency, lustre, and sensibility; and the face assumes the well-known expression described as the *facies Hippocratica*.

After death the body is subject to a gradual and progressive loss of heat, until ultimately the body becomes of about the same temperature as the surrounding media, and as this loss of heat is progressive, it may serve as an indication of the time a body has been dead. Thus, under ordinary circumstances, a body becomes cold in from fifteen to twenty hours after death. In some cases, however, there may be

a post-mortem elevation of temperature from chemical action, in which oxygen combines with the elements of the body with extraordinary energy.

Some of the most important signs of death are to be found in the condition of the muscular system. These conditions are marked by three stages: (1) When the muscles become flaccid, but still preserve their irritability. The duration of this stage, which sets in immediately after the arrest of the heart, or after death, in the popular conception of the word, may last for only a few minutes or for several hours, depending upon the cause of death. When contractility is present in *any* muscle, the person is either not dead or has recently died; when absent in *all* muscles, it may be stated positively that death has taken place. (2) *Rigor mortis*, or cadaveric rigidity, soon succeeds the first stage. In this condition the muscles become stiff and rigid, and the limbs retain the position they occupied at the time rigidity supervened. Rigor mortis is due to the coagulation of the myosin of muscles, and is a process entirely analogous to the coagulation of the blood. On the occurrence of rigor mortis muscles lose their alkalinity and become acid: they also lose their elasticity and transparency. Rigor is also associated with the development of heat, partly due to the physical changes in density, and partly to the chemical changes.

Rigor mortis ordinarily commences about three or four hours after death, though the time of its occurrence will depend upon the mode of death. Thus, in cases of sudden death in robust muscular subjects, not having been exposed to fatigue, rigor may be delayed for twelve hours or more. On the other hand the first stage of muscular change may apparently be absent, and rigor occur almost immediately after death: such cases are seen in subjects which have been exposed to great fatigue before death, as in hunted animals, in strychnia poisoning, and in instant death at the close of the action on the battle-field. Rigor mortis passes from above downwards; it begins in the back of the neck and lower jaw, passes then to the facial muscles, the front of the neck, the chest and the upper extremities, and last of all to the lower extremities. Usually it passes off in the same order, and when once gone, whether from the natural progress of changes, or from forced movements, it never returns, and the body becomes as flexible as it formerly was. Rigor mortis usually lasts for twenty-four or thirty-six hours, though when death has been caused by long continued exhausting diseases it may not last longer than an hour or two, or it may be very much prolonged: as a rule the longer its advent is delayed, the greater its duration and intensity.

(3) After rigor mortis has disappeared the muscles again become flaccid and alkaline in reaction, and the third stage of change, that of *putrefaction*, sets in, unless prevented by rapid desiccation, or by the use of agents which prevent putrefaction. Putrefaction, which furnishes the sole absolute sign of death, consists in a slow oxidation of the organic constituents of the body, brought about by the action of the air under the influence of bacterial organisms. The marks of post-mortem lividity (*Suggillations, livores*), which are precursors of putrefaction, are caused by the diffusion of the blood coloring matter out of the corpuscles, first into the serum, and afterwards into the fluids of the different organs.

(R. M. S.)

DE BOW, JAMES DUNWOODY BROWNSON (1820-1867), an eminent Southern editor and statistician, was born at Charleston, S. C., July 10, 1820. His father, Garret De Bow, a native of New Jersey, had settled in Charleston as a merchant, and was for a time successful, but afterwards sank into poverty. At an early age the son was employed in mercantile business, but as soon as he obtained the necessary means went to Cokesburg Institute, and thence to Charleston College, from which he graduated in 1843. Having studied law, he was ad-

mitted to the bar in 1844, but had already entered upon a literary career by contributing to the *Southern Quarterly Review*, then published at Charleston by D. K. Whitaker. De Bow soon became editor of the *Review*, and among his articles was one on *Oregon and the Oregon Question*, which attracted attention throughout the country, and was the occasion of a debate in the French Chamber of Deputies. In 1845 he was secretary of the convention held at Memphis, Tenn., to promote the interests of the South. John C. Calhoun presided over the convention, and De Bow prepared an elaborate report of its proceedings. He had also previously published some articles in the Charleston *Courier* advocating the holding of this convention, and while preparing them first felt the need in the Southern States of a monthly magazine, commercial rather than literary. For the purpose of establishing such a magazine he removed to New Orleans towards the close of 1845, and the first number of *De Bow's Commercial Review* was issued in the following January. For a time its existence was precarious, but eventually it became the leading periodical of the South-west. In 1848 he was appointed professor of political economy and commercial statistics in the University of Louisiana, and in the same year, when that State established a bureau of statistics, Mr. De Bow was placed in charge, and issued a valuable report in 1849. He assisted in founding the Louisiana Historical Society, and was a member of the New Orleans Academy of Sciences. He gathered material with a view of writing a history of Louisiana, but afterwards abandoned this intention, though he published a series of articles in his *Review* on "The Early Times of Louisiana." In 1853, Pres. Pierce appointed De Bow superintendent of the United States census, which position he held for two years, editing and completing the census report for 1850 in a superior manner, yet at reduced cost to the Government. In 1853 he issued *The Industrial Resources of the Southern and Western States*, in three volumes, compiled from his *Review*, and published an *Encyclopædia of the Trade and Commerce of the United States*. He was always an ardent advocate of Southern conventions, political, agricultural, mercantile, and educational. In most of those which were held he was a delegate, was several times secretary, and was president of the Knoxville convention of 1857. In these, as in the pages of his *Review*, he urged the perpetuation of slavery as it existed in the Southern States, and fiercely denounced all attempts at its abolition. Becoming more extreme in his views as time passed on, he even proposed the revival of the slave-trade. He was of course an advocate of the secession of the South, and in 1858, in an address before the alumni of Charleston College, he maintained that the only salvation of the interests of that section lay in an immediate dissolution of the Union. When secession was accomplished he held several important positions under the Confederacy, especially that of chief agent for the purchase and sale of cotton on behalf of the Government. His *Review* was suspended for two years, but he was still active with voice and pen in behalf of the Southern cause. After the close of the war he resumed the publication of his *Review* at Nashville, and, accepting the results of the conflict, urged the Southern States to encourage immigration from Europe, to make a fair trial of the system of free labor, and to introduce manufactures. He became president of the Tennessee and Pacific Railroad, and used every effort to advance this great undertaking. Learning that his younger brother was lying at the point of death in New Jersey, Mr. De Bow hastened from the South to be near him. On the journey he caught a severe cold that terminated in pleurisy, of which he died at Elizabeth, N. J., Feb. 27, 1867. His brother died a month later. The *Review* was continued by his heirs for two years after his death. Mr. De Bow's characteristics were self-reliance, diligence, application, integrity, and devotion to what he believed to be the true interests of his country.

DEBTS, NATIONAL. National debts of long duration were unknown among the nations of antiquity. They carried on wars either by preparing for them in times of peace, or by subsisting on the enemy.

When Alexander overthrew Darius on the plains of Arbela an immense amount of treasure was taken. In most cases the nation which first declared war invaded the country attacked, where to a considerable degree its armies were supported. Napoleon adopted this policy, otherwise his military operations would not have been so favorably regarded by the French people. Debts were often contracted in anticipation of taxes; but the first permanent national debt is comparatively of modern date. The modern idea seems to be to incur the obligation requiring the expenditure, and raise the means to fulfil it afterward; the ancient idea was the reverse. It cannot be unhesitatingly asserted that the modern policy is the wisest. "Pay as you go" is one of the soundest rules that can be observed by nations as well as by individuals.

The first permanent national debt was created by the papal government. However loud were the complaints of extortion heard in Rome in the fifteenth century, the fact cannot be disputed that only a very small portion of the money raised for the pope was put into his treasury. All the nations of Europe were obedient to Pius II., yet he was so greatly in need of money that he could afford only one meal a day to himself and his dependents for a long time, and was obliged to borrow 200,000 ducats to prepare for the war with Turkey which he meditated. Whenever costly enterprises were undertaken the pope resorted to extraordinary expedients, and among these were jubilees and indulgences. Another mode of raising money was to create and sell offices. A certain sum was immediately paid for the office, and the official received at stated times thereafter a fixed sum or interest during his life. These arrangements were essentially annuities. The interest was raised by increasing the imposts of the church. There existed in the year 1471 nearly six hundred and fifty salable offices, the income from which amounted to 100,000 scudi. These were, says Ranke, chiefly held by procurators, registrars, abbreviators, correctors, notaries, clerks, even messengers and doorkeepers, whose increasing numbers continually raised the costs of a bull or a brief. This was, indeed, the very object of appointing them, for their duties amounted to little or nothing.

Sixtus IV., adopting the plan proposed by his protonotary, Sinolfo, established whole colleges by a single act, the places in which were sold for 200 or 300 ducats each. These institutions bore singular titles; one of them was called the "college of a hundred janissaries." Sixtus IV. carried the system so far that he has been regarded its real author; but, as we have seen, it was invented long before his day. Under him, however, the system was worked to its utmost capacity. His successors did not hesitate to employ the system as occasion required. Innocent VIII. founded a new college of twenty-six secretaries for 60,000 scudi, with a complement of other officers. Alexander VI. appointed eighty writers of briefs, each writer paying 750 scudi for his appointment; and Julius II., on the same terms, added one hundred writers of archives. He also established a college consisting of a hundred and forty-one presidents of the annona, or bodies which received the different taxes, all of whom were paid by the state. His success in raising money was so great as to excite the admiration of other princes, whatever they might have thought of him as the religious head of the church. Leo X., who squandered the revenues of the church in a shameful manner, not content with selling the existing offices, raised a large sum by nominating additional cardinals. He created more than twelve hundred offices. Their sale yielded the sum of 900,000 scudi. The interest amounted to an eighth of the capital, and was raised by slightly increasing the

church dues, but chiefly by contributions from the surplus of the municipal administrations paid into the coffers of the state from the produce of the alum-works, the sale of salt, and the *dogana*, or customs revenues of Rome.

"However censurable this prodigality," says Ranke, "Leo was doubtless encouraged in it by finding that it produced for the time advantageous rather than mischievous effects. It was partly owing to this system of finance that Rome, at the period in question, rose to such an unexampled height of prosperity, since there was no place in the world where capital could be invested to so much advantage. The multitude of new offices, the vacancies and consequent reappointments, kept up a continual stir in the curia and held out to all the prospect of easy advancement. Another consequence was that there was no necessity for burdening the public with new taxes; it is indisputable that the states of the church compared with other provinces, and Rome with other cities, in Italy, were charged with the smallest amount of taxation. The Romans had already been told that whilst other cities furnished to their princes heavy loans and vexatious taxes, their master, the pope, on the contrary, made his subjects very rich."

But this pleasant state of things could last no longer than while a surplus remained in the public treasury. Leo did not live to fund all his loans, and his successors were obliged to tax the people more heavily. In 1526 Clement VII. took up arms against Charles V. and new loans became necessary. Until this time the money paid to the state on the sale of an office was returned in the way of interest, but when the lender died the obligation of the state to pay ceased. Clement proposed to raise 200,000 scudi by paying ten per cent. to the lender during his lifetime and continuing the payment to his successors. This was the first national loan in the modern sense of the term. The interest was charged on the *dogana* or custom-house revenues, and the loan was made more secure by giving a share in the management of the institution to the creditors. The old form of borrowing, however, was not wholly abandoned, for the lenders constituted a college; a few undertakers of the loan paid the whole amount into the treasury, and then disposed of the shares among their own college-members. Thus the lenders became participants in the management of the government to a certain extent, and Ranke says that "no capitalist would lend his money without the form of such participation."

Although this mode of obtaining loans had been devised, the former one of getting them by the sale of offices was not abandoned. Subsequent popes resorted sometimes to one mode and sometimes to the other. When interest ceased on the death of the creditor, which was the case with the loans called *vacabili* and received for offices, the rate was higher than on those loans whose interest was perpetual. These loans were called the *non vacabili*. For a long period the popes exerted themselves to the utmost to raise money by these modes, chiefly to aid in prosecuting wars in which the states of the church were usually engaged in company with other nations. The Turks for centuries were a menace to Europe, and the pope was often zealous in raising men and money to beat back the dreaded Moslem. But after a time so many loans had been issued that the taxes grew very high and were among the most oppressive in Europe. Many of these had been assigned to the lenders to receive their advances, and they, of course, insisted on their collection, and were usually successful. By this method they made sure of getting their money: indeed, without having such power, probably no loans could have been negotiated in those days. The honesty and efficiency of the government were not so well established as to induce lenders to part with their money on the simple promise of the government that it should be repaid in regular annual payments. They insisted that certain

revenues should be pledged to them, and, moreover, that the farmers of taxes should pay the portion thus assigned directly to the lenders without first putting it into the state treasury.

For centuries the people living under the most enlightened governments have had more faith in them and have trusted them to collect the revenues and pay their obligations. But one feature of this system has survived to our day—namely, the pledging of a certain revenue for the payment of a particular debt. That great financier, Pitt, strongly recommended Parliament to do this when authorizing some of the war loans during the war with Napoleon; and Alexander Hamilton, who had studied the British system of finance closely, recommended a similar policy for adoption by the American Congress. This was done in many instances. Pitt and Hamilton both believed that the possessors of money would lend more freely if the sources whence payments were to be made were described and specifically pledged for that purpose. But the custom of the lender to participate in the collection of the revenue, and to receive it directly from the tax-gatherer, has long since passed away, save in a few recent instances, as when Turkey and Egypt were compelled to allow some share of foreign interference in the administration of their finances.

The next states to imitate the pope in borrowing were Genoa and Venice. In both states taxes were assigned to the creditors, who participated largely in their collection. One revenue after another was thus assigned to them until only a very small sum flowed into the public treasury. The first mode of contracting a permanent national debt, therefore, was this: the state borrowed money, pledging certain revenues in payment which were collected by the creditors or largely through their instrumentality. A more minute account of the loans of Genoa and Venice will be found in the article on BANKING.

In Florence government loans were made during the first half of the thirteenth century. There were two modes of making them. By one mode the treasurers of the commune made an agreement with one or more great banking-houses, who, on receiving an assignment of the custom-duties, advanced the money and distributed the loan among their customers and friends. By the other mode the government itself announced the loan and allotted it to the citizens in proportion to their income, which was recorded on the *esturio* or assessment of real and personal property. The security given in this case also was the custom-duties for a fixed period.

Spain followed next. Then her Dutch child, Holland, followed her example. Her debt was contracted in the 16th and 17th centuries when contending so heroically against the might and tyranny of Spain, and also in consequence of the wars with Cromwell, Charles II., and Louis XIV. They attained their greatest height about the end of the 17th century, when the debt of England was beginning.

This was the time when the stadtholder of the Netherlands and his wife acceded to the throne of England. Many of the people were disaffected by the event, and William III. was obliged to guard his possession at no inconsiderable expense, and yet if possible to prevent his new subjects from feeling the cost. One of his first acts was to abolish the tax of hearth-money, thereby surrendering \$1,200,000 per annum, although the national income was considerably below expenditures. Obligated to defend his kingdom within, and to enlist forces for war with France, and deeming it impolitic to impose new taxes, he could not do otherwise than to borrow. Other English monarchs had done the same thing before, but the credit of the state had never been pledged. The loans were personal, not national. In 1694, for the first time in English accounts, appears the item, "Interest and Management of the Public Debt."

The first funded debt was \$6,000,000, borrowed from

the Bank of England in 1694. At that time the word "fund" meant the special tax or fund which was set apart for meeting the charge on the money borrowed, whereas now the word has come to mean that money itself. After this followed the East India Company's loan of \$10,000,000. Four years afterward the debt of Charles II. to the bankers and goldsmiths was compounded and added to the funded debt. This still forms a part of the national indebtedness. (For history of English debt see FINANCE, in *ENCYCLOPÆDIA BRITANNICA*.)

France created a debt in the reign of Charles V. in 1375, which was increased in ransoming Francis I. But when Sully became the chief minister of Henry IV. in 1597 he reformed the financial system, and during his administration paid the public debt, which amounted to 332,000,000 livres, besides remitting 20,000,000 of taxes in arrears and collecting a reserve of 17,000,000 livres, which were deposited in the Bastille. This reserve was squandered by Henry's successors, and the nation plunged deeply into debt during the reign of subsequent kings. At the death of Louis XIV. in September, 1715, the debt, says Cohen, amounted to \$620,000,000; but another author more accurately states that "as to the amount and nature of the obligations which the state had incurred, the most vague notions prevailed, even among financiers. One author states that they were thought to exceed the intrinsic value of the whole country; the fact was that, except so far as the rents upon the Hôtel de Ville were concerned, there were no regular means of ascertaining what money had been borrowed by the state and from whom. The country was flooded with state bills of endless variety in point of amount, date, and security. Some were for millions of livres, others for tens, hundreds, thousands. The date of some was a century old, that of others did not extend beyond the existing year. Many were payable at the national treasury, not a few were drawn upon receivers-general; and the whole formed a mass of confusion, out of which it seemed impossible to evolve anything like order, in accordance with the principles of justice. The grossest frauds had been practised upon the state and its creditors; debts had been contracted, although no money had been received; those by whom money had been really advanced had been compelled to sell their securities at one-half or one-fourth of their nominal value." The only well-authenticated fact about the debt at this time is that the sum annually required to pay the interest exceeded 89,000,000 livres. A more particular description of the indebtedness of France at this date will be found in Murray's *French Finance and Financiers under Louis XV.*

France was not the only European state the amount of whose debt for a long period was involved in obscurity. The debts of Spain and Russia, until a recent period, have been an unfathomable mystery. Several reasons may be given for keeping them in this way. One is neglect and inefficiency on the part of officials. Another is that frauds could be more easily perpetrated and the treasury, with less difficulty, robbed. It has been considered a wise policy in some cases to keep the subject in darkness through fear that a full exhibit of the national indebtedness would impair public credit. So long as the real amount was unknown it was easier to make such representations concerning it as the public interests seemed to demand. Of course this could not be done if the record were accurately kept and published.

There are four ways of stating national debts. The most usual way is to state them by their nominal capital. Thus we say that the debt of the United States on Dec. 31, 1881, less the cash in the treasury, was \$1,765,491,717. This way is inaccurate for comparing debts because the difference in interest is not considered, nor that of population or national wealth. But it is the easiest way, and conveys to the reader some idea of the subject. The second way, which is in gen-

eral use on the continent of Europe, consists in stating debts by their annual rente or interest. This, it is said, measures more accurately the burden on a nation; though it does not when a portion of its debt consists of terminable annuities, which is the case with England. This way is not perfect, for it takes no account of population or wealth, and consequently of the pressure of taxation. The third way marks an advance by dividing the annual charge of the debt by the population, and the last way consists in ascertaining the proportion or percentage of the annual charge of the debt to the gross income of the population. But as Baxter, who has treated of this subject quite fully, says, "materials are seldom available for arriving at this comparison, and its general adoption must be left for an age of more complete statistical knowledge."

It is startling to think what a large proportion of national debts is contracted for war expenditure. The four debts incurred by the United States were for this purpose. The debt of Great Britain was similarly contracted. So was the larger part of the debt of France and the Netherlands, Russia, Austria-Hungary, and Italy. The debt of Germany represents a larger outlay for building railroads, and making other improvements, than the debt of any other European nation. A considerable sum has been expended by Italy and France for railroads and canals. A very large sum has been borrowed to meet annual deficits. This is true more particularly with respect to Austria-Hungary, Russia, Italy, and Spain.

The earliest account that can be given with any degree of accuracy of the debts of nations is for 1715. At that period the French debt was \$700,000,000; the Netherlands owed \$450,000,000; England, \$180,000,000; and Spain, the Italian republics, and other states, about \$250,000,000. The total national indebtedness of the world was therefore \$1,500,000,000—being somewhat less than the debt of the United States at the present time.

The debt of France was so enormous, and a large portion was so well known to have been fraudulently contracted, that steps were immediately taken after the death of Louis XIV. to reduce the amount. The debt was of three kinds: state bills, the amount of which was estimated at 700,000,000 livres, another sum of 800,000,000 livres, which represented the purchase-money paid for judicial and other offices, and a third sum of 500,000,000 livres, which was properly the funded debt of the nation. This entire sum, as nearly as can be ascertained, was about \$700,000,000. As the grossest frauds had been perpetrated in issuing the state bills payment of them was suspended until they could be examined and verified. The brothers Paris, who had acquired a great reputation for their financial skill, were appointed to perform this delicate task. The amount presented for examination was \$210,000,000. It is not known on what principles the examiners proceeded in making their determination; but their result is known, for this portion of the public debt was reduced to \$65,000,000. The proceedings appear to have been quite satisfactory, for when persons were asked to present complaints, if they had any, because of the decisions rendered, the total amount of the claims then presented was only 14,000,000 livres. Of this amount 8,000,000 livres were allowed. This was the beginning of national debt scaling—a process with which in these days we are painfully becoming too familiar.

The next step of the kind was taken by Spain. When Philip V. died in 1745 his debts amounted to \$45,000,000. Ferdinand VI., who succeeded him, was frightened at the burdens. He assembled a junta composed of bishops, ministers, and lawyers, and asked them to declare whether a king was obliged to discharge the debts of his predecessor. The question was decided in the negative in accordance with the king's hope and expectation. His conscience was quieted and bankruptcy was declared. But he was no

spendthrift; on the contrary was industrious in saving. All branches of the government became less effective in consequence of his parsimony. When Charles III. succeeded him he found nearly \$35,000,000 in the treasury. He repaired the act of Ferdinand, and in 1762 paid six per cent. on account of the debts of Philip V., and continued to do so for the next four years. In 1767 the loans bearing six per cent. interest were reduced to four per cent. loans. The year following 60,000,000 reals were divided among the creditors. In 1769 his situation obliged him to discontinue payments. The result was the complete destruction of the royal credit. In 1783 Charles tried to negotiate a loan of 180,000,000 reals, the creditors of Philip III. taking one-third at par. At the end of two years the experiment was given up, as hardly 12,000,000 had been taken.

Of all the countries in Europe carrying debts during the period under immediate review, the Low Countries were by far the most heavily burdened. But the people never for a moment thought of repudiating the debt. They struggled unflinchingly to pay it. So heavy was it that the price of bread in the towns was doubled, and it was a common saying at Amsterdam that every dish of fish brought to table was paid for once to the fisherman and six times to the state. For a short period her commerce, fisheries, and manufactures increased notwithstanding the burden. After 1672 the country began to decline, and its condition was very serious by 1715. "Wages," says McCulloch, "having been raised so as to enable the laborers to exist, the weight of taxation fell principally on the capitalist. Profits were in consequence reduced below their level in surrounding countries, and the United Provinces lost their ascendancy; their fisheries and manufactures were undermined; and their capitalists chose in the end rather to transfer their stocks to the foreigner than to employ them at home."

During the next eighty years after 1715 the debt of England increased more than that of any other nation. One of the heavy items of indebtedness was the cost of attempting to subdue the American colonies. This period covered the long administration of Sir Robert Walpole, who established, with the concurrence of Parliament, a sinking fund, by the operation of which he was confident that within a reasonable period the national debt would be paid. It was composed of a few million pounds, which, by a wondrous manipulation not exactly understood by those less wise in finance than himself, would be sufficient in due time to pay a vastly larger amount of indebtedness. No wonder this brilliant discovery was hailed with delight, for the prospect of discharging a heavy debt by the payment of a small sum is, next to discharging such a debt by the payment of nothing, doubtless one of the most pleasing illusions in which the burdened debt-payer can indulge. For a considerable period Walpole's sinking-fund annually expanded. Within twenty years, however, from the date of its creation, the accumulated treasure was applied toward defraying the ordinary expenses of the government. Such was the fate of the first sinking-fund. Fifty years afterward Pitt established another, which was destined to play a more important part in the history of English finance, and excited many a grave discussion before the fatal error of the system was clearly seen.

In 1793 the following were the debts of the nations of the world:

Great Britain (with value of annuities).....	\$1,296,750,740
The Low Countries.....	500,000,000
Austria.....	175,000,000
France.....	160,000,000
Russia.....	85,000,000
Prussia and German States.....	50,000,000
Spain.....	40,000,000
Portugal.....	4,500,000
United States.....	80,352,634
British India.....	40,000,000

It will be seen, therefore, that since 1715 national indebtedness had increased more than \$1,000,000,000. Borrowing had become more general. Yet the debt of Great Britain was more than half the entire amount. It had been augmented during the Wars of the Succession, and though a long and pacific administration followed that period, no sensible reduction of the amount was effected. Then came the checkered contest of 1739, and the more triumphant campaigns of the Seven Years' War, both of which added to the burden. But a far heavier weight was added by engaging in the contest with the United States. At its close in 1783 the national burdens were so greatly increased that both David Hume and Adam Smith believed that they would prove fatal to the nation. At that time the interest was no less than \$47,258,860. The cost of the struggle with the United States was \$487,997,480.

Pitt came into office in 1784. "The interest of the debt," says Alison, "absorbed now more than two-thirds of the public revenue. It was impossible to conceal that such a state of things was in the highest degree alarming, not only as affording no reasonable prospect that the existing engagements could ever be liquidated, but as threatening at no distant period to render it impossible for the nation to make those efforts which its honor or independence might require." The situation was deeply pondered by Mr. Pitt. Public attention had been directed by Dr. Price to the prodigious powers of the accumulation of money at compound interest, and he had demonstrated with mathematical certainty that any sum, however small, increasing in that way, would, in a given time, extinguish any debt. Pitt, accepting the views of Dr. Price, proposed to establish a plan for discharging the British debt. "All former sinking-funds had failed of producing great effects because they were directed to the annual discharge of a certain portion of debt, not the formation by compound interest of a fund destined to its future and progressive liquidation; they advanced, therefore, by addition, not multiplication, in an arithmetical, not a geometrical progression. . . . The wonderful powers of compound interest, the vast lever of geometrical progression, so long and sorely felt by debtors, were now to be applied to creditors."

Accordingly Pitt proposed that a million pounds should be vested in certain commissioners annually, which should be derived partly from savings effected in various branches of the service and partly from new taxes. The payments were to be made quarterly, and with the sums thus put into the hands of the commissioners they were to purchase stock, the dividends on which were to be invested in like manner. By thus setting apart a million pounds annually, and applying its interest to the purchase of stock, the success of the plan was regarded as a demonstrated certainty. The future accumulations would spring, not from any additional burdens imposed on the people, but from the dividends on the stock thus purchased. The powers of compound interest were thus to shift from the side of the creditor to that of the debtor, from the fund-holders to the nation. The bill passed the house without a dissenting vote, and on the 26th of May, 1786, the king gave it the royal assent in person to mark his sense of the importance of the measure.

The fact that every dollar of debt discharged must come from the people in the way of taxation was a truth as obvious to Pitt as to Robert Hamilton, whose work on the National debt, first published in 1813, exploded the sinking-fund theory. Of course there was no magical power in the sinking-fund to draw money for paying the debt, but Pitt knew this as well as Hamilton. He knew that what came into the hands of the sinking-fund commissioners must be drawn from the tax-payer. But, as Alison truly says, "Pitt was perfectly aware of the natural impatience of taxation in general, and the especial desire always felt that, when the excitement of war ceased, its expenditure

should draw to a termination. He foresaw, therefore, that it would be impossible to get the popular representatives at the conclusion of the war to lay on new taxes, and provide for a sinking-fund to pay off the debt which had been contracted during its continuance. The only way, therefore, to secure that inestimable object was to have the whole machinery constructed and in full activity during the war, so that it might be at once brought forward into full and efficient operation upon the conclusion of hostilities, without any legislative act or fresh imposition whatever." And although the true nature of the sinking-fund was after a time generally understood, yet through this machinery a large amount of indebtedness was discharged, far more probably than would have been if the people had clearly known how the reduction was effected. In other words this device blinded them; they did not know how much they were contributing toward paying the debt; if they had known, they would have set aside the plan at an earlier day.

It will be noticed in the foregoing table that old debts had increased in amount and new ones had been added. The debt of the United States had been created in contending against Great Britain. The debt of Russia consisted of notes issued by the Russian bank, which had been founded by the Empress Catherine in 1768. The finances of Prussia have been managed with great economy ever since the founding of the kingdom in 1700, and more than one king left a goodly treasure to his successor; but in the foregoing statement Prussia was a debtor to a small amount. The most noteworthy change beside the vast increase of the English debt was the diminution of the debt of France. That wonderful country, thrifty beyond comparison, has never done anything toward paying its debts, but on several occasions it has reduced them in a more speedy if less honorable manner. The first reduction while the Duke of Orleans was regent has been already described. It was frequently reduced and expanded during the reign of the two subsequent kings, and suffered a tremendous diminution amid the terrors of the Revolution of 1789. A vast amount of paper money was issued at that time. There were two kinds, the assignats and mandats. (See MONEY.) Of the former kind \$6,125,000,000 were issued; of the mandats \$480,000,000. The funded debt was also swelled to \$480,000,000. This amount was afterward reduced two-thirds, and was consequently called the "Tiers Consolidés." A vast amount of paper money was issued in the time of John Law; for the history of his experiments see BANKING.

The next table of debts represents the indebtedness of the nations in 1820:

Great Britain...	\$4,510,000,000	Russia.....	\$250,000,000
Low Countries.	720,000,000	Naples.....	100,000,000
France	700,000,000	Portugal.....	40,000,000
Austria.....	493,500,000	Denmark.....	21,500,000
Prussia and		United States...	91,015,566
German States	265,000,000	South America.	15,000,000
Spain	260,000,000	British India...	145,000,000

This period shows an enormous increase (above \$5,000,000,000), more than two-thirds of which had been incurred by England. She now owed nearly three-fifths of the aggregate national debt of the world. This addition represented part of the expense to subdue Napoleon. The wars of that period mark a momentous epoch in English history. "Their effects and consequences," says Wilson, "are felt by us still, and, so far as one can see, will continue to be felt as long as England exists. Compared with what they cost us, all other outlays on our previous wars seem as nothing. Their charges led to the remodeling of our fiscal system, spurred the nation to great exertions, developed its trade, increased the poverty of its poor, and the wealth of its rich. We can form no intelligent conception of our financial position to-day, unless we can grasp some idea of what these wars meant and still

mean for England." An eminent statesman declared in the House of Commons in 1815 "that national bankruptcy was inevitable in view of a public debt of £917,000,000."

Notwithstanding Pitt's greatness as a minister, he committed two errors from which his country has severely suffered. The first was in not waging the war against Napoleon with sufficient vigor during its early stages. Money and men enough were raised, but instead of sending the latter to the Continent to act in conjunction with the allies in putting down the common enemy, they were transported to India, where they performed a splendid service in winning an empire for the British crown; this, however, was a work which might have been postponed without much loss, while the delay to crush Napoleon in 1793, when it might have been done had Pitt employed all the resources at his command, entailed on his country a vastly greater burden which is destined to be felt by many succeeding generations.

The other mistake consisted in not borrowing more money at 5 instead of 3 per cent. interest. To clearly understand the serious consequences of this short-sighted policy it is only necessary to state that when loans were contracted bearing 3 per cent. interest the nation agreed to give 100 pounds for the 60 pounds which it received, whereas on the loans which bore 5 per cent. interest the nation received 100 pounds—the same sum which it agreed to pay. There was borrowed \$3,000,000,000 of stock in the 3 per cents., and consequently the nation must pay \$1,200,000,000 more than it ever received from the public creditors. Though the difference in the rate of interest was very considerable, yet on the return of peace the state acquired the power of lowering the rate of interest on its debts to the current rate by threatening to pay off the principal, an operation which was successfully performed by later administrations with the 4 and 5 per cents. By lowering the interest on the 5 per cents. in 1824 to 4, and in 1829 to 3½ per cent., no less than \$12,000,000 annually was saved to the nation on that stock alone, though it amounted only to \$785,000,000. Had the \$1,800,000,000 which was actually paid by the public creditors for the \$3,000,000,000 in the 3 per cents. been subjected to the same operation, the saving effected without doing injustice to any creditor would have been \$27,500,000 a year. Besides, the 3 per cent. paid on the nominal amount of \$3,000,000,000 received by the government was equivalent to 5 per cent. on the actual amount of \$1,800,000,000. The national burden, therefore, was no lighter during the war by issuing 3 per cents. than it would have been had 5 per cents. been issued, and the greater burden afterward borne in consequence of adopting such a policy is very apparent.

It will be noticed that while France was the central figure in all the wars of this period her indebtedness did not increase with anything like the rapidity of that of England. It did not grow much beyond \$500,000,000, although the empire was almost constantly engaged in war. Of this sum, too, \$260,000,000 were levied for war contributions and the army of occupation after declaring peace. The reason for the small increase was that the French armies were fed, clothed, lodged, and paid very largely by foreign states. The revenues of France, as a good authority has stated, did not furnish more than half the total sum required to maintain the expensive and gigantic military establishment of the emperor, while its inhabitants received almost the whole benefit from its expenditure. This explains why he was constantly attempting to make fresh conquests and why the French people were so attached to his government. It also explains the internal prosperity of the country as well as the hatred with which France came to be regarded by foreign states.

Of all the nations of Europe which suffered by this system, Holland suffered most. Invaded and conquered by the French, she lost her commerce, her colonies, and her independence, and was obliged to pay

war contributions to the French from 1794 to 1814, which amounted to nearly \$500,000,000. Her funded debt also increased \$220,000,000. Once a rich and brave people, they were enabled by borrowing to conquer their independence from Spain, to resist the encroachments of France, to carry on naval wars with England, and to rank as a first-rate power in Europe. But after 1715 her contest against the larger states was ended by exhaustion. She lost her commercial pre-eminence and resources through excessive taxation, and was weighed down by debt and competition with less burdened traders.

The increase of the debts of other European states during this period was caused mainly by the wars of Napoleon. The debt of the United States had been increased in consequence of engaging in a second war with Great Britain. After the amount of the Revolutionary debt was determined and funded, Congress devised a mode of reducing it; but, during the closing years of the 18th century, so many special and unexpected expenditures occurred that the amount remained about the same as it was when first funded. But in 1800 all untoward events within and without which had occasioned an increase of the army, the building of naval ships, and other preparations for threatened war passed away, and the debt-paying which then began continued without interruption until the opening of the second war with Great Britain. When this was ended in 1815 the debt had grown to \$127,334,933; but the work of liquidation was again renewed, and by 1820 the national indebtedness had been reduced to the amount above mentioned.

The next table represents the national debts in 1848.

Great Britain.....	\$4,019,145,810
France	910,000,000
Austria	625,000,000
Spain	565,000,000
Russia.....	500,000,000
The Netherlands	500,000,000
Prussia and German States.....	200,000,000
Italian States.....	150,000,000
Belgium.....	87,000,000
Portugal	85,000,000
Denmark	56,500,000
Greece.....	50,000,000
Sweden and Norway	3,000,000
United States	47,044,862
Mexico and South America	300,000,000
British Colonies	33,000,000
British India	250,000,000

For these thirty years the total indebtedness of nations was not very largely augmented, and only Sweden and Norway, Greece, and some British colonies were added to the roll of national debtors. The two most remarkable features in this statement are the reductions made in the English and Dutch debts. The principal reduction in the former was rapidly made after 1815. "If the sinking-fund had been let alone," said an able writer in 1832, "it would, since the year 1813, have paid off above £400,000,000; and even after deducting the immense loans of 1814 and 1815, the national debt would have been upwards of £300,000,000 less than it is now. In the year 1847, supposing no new debt contracted, it would have been entirely extinguished."

Turning now to the Netherlands, it may be remarked that when Napoleon took possession of the country he incorporated it with France, and reduced the debt to one-third of the former amount. Order was partly restored toward the end of 1813, after the arrival of the king, and on May 14, 1814, he presented to the States-General a new law for the regulation of the debt, by which the uniform rate of interest on all the stocks was fixed at 2½ per cent. Previously they had borne twelve different rates, varying from 1¼ to 7 per cent. Another provision of the law restored to the creditors the debt which Napoleon attempted to abolish. The nominal amount of the debt, therefore, was

preserved, but the rate of interest was in the aggregate considerably reduced. Although new loans became necessary, yet by the operation of a sinking-fund, which was established at the time when the debt was restored and the rate of interest changed, and by the employment of surpluses in the same way, the debt was reduced at the beginning of 1851 to \$512,300,000. The sum of \$50,000,000 was transferred to Belgium after 1830, but a loan for as much more was negotiated to maintain the Belgian war.

In marked contrast with the action of the Dutch government in undoing the work of Napoleon and restoring the rights of its creditors was the action of the pope with respect to the creditors of the Roman state after the re-establishing of papal rule. When Napoleon invaded the latter state its debt amounted to \$148,300,000. By a series of arbitrary orders it was declared to be extinguished. Napoleon realized that it was easier for him to impose new exactions if he could relieve those whom he conquered of their former burdens. When the pope regained power he did not recognize the existence of the old debt. It had become badly tangled, it is true, but the pope could have disentangled it if he had desired. He declared, however, that the debt had been extinguished by the action of the French emperor. Whatever regrets the pope may have had over other orders of Napoleon, there is no reason for believing that he was displeased with the great conqueror for his summary mode of relieving the Roman state of its obligations.

It will be noticed that France added \$210,000,000 to her debt during the Orleans reign. Of this sum \$150,000,000 were required to meet the deficits of the first four years after the Revolution. The addition to the Austrian debt was occasioned by annual deficits which have appeared without exception ever since 1789. With respect to Spain a commission was appointed in 1820 to examine into the public debt, and make recommendations concerning it. They reported the amount to be \$700,000,000. This enormous increase since the time of Charles III. had come from the issue of bank and government notes. (See BANKING and MONEY.) Two years afterward the matter was reconsidered, and the amount was declared to be \$260,000,000,—a wide departure from the former result. The doubling of the Russian debt was occasioned by war and by annual deficiencies. The increase consisted of paper money. The United States had paid off the debts of two wars, but had begun to accumulate debt in a time of profound peace, with no extraordinary expenditure, until 1846, when war broke out with Mexico, which gave rise to new loans for a considerable amount.

In 1870 we find the following figures of national indebtedness:

Great Britain.....	\$3,989,718,300
France	2,277,522,000
Austria-Hungary	1,654,610,000
Russia.....	1,070,630,000
Italy	1,900,000,000
Spain.....	1,386,952,500
German Empire.....	720,242,000
Turkey	603,446,000
Netherlands.....	369,854,000
Portugal.....	291,990,000
Belgium	136,800,000
Smaller States.....	251,975,000
United States.....	2,480,672,427
British Colonies.....	104,600,000
Mexico and South America.....	1,060,000,000
British India.....	515,000,000
Japan, Ceylon, Hong-Kong.....	6,580,000
Australasia	178,720,000
Africa, Egypt, Morocco, etc.....	198,275,000

What an enormous increase these figures show! And what a large number of states are now found in the company of debtors! Borrowing has become fashionable all over the world. At first confined to the older and richer countries, the fever has spread to the

youngest and most impecunious. We hardly know which will surprise the reader most, the inclination of so many states to borrow, or the willingness of lenders to part with their money. The folly of much of this borrowing has long since been realized; but sweeping as national bankruptcy has been, it is feared that the list may be further enlarged.

Beginning with England, what do the figures show? A small decrease of \$100,000,000,—a sum not so large as the United States, in several instances, has paid in a single year. England increased enormously during this period in wealth and population; but, instead of paying the national debt, the nation adopted the policy of remitting taxes and keeping up the interest account. It is true that an additional expense of \$175,000,000 was incurred in 1855-56 for the Crimean war, and the expenditures were heavy for the Chinese and Abyssinian wars. Mr. Baxter has prepared the following table, which shows the total amount of capital paid off or expired from 1815 to 1870, not including the expense of the two wars just mentioned, which was paid out of the regular revenues:

1834, Negro Emancipation.....	\$100,000,000
1846-47, Irish Famine	35,000,000
1855-56, Crimean War.....	175,000,000
1865, Fortifications.....	30,000,000
1869, Purchase of Telegraphs.....	35,000,000
Further balance paid off, being the difference between the total of \$4,510,000,000 in 1815, and \$4000,000,000, in 1870	510,000,000
Total for the 55 years.....	\$885,000,000
Being per year.....	\$16,100,000

"But," says Baxter, "these figures take credit for \$205,000,000, the value of the annuities existing before 1815, which were not created as a sinking fund; and they also take credit for the failure to meet the extraordinary emergencies during that period. The true reduction of the debt of 1815, by the efforts of the nation during the last fifty-five years, after providing for the expenditure of those years, is only

Clear reduction.....	\$305,000,000
Being per year.....	5,500,000

Such has been the progress of the English nation in the task of reducing the nominal capital of the national debt, a rate of progress that would require seven hundred more years to effect the final extinction of the debt existing in 1815."

While England reduced her debt somewhat during this period, the Netherlands did far more, comparatively, for she reduced hers \$109,100,000. Thus in fifty-four years it has been diminished \$320,000,000, a larger reduction than Great Britain effected during that time, although the latter country possessed tenfold more wealth and population.

But France added largely to her indebtedness. While the second republic lasted from March 1, 1848, to December 31, 1851, the deficit was \$71,874,800, to cover which loans were necessary. The financial situation was not improved by establishing the second empire. The deficits continued. Extensive internal improvements were undertaken. Then there was a series of wars; the Crimean, Italian, Chinese, Anamite, and Mexican. These wars, beside other expenditures, occasioned deficits to the amount of \$447,707,900. The total indebtedness of the nation, therefore, ran up to the very high figures above given previous to the outbreak of the Franco-German war.

Another marked change is noticeable in the Italian debt. Before annexation took place the debt of the kingdom of Sardinia in 1847 did not exceed \$25,000,000. The difficulties of 1848 and the wars with Austria and Russia increased the debt within ten years to \$200,000,000. When the kingdom of Italy was formed in 1861, the debt swelled to \$420,000,000, including the Neapolitan debt of \$125,000,000. But nine years

afterwards the debt had reached the enormous sum of \$1,857,300,000. Its increase had been more rapid than that of any other state. Every year after the formation of the Italian kingdom, March 17, 1861, ended with a deficiency until 1875. Perhaps no debt in Europe presses more severely on the people.

The United States now appears as the third on the list of borrowers, approaching very nearly to France. Great Britain, France, and the United States owed almost half the entire amount. The debt of the latter country was created with amazing rapidity; no nation ever spent so much for war purposes in so brief a period. This vast mass of indebtedness was accumulated in four years, for when the war broke out the national debt was only about \$60,000,000. The money was borrowed at varying rates of interest from 5 to 7 $\frac{1}{2}$ per cent. A very large portion of the debt consisted of legal tender notes and other obligations bearing no interest.

On investigating the unexampled national borrowing which occurred in these twenty years, we find that the larger portion was spent to carry on wars and prepare for them; no inconsiderable sum was borrowed to pay constantly accruing deficiencies; a much smaller sum was expended for national improvements. A vast amount was spent in a most wasteful manner; and when the money was gone, more than one nation had but little to show for the expenditure. This was especially the case with Turkey, Egypt, Spain, Portugal, and the South American states. Borrowed money usually, as the world knows, is spent more recklessly than any other; this trite truth has been shockingly illustrated in the history of national spending.

We now come to the last date for tabulating the history of national borrowing, 1880. England no longer leads the nations; that unenviable distinction has passed to France.

France	\$3,829,982,399
England.....	3,766,671,000
Russia.....	3,318,953,000
Spain.....	2,579,245,000
Italy	2,540,313,000
United States.....	2,120,415,370
Austria-Hungary.....	1,881,115,350
Turkey	1,376,486,500
Portugal.....	457,451,000
Netherlands.....	397,738,270
Belgium.....	308,269,490
German Empire.....	261,476,890
Roumania	118,742,600
Greece (1881).....	71,540,155
Denmark.....	48,665,000
India	758,640,325
Australia.....	442,851,500
New Zealand	137,113,055
Japan	357,708,095
China	11,100,000
South America and Mexico.....	
Egypt	491,990,010

In this last decade the Franco-German and the Turkish wars have occurred, and a very short war between Germany and Austria, but no other costly operations of the kind have taken place in Europe, yet the growth of its national indebtedness has been truly fearful. Much of the money borrowed has been expended in building fortifications, ships, and in other warlike preparations. Something has been expended for internal improvements. Germany can give the most satisfactory account of her borrowings. It is said that her public property is quite sufficient to reimburse her debt. Her finances have been managed with great economy. Notwithstanding the heavy cost of the recent war to France she has been borrowing quite freely since to pay for building railroads and canals. Her budgets are made up in such a way that it is difficult to ascertain what are the yearly receipts and expenditures; what portion of the money borrowed has been spent in paying annual deficits is not publicly known. One thing is now certain: instead of having

annual surpluses, as the finance ministers from time to time have announced, deficits have been constantly occurring, which were paid from loans contracted to pay for internal improvements. It may be added that the debts created in the Australian quarter of the world were for railroads, water-works, and other useful improvements, and the people living there have much to show for their expenditure. The debt of Japan was principally incurred in extinguishing the pensions which the nobles and priests drew from the government. Another portion was created to pay for building a railroad. The debt of China consists of two loans, one contracted in December, 1874, for \$3,138,375, bearing eight per cent. interest; and the other in July, 1878, for \$8,021,380 at the same rate. The increase in the debts of Spain, Turkey, Egypt, and many other states has resulted largely from wholly unjustifiable extravagance and fraud.

So far as reductions are concerned these have been effected in the United States on the grandest scale. If this nation piled up debt with startling rapidity she has excited the admiration of the world by swiftly reducing it. On August 31, 1865, the interest-bearing debt was \$2,381,530,294.96. In seventeen years this part of the debt has been cut down to \$1,437,693,750, a reduction of \$943,836,544.96, or 40 per cent. The total debt, less cash in the treasury, was reduced during the same period from \$2,812,662,178.92 to \$1,658,926,171.96, a reduction of \$1,153,736,006.96, or 41 per cent. The annual payment of interest on the interest-bearing portion of the debt has been reduced from \$150,977,697.87 to \$56,446,488.50, a total of \$94,531,209.37, or about 63 per cent.

In contracting debts it is a very important question whether the money is advanced at home or comes from abroad. One reason why the English and French debts are so cheerfully borne and the burden so lightly felt is because almost the entire amount is held in the country which created the debt. The French debt was distributed on Jan. 1, 1879, among 4,380,933 persons; many of them farmers. This is the reason why a reduction of the rate of interest in that country is so unpopular. Instead of paying five per cent. France could borrow the money at three, but she prefers to pay the higher rate because it is more satisfactory to the people. It requires no lengthy argument to show that the operation consists merely in taking money out of one pocket and putting it into another; yet some changes occur, and regarding the subject in all aspects it is deemed the wiser policy to pay the higher rate. In the United States a large portion of the debt was held abroad for several years, but the process of refunding it at lower rates of interest, and the movements of trade in favor of this country, have had the good effect of transferring, as is believed, nearly all the debt once held abroad to America. Less than \$200,000,000 are owned probably by foreign creditors. The debt of Holland has also been owned at home. Indeed, in 1778, when the debt of that country was very large, the Dutch still owned more than \$300,000,000 of the obligations of France and England.

But the case is very different with many nations. Nearly all the loans of Mexico and the South American states, those of Egypt, Turkey, Greece, Spain, and Portugal have been contracted with foreigners. Russia has contracted nineteen foreign loans since 1822, aggregating \$734,900,000. It will be readily seen what a constant drain is going on in those countries to discharge the annual interest account. We might add, too, the British loans to India and to many English colonies. Of course the payment of so much interest abroad impoverishes a country. It can have no other effect. If there be a large trade-balance due to the interest-paying country, the effect of paying interest abroad may be counteracted; unhappily the nations which have borrowed the most freely from other countries have usually the smallest trade with

them. So the account is kept perpetually on the wrong side for the debtor nations.

It is not singular, therefore, that such nations getting tired of paying, and knowing that the failure to pay will not cause loss at home, finally repudiate their obligations. France was perhaps the first nation to do this, but she has had many imitators in modern times. Over and over again Spain has compounded with her creditors. Greece has drawn a pretty wide line between her foreign and home creditors, paying the demands of the latter and ignoring those of the former. Many of the South American states long ago joined the ignoble but somewhat fashionable army of repudiators. Portugal belongs to the same category. Where a national debt is owned at home, a strong influence can be exerted to enforce its payment. Repudiation in that case at once creates a class of sufferers in the nation itself who, of course, will do their utmost to prevent it. But when the debt is held abroad too often all classes join in relieving themselves from the obligation of paying it.

One may ask how have so many nations been able to borrow so easily, especially after showing a disinclination to fulfil their obligations. This is one of the most curious chapters in the history of national borrowing. The brief answer is, many of these loans have been effected through the machinery which cunning bankers have devised. They have been offered large sums to negotiate loans, and the reward to be received in the event of success has been a sufficient stimulant to produce striking results. Hence bankers have almost always been found who were willing, nay, eager, to undertake these operations. A few years ago an investigation of this subject was made by a committee of the British Parliament and a flood of light was turned upon it.

In defence of the policy of paying a national debt slowly, it has been often urged with respect to Great Britain and some other nations that they were increasing in wealth and numbers, and consequently the burden grew lighter every year. Tables have been constructed from time to time showing the amount of debt, income, and population, and how the burden was diminishing. One of these, perhaps the most carefully calculated, may be found in that excellent work, Mulhall's *Progress of the World*.

But there is a great deal of delusion in these calculations. In the first place while it is perfectly clear that if the amount of debt is unchanged and the population increases, the average amount which one must pay is diminished, it does not follow that the amount is in any sense diminished for those who must pay. If the addition to the population be paupers or persons who are unable to pay, the burden of the others is not lightened. It remains the same. Now while the population in all countries is increasing, pauperism in some of them is increasing with frightful rapidity, so that an increase of their numbers does not diminish their burden of debt. This however is not true with respect to all nations, as a writer in a recent number of the *Contemporary Review* has shown.

Of course an increase of wealth diminishes the burden. This is true in one sense, though not in another. Two conditions must exist to make debt-paying possible: first, the means; secondly, the inclination. The truth is in countries where the theory of deferring the payment of their national debts is advocated that their citizens may increase in wealth and numbers, the way is solidly paved either for making their debts perpetual or for repudiating them. The desire to pay ceases. No country better illustrates this truth than Great Britain. While a certain class, and among them her ablest and best men, strongly favor a more rapid reduction of the debt, the idea is not popular. Mr. Gladstone has advocated a speedier reduction on many occasions. And, to effect this end, a kind of securities known as terminable annuities have been devised. These are formed by converting

portions of debt into a security the annual payment on which is considerably higher than the rate of interest on the former security, but after a certain number of years the payment ceases and the debt itself is extinguished. As people are willing to discharge the interest on the debt, these conversions are made in order to blind the people into paying what they would not pay in the ordinary way by direct purchase.

While the policy of the English government in reducing taxes after the close of the Napoleonic wars was a wise one, yet not a few thoughtful persons have contended that the reductions were carried too far; that England ought to have proceeded more rapidly in cutting down her debt. Now the opposition to reducing the debt is so strong that it is very difficult to accomplish much. Nothing can be truer than that the best time to pay debts is when the people are in the mood for paying them. Possibly they might be richer at a future time, but if the inclination does not then exist, debt-paying is far more difficult. If any reduction were effected it would be an unwilling one, and would be regarded as a greater burden than the payment of the same or greater sum when the willingness to pay it prevailed.

Mr. Baxter in his work on *National Debts* reached sundry conclusions on this subject which are so valuable and weighty that we shall reproduce them. "A national debt is a mortgage of the future income and earnings of a nation, and shifts the burden from the borrowing generation to materially different property and earners. Hence it is only justifiable in case of great emergencies, with which the state is unable otherwise to cope; but it is then able to render great services to the nation. It generally leads to much greater and less economical expenditure, and is raised on onerous terms. It weakens a nation by withdrawing capital from productive employment and improvements, and also by necessitating additional and often injurious taxation. Its bad effect is modified by the growth of the nation, which gradually diminishes its pressure and burden. But great wars from time to time arise, requiring large increases of debt, so that national growth cannot be depended on to wipe out a national debt. In time of peace the industrial competition of nations gives a great advantage in the market of the world to the nation least weighted by debt. The removal of prejudicial taxation, so long as it exists, must be the principal object of exertion. But for war reasons, and also for peace reasons, it is always the true policy of a nation to keep steadily in view, and persevere in efforts for, the reduction of its national debt."

Having considered the national debts of the world, perhaps something ought to be added concerning the debts of the States composing the American Union. During the Revolutionary war they contracted debts to a considerable amount for war purposes. The contributions made by them were very unequal, but the Congress of the Confederation promised that justice should be rendered to all in the end. When the war was over, and the subject of funding the Revolutionary debt was discussed in Congress, there was a very strong opposition to assuming the debts of any States. Hamilton contended that when the debts were contracted the various States expected the Federal government to discharge them. There was another reason why the government should do it. Previous to entering into the permanent union the States on the seaboard collected taxes on imports, but this right was relinquished to the general government when the Constitution was adopted. Since they had parted with their richest sources of revenue the government was clearly bound to take the State burdens at that time existing. To take the taxes, or the right to receive them, and not pay the debts when due, was an unjustifiable proceeding. The motion to assume was carried by only two votes, and even this slim majority was obtained only by a consent on the part of Northern mem-

bers to locate the capital on the banks of the Potomac. Besides, not the entire amount was assumed, but an arbitrary sum which was fixed at \$21,500,000. A balance of about \$4,000,000 was left which Congress would never consent should be paid by the government, although several efforts were made to secure the public assumption of the entire amount.

The balance that was not assumed was so small, however, that it formed no burden to the States, so that they really began under the present Constitution with no debts worth mentioning. For many years, too, they remained in that happy condition. Some of them assisted the Federal government in the way of loans during the war of 1812, but not until 1820, or more than 30 years after the adoption of the Constitution, did they incur much indebtedness. After that date they began to borrow, and during the next 20 years they piled up \$200,000,000 of indebtedness. In this sum, however, is included \$28,101,644.91 deposited with the States by the general government which had accrued as surplus revenue after discharging the national debt. Leaving out this advance to the States they had borrowed more than \$170,000,000 in these 20 years. What did they do with the money? Mr. Flagg, once the comptroller of New York, declared it was spent essentially in the following manner: about 31 per cent., or \$52,640,000, were expended in aiding State banks; \$60,201,551 were expended for canals; nearly 25 per cent., or \$42,871,084, were furnished to railroads, and \$6,618,958 for turnpikes and macadamized roads, and the balance was expended for several objects. Over \$100,000,000 therefore were spent for internal improvements.

These debts were chiefly due to British creditors. They were converted into stock, and held in shares, and passed through many hands, but after a short time some States became negligent about paying. The States finally turned toward the Federal government for relief. We have just remarked that the government deposited a large sum with the States in 1837, but this was not the entire amount of the surplus which Congress had ordered to be disposed of in this manner. It was three-quarters of it, but in consequence of the panic which swept over the country before the close of 1837, the government was not able to deposit the other quarter. Woodbury, the secretary of the treasury, recommended that Congress should ask the States to refund the money, inasmuch as the government was in sore need of it. But Congress had no thought of heeding his advice. On the other hand, it insisted at a little later period that the remaining quarter of the surplus should be deposited with them, but if the government complied it must borrow the money, for after 1837 for several years there was an annual deficit. Congress had temporarily stopped the payment of this quarter, and was angry with the president afterward because he would not consent to the legislation needed for paying this sum to the States. Failing to get that they sought to obtain the income from the sales of public lands. They were truly in great need of money, but the president was inflexible. Then William Cost Johnson, of Maryland, in 1842, introduced a new scheme which was nothing less than the assumption of the State debts by the government. This plan emanated from the other side of the Atlantic. Benton says that "these British capitalists, connected with capitalists in the United States, possessed a weight on this point which was felt in the halls of Congress. The disguised attempts at this assumption were in the various modes of conveying Federal money to the States in the shape of distributing surplus revenue, of dividing the public land money, and of bestowing money on the States under the fallacious title of a deposit. But a more direct provision in their behalf was wanted by these capitalists, and in the course of the year 1839 a movement to that effect was openly made through the columns of their regular organ, *The London Banker's Circular*, emanating from the most

respectable and opulent house of the Messrs. Baring Brothers and Company."

A special committee was appointed to consider the matter, who reported in March, 1843. Johnson was chairman. Their appointment was based on numerous memorials for relief presented to the house desiring the issue of \$200,000,000 of stock, which should be divided among all the States, Territories, and the District of Columbia. The memorialists desired also that the stock should be issued on the faith of the general government, and that the proceeds of the public lands should be specifically pledged for the payment of interest and principal. The industries of the country were then suffering an eclipse, and those who favored the assumption of the State debts believed that things would not improve until the States were relieved of their burdens. The committee also believed that the principal cause of the embarrassment then existing arose from the heavy State indebtedness. "At so late a period as 1830," the committee remarked, "very few of the States were indebted, and those few to a very moderate amount, whilst most of them had surplus revenues in their treasuries. Animated by a spirit of enterprise, in some cases perhaps imprudent, to develop their resources, and encouraged for a time by the aid of the national treasury, some of the States embarked in systems of internal improvement too vast in design and too extensive for immediate accomplishment with their limited means, and, when suddenly all aid from the national treasury was withheld, had recourse to their own separate credit to effect what only the joint action of the States and the general government should perhaps have attempted, and which, by their united capacities alone, could have been successfully accomplished."

The interest on the State debts was payable abroad in specie or its equivalent. The States had no power to raise a revenue except by direct taxation. Some of them had already failed to comply with their engagements, because, as they declared, of their inability. The foreign holders were willing to reduce the rate of interest one-half if the government would assume the debts, and the saving thus effected, as the committee remarked, "set apart as a sinking-fund, at six per centum, would liquidate the principal of \$200,000,000 in 18½ years." The committee did not propose simply that the government should assume the obligations of the debtor States; the injustice of doing this was seen from the outset. What they did propose, therefore, was "to place all the States upon an equality in the benefit of the distribution of the stock, of the interest thereon as well as the principal."

The following table represents the State indebtedness on Sept. 2, 1842:

Maine	\$1,734,861.47
Massachusetts	5,424,137.00
Pennsylvania	36,336,044.00
New York	21,797,267.91
Maryland	15,214,761.49
Virginia	6,994,307.54
South Carolina	5,691,234.41
Georgia	1,309,750.00
Alabama	15,400,000.00
Louisiana	23,985,000.00
Mississippi	7,000,000.00
Arkansas	2,676,000.00
Florida Territory	4,000,000.00
Tennessee	3,198,166.00
Kentucky	3,085,500.00
Michigan	5,611,000.00
Ohio	10,924,123.00
Indiana	12,751,000.00
Illinois	13,527,292.53
Missouri	842,261.00
District of Columbia	1,316,030.00
Total	\$198,818,736.35

Although State indebtedness had spread over the country, very different views existed in the several sec-

tions about paying it. In the East, for example, no one thought of such a thing as not paying the obligations incurred. Massachusetts had created her debt chiefly in aiding a railroad enterprise; the investment was deemed wise, and no general regret was expressed because it had been made. A large portion of the indebtedness of New York had been incurred for building the Erie Canal. While, therefore, some States were very strenuous in having their burdens put on the shoulders of the general government, there was strong opposition to the measure, and it did not pass the house. A great deal was said during the debate about the assumption of the State debts in 1790, but the nature of these was entirely different. They had been created for the general good, and it was just that the government should assume them; but the debts since incurred were strictly of a local nature, and there was no reason why the government should be burdened with them. The amount, it will be noticed, was greater than that accruing from either war with Great Britain.

From that period until the outbreak of the war in 1861 the debts of the States did not increase much. Nothing more was heard about the federal assumption of them. Several of the States repudiated their debts, others reduced theirs, and in a few instances new debts were contracted. The following table gives a sectional view of State indebtedness from 1842 to 1860:

	1842.	1852.	1860.
New England States.	\$7,158,274	\$6,862,265	\$7,398,060
Middle States.....	73,348,072	79,510,726	86,416,045
Southern States	73,340,017	64,499,726	93,046,934
Western States.....	59,931,553	42,993,185	49,395,325
Pacific States.....	.....	2,159,403	.....
Total	\$213,777,916	\$196,025,305	\$236,256,364

During the war from 1861-65 the debts of the States were considerably increased by that event, but the indebtedness of the Southern section was swelled far more during a brief period afterward than were the debts of all the other sections by the war itself. Under the guise of internal improvements the debts of the Southern States after reconstruction had taken place increased at a rapid pace. Many of their bonds were negotiated under suspicious circumstances. In 1870 and in 1880 the debts of the States stood thus:

	1870.	1880.
New England States.....	\$50,348,550	\$49,969,514
Middle States.....	79,834,481	45,672,575
Southern States.....	174,486,452	113,967,243
Western States.....	44,018,911	36,565,360
Pacific States.....	4,178,504	4,547,389
Total.....	\$352,866,898	\$250,722,081

The reductions shown for 1880 were made by the Middle and Western States by actual payments, but this was not the case with the Southern States. Their sixty millions of reduction were effected by the much easier mode of repudiation. In nearly all of the States the policy of a gradual reduction has been established, and at no distant day, unless new wars shall be waged, State indebtedness will not exist.

Authorities.—From Maurice Block's valuable *Statistique de la France* much may be gathered, not only concerning France, but other European countries. R. Dudley Baxter's *National Debts* (London, 1871) is also noteworthy. General papers on this subject have been read before the London Statistical Society, which are rich in facts and deductions. The first was read by Leone Levi in 1862 (vol. xxv., p. 313); the second by R. Dudley Baxter in 1874 (vol. xxxvii., p. 1); the third, and perhaps the ablest, by Hyde Clark in 1878 (vol. xli., p. 299). A very concise account of the national debts of Europe in 1840 may be found in *Hunt's Merchants' Magazine* (vol. viii., p. 397). The *Statesman's Year-Book* is a valuable repertory. Concerning the debt incurred by the Franco-German war of 1870-71, how the money was raised and paid, see Robert Giffen's excellent essay in his

Essays in Finance; also another in *Blackwood's Magazine*, Feb., 1875, entitled "The Payment of the Five Millions." Additional facts respecting the Italian debt are given by Leone Levi in a paper on "The Economic Progress of Italy during the last Twenty Years," which was read before the London Statistical Society in March, 1882. More complete information, however, is furnished by Mr. Herries in his report of 1876 as secretary of the English embassy and legation to Italy. A clear statement of the Japanese debt was made by Consul-General Van Buren in No. 15 of the *Reports from the Consuls of the U. S.*, Jan., 1882. For statistics of debt of the United States and the debts of the States see R. P. Porter's Special Report in the Census for 1880. Two papers on "Modern Public Debts and the Payment of Them," by Henry C. Adams, in the *International Review*, March and September, 1881, are worthy of mention in this connection.

(A. S. B.)

DE CANDOLLE, ALPHONSE LOUIS PIERRE PYRAMUS, a Swiss botanist, was born at Paris, Oct. 27, 1806. He is the son of the celebrated botanist, Augustin Pyramus de Candolle. He was educated at Geneva, to which city his father had returned in 1816. Having studied law he received the degree of doctor for his thesis on *The Law of Pardon*, which was published at Geneva in 1829. Yet he preferred to devote himself to the science in which his father had become famous, and in the study of which his father's instructions, library, and herbarium afforded him great advantages. One of his earliest publications was a *Monographie des Campanulées*, Paris, 1830. In the next year he was appointed professor of botany in the Academy of Geneva, and soon after prepared an elementary work, *Introduction à l'étude de la botanique*, 1835. He also assisted his father in the celebrated work, *Prodromus systematis naturalis regni vegetabilis*, and after his father's death in 1841 continued the work with the aid of botanists of various countries. Volumes vii. to xvii. contain many monographs of families prepared by him. After a time changes in the administration at Geneva obliged him to resign his position as professor and as director of the botanic garden. He then engaged chiefly in original research in his chosen field, and in 1835 published a valuable work entitled *Géographie botanique raisonnée*, which has procured for him a world-wide reputation. In 1866 he was elected president of the International Botanical Congress at London, and in the following year of a similar congress at Paris. In the latter a summary of laws on botanical nomenclature presented by him was adopted and has been published with notes in French, German, and English. Having already been a correspondent of the French Academy of Sciences, De Candolle was in 1874 chosen a foreign associate of that body, succeeding Prof. Agassiz. As the entire number of such associates is limited to eight, this position is one of the highest scientific honors of the present day. De Candolle has also been elected a member of the most eminent European scientific bodies as well as of the American Academy of Science. His labors in the cause of science have not prevented him from taking part in the public affairs of his city; he has several times been a member of its legislature and twice of its constituent assembly, acting with the liberal party. He is also president of the Geneva Society of Arts.

Besides a large number of memoirs and the works already mentioned he has published a *Histoire des Sciences et des Savants depuis deux siècles, suivie d'autres études sur des sujets scientifiques*, Geneva, 1873. This work has already become rare. A later practical work is his *Phytographie, ou l'art de décrire les végétaux considérés sous différents points de vue*, Paris, 1880. His latest work is *Origine des Plantes cultivées*, Paris, 1883.

DE CANDOLLE, ANNE CASIMIR PYRAMUS, a Swiss botanist, son of the preceding, was born at Geneva, Feb. 20, 1836. He completed his literary and classical studies at the University of Geneva, from which he received the degree of doctor of philosophy.

He assisted his father in editing the *Prodromus*, as well as a continuation of that work in four volumes. These contain numerous monographs on families of plants written by him. He has given especial attention to the arrangement and formation of leaves; his most important treatise on this subject is *Considerations sur l'étude de la phyllotaxie* (1881).

DECATUR, a city of Illinois, county-seat of Macon co., is on Sangamon River, 39 miles E. of Springfield. It is on the main line of the Wabash, St. Louis, and Pacific Railroad, at the junction of the St. Louis, the Chicago, and the Champaign divisions; also on the Illinois Central, the Illinois Midland, the Peoria, Decatur, and Evansville, and a branch of the Indianapolis, Bloomington, and Western Railroad. Decatur has a national and 3 other banks, 4 weekly and 3 daily newspapers, 14 churches, 6 public-school buildings, also 2 large flour-mills, furniture-works, an iron-mill, and manufactories of farm implements and castings. It is thriving and pleasant, with gas- and water-works, and a park. The city debt is about \$100,000, and the annual public expense about \$60,000. Decatur was settled in 1820 and incorporated in 1829. Population, 9547.

DECATUR, STEPHEN (1751-1808), an American naval officer, was born at Newport, R. I., in 1751. During the Revolutionary war he commanded several privateers and captured many English vessels. In 1798, when the navy was reorganized on account of trouble with France, he was appointed captain and placed in command of the Delaware, 20 guns, and cruised in the West Indies, where he captured some French privateers. He was afterwards placed in command of a squadron of thirteen sail on the Guadeloupe station. When the navy was reduced in 1801 he was discharged, and engaged in commerce in Philadelphia, where he died Nov. 14, 1808.

DECATUR, STEPHEN, JR. (1779-1820), son of the preceding, a distinguished American commodore, was born at Sinnepuxent, Md., Jan. 5, 1779. The family resided in Philadelphia, but his mother had taken refuge at this place when the British army occupied that city in 1777. After a brief experience in merchant vessels, Stephen entered the navy as a midshipman in 1798, and served in the West Indies under Com. John Barry. In the next year he was made a lieutenant, and in May, 1801, sailed in the Essex, under Capt. William Bainbridge, to Tripoli. Having been transferred to the frigate New York, Capt. James Barron, he acted as second in a duel at Malta in which an English officer was killed. When the governor of the island demanded the surrender of all concerned in the affair, Decatur was permitted to return to the United States. In November, 1803, he rejoined the fleet at Tripoli under Com. Preble, and was placed in command of the Enterprise. He soon formed a project of destroying the frigate Philadelphia, which had been captured by the Tripolitans, and was then lying in the harbor close by the castle and batteries. For this purpose he sailed into the harbor on the night of Feb. 15, 1804, with seventy men and thirteen officers in a small vessel that had been captured from the Tripolitans and named the Intrepid. When hailed and ordered to anchor, he directed his Maltese pilot to answer that he had lost his anchor. He was thus permitted to reach and board the frigate, when he quickly overpowered the Turkish crew, some of whom swam ashore, while at least twenty were slain. Spreading combustibles throughout the frigate, he set it on fire, and sailed back in the Intrepid without losing a man. For this exploit he was promoted to be captain. Congress presented to him a sword and voted two months' extra pay to all who had shared in the adventure. He continued to serve in the blockading fleet, and when Com. Preble bombarded the town and attacked the shore-batteries with his frigates, Aug. 3, 1804, Decatur led three gunboats in an engagement with a much larger number. With twenty-seven men he boarded a boat containing forty, and in ten minutes made it a prize. Meantime, his

brother, Lieut. James Decatur, commanding another boat, was shot by a Turkish captain as he stepped on a vessel that had pretended to surrender. Stephen hastened in pursuit, boarded the vessel with eleven men, and after a desperate struggle killed the Turk. Of the eighty men in the two boats thus captured, fifty-two were killed or wounded, while the loss of the Americans was only fourteen. At the close of the war Decatur returned to America, and was employed in superintending the building of the gunboats ordered by Jefferson's administration until he superseded Com. Barron in command of the Chesapeake. In 1812 he was removed to the frigate United States, 44 guns, in which, on Oct. 25, he encountered the British frigate Macedonian, 49 guns, and captured her after a fight of an hour and a half, in which his loss was twelve and that of the enemy 104. Capt. Decatur, however, as an acknowledgment of the bravery of Capt. Carden of the Macedonian, refused to take his sword. His vessel was carried into New York, and Congress voted a gold medal to Decatur and a silver one to each officer under him. In 1813, the harbor of New York being closely blockaded, Decatur, attempting to pass to sea by Long Island Sound, was intercepted by the British fleet and driven into New London, where he remained over a year closely shut up in spite of his attempts to break the blockade. Decatur asserted that persons on shore gave warning to the ships outside of his movements by burning blue lights, and on account of this charge the political opponents of the war were henceforth called "Blue Lights." In the summer of 1814 he was transferred to the command of a squadron intended to sail from New York for a cruise in the East Indies, but here also was unable to leave the port until Jan. 15, 1815, when he sailed on a tempestuous night in the President, a 44-gun ship. Having grounded while crossing the bar, his vessel was injured, and when espied by the blockading squadron was chased for fifty miles. After a severe engagement with the Endymion, 40 guns, the President, being surrounded by three others, was obliged to surrender, and was carried into Bermuda. Decatur was paroled, and on his return to the United States was honorably acquitted by a court of inquiry for the loss of his ship. In May he was despatched with a squadron of nine vessels to the Mediterranean, and on June 17, off Cape de Gatte, fought and captured an Algerine frigate, 46 guns, the Algerine admiral, Rais Hammida, being killed in the action. Two days later Decatur captured another vessel of 22 guns, and on June 28 anchored with his whole squadron in the harbor of Algiers and demanded the immediate negotiation of a treaty. The dey, compelled to submit, surrendered all demands for tribute from the United States, restored all prisoners and property taken during the war, and received the vessels that had been captured a few days before. Decatur, then proceeding to Tunis and Tripoli, demanded and obtained satisfaction for past offences and the release of all American captives. He thus effectually showed the nations of Europe how to put an end to the piracy and insolence of the Barbary States, which had lasted for nearly three centuries. On his return to the United States he was appointed naval commissioner, residing in Washington. He was mortally wounded in a duel with Com. Barron, near Bladensburg, and died at Washington, D. C., March 22, 1820.

DECHAMPS, AUGUSTE ISIDORE VICTOR (1810-1882), a Belgian cardinal, born at Melle, East Flanders, Dec. 6, 1810, a brother of Adolphe Dechamps, a noted statesman, with whom he was educated at the Musée of Brussels. In youth he joined his brother in writing liberal articles for *l'Emancipation* and the *Journal des Flandres*. At that time he professed himself a disciple of Lamennais, a master whom he did not long follow. He studied divinity at the Tournay Seminary, at Mechlin, and the University of Louvain, and after joining the Redemptorists studied six years longer at Wittem, in the Netherlands. There-

after he began a distinguished career as a pulpit orator, taking rank as a preacher with Dupanloup and Lacordaire. In 1865 he was consecrated bishop of Namur; in 1867 he was translated to the archiepiscopal see of Mechlin (Malines), and in 1875 he was made a cardinal-priest. In the struggle of 1879 between the liberals of Belgium and the Ultramontanes regarding the secularizing of the public schools, Dechamps was the leader of the church party. Pope Leo XIII. addressed to Dechamps his celebrated letter of Dec. 20, 1880, on the Thomist philosophy. The cardinal was also a strenuous opponent of freemasonry. He died Sept. 29, 1883. Among his books are, *Le Christ et les antichrists* (1858); *La Question religieuse résolue par les faits* (1860); *Lettres théologiques* (1861); *Pie IX. et les erreurs contemporaines* (1865); *St. Vincent de Paul et les Misérables* (1865); *Appel et défi* (1865); *l'Infallibilité et le concile général* (1869); and *La franc-maçonnerie* (1875).

The cardinal's elder brother, ADOLPHE DECHAMPS (1807-1875), was in early life a Liberal Catholic of republican proclivities, later a moderate liberal, and after 1851 a leader of the party of the episcopate. He took a very important part in Belgian politics, in the cabinet and the legislative chambers, and as editor of the *Revue de Bruxelles* and the ultramontane *Revue Generale*. Among his writings are *Le second empire* (1859); *L'empire et l'Angleterre* (1860); *Jules César, l'empire jugé par l'empereur* (1865); *Les partis en Belgique* (1866).

DECORAH, the county-seat of Winneshiek co., Iowa, is on the Upper Iowa River, crossed here by two bridges, and on a branch of the Chicago, Milwaukee, and St. Paul Railroad, 30 miles W. of the Mississippi River, and 13 miles S. of the Minnesota line. It has 3 banks (1 national), 4 hotels, 7 churches, an academy and public schools, and is the seat of the Norwegian Luther College of the Northwest, a Lutheran institution with fine buildings, founded in 1861. Decorah has 5 weekly newspapers (1 Norwegian), and 3 literary and religious periodicals issued by the college. It has abundant water-power, which is used in a woollen-mill, agricultural implement factory, and flour-mills. It has also a scale-manufactory, 2 creameries, and other industries. It was settled in 1859, being named from Decorah, a Winnebago chief, and incorporated in 1867. Population, 3529.

DEDHAM, a town of Massachusetts, county-seat of Norfolk co., 10 miles S. W. of Boston, with which it is connected by two lines of the Boston and Providence Railroad, and by the New York and New England Railroad. It contains a granite court-house with a dome; a jail and house of correction, also of granite; a town-hall of stone (erected as a memorial of Dedham soldiers who fell in the war of 1861-65), a handsome stone railroad station, 10 churches (several of the number being fine structures), a national bank with a capital of \$300,000, a savings bank (fund and surplus, \$1,600,000), 2 fire insurance companies, a public library (8,000 volumes), a historical society, an asylum for its discharged female prisoners of the State, high and graded schools, a manufactory of woollens, with 3 large mills, various minor industrial establishments, gas- and water-works, and 2 weekly newspapers. "Mother Brook," a stream of water 3 miles long and partly artificial (made about the year 1639), diverts one-third of the water of Charles River and takes it to a branch of the Neponset, affording to Dedham and East Dedham very valuable water-power. Valuation in 1883, \$4,966,260; yearly expenses, \$78,000. There is no public debt. Dedham was settled in 1635 and was for a time called Contentment. Population of township 6233.

DE DONIS, THE STATUTE, more properly, the statute *De Donis conditionalibus*, being chapter i. of the Statute of Westminster the Second, passed in 13 Edw. I., A. D. 1285. The object of this statute was to prevent the alienation of landed property by those

who held only limited estates therein, so as to defeat the estates of those who would otherwise take subsequently.

It was not uncommon during the general prevalence of the feudal system for a grant of land to be made in such form that upon the death of the original feoffee the same should descend only to the heirs of his body, and not to any of his collateral relatives. It is indeed supposed by many, and with much reason, that this was the universal form of the original feudal grants. An estate of this kind being, however, a restricted or limited feud, because it did not descend to all of the heirs, was called *feudum talliatum*, from *tailleur*, to cut or mutilate, and in English a "fee-tail." Fee-tails existed among the Saxons in very early times, and were continued by the Normans after the Conquest. By a curious subtlety, however, they seem to have lost in England much of their distinguishing character. Where an estate was given in such a form, it was held to be in effect a conditional fee; *i. e.*, if the donee should not have heirs or issue according to the prescribed description, the land was held to revert to the donor: if, however, the condition of the grant was performed by the birth of such heirs presumptive or issue, then the donee was held to be immediately seised in fee simple, so that he might charge or alien the land as he could a fee-simple estate.

The barons of the realm, to whom this doctrine of conditional fees was peculiarly distasteful, appealed to King Edward I. for a restoration of the ancient strictness of the *feudum talliatum*. The result was the passage of the statute *De Donis*, the provisions of which substantially were, that in every case the will of the donor, according to the form in the deed of gift (*secundum formam in charta sui doni*), manifestly expressed, should be thenceforth observed, so that they to whom the land was given should have no power to alien the same, but that it should descend to their issue, or, in default of such issue, revert to the donor and his heirs.

The statute, being regarded as a remedial one by the courts, was liberally construed, and as a consequence a serious check was put to the alienation of lands throughout the realm. The obscure doctrine of collateral warranty afforded relief in some cases by authorizing alienation by a tenant in tail. No perfect system for evading the statute was, however, devised until near two hundred years afterwards. But at length, in 12 Edw. IV., A. D. 1472, the King's Bench in Taltarum's Case indicated that by the solemn farce of a common recovery a tenant in tail might alien his lands in fee, notwithstanding the provisions of the statute *De Donis*. Fines came a little later to be held capable of producing the same effect. Both these devices have now, however, been done away with by 3 & 4 Wm. IV. c. 104, and a tenant in tail is now enabled to alienate in fee by executing an ordinary deed reciting his intention to bar the entail and attended by certain simple formalities.

The statute *De Donis* is believed to have been originally in force in all the American colonies except South Carolina, fines and recoveries being commonly used to evade its provisions. In Virginia, so solicitous were the authorities to carry out its intent that fines and recoveries were expressly abolished by statute.

In some of the United States statutes have been passed which virtually repeal the statute *De Donis*. This is the case in Alabama, California, Florida, Georgia, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Mississippi, New York, North Carolina, South Carolina, Tennessee, Texas, Wisconsin, Virginia, West Virginia, and Dakota. In others the original tenant in tail is made tenant for life, with remainder to his heirs in fee. This is the law in Arkansas, Illinois, and Vermont. In all the rest of the States, where estates tail still exist, they may be barred at any time by deeds properly executed and enrolled.

(L. L., JR.)

DEED, in law, any contract or agreement in writing under seal. The term is usually applied to an instrument whereby lands, tenements, and hereditaments are conveyed from one person to another.

Deeds for the conveyance of real estate are either deeds poll or indentures. A deed poll is one executed by one person only, and is so called because it is polled or shaven quite even at the top. An indenture is a deed which is either actually or in contemplation of law made by and between two or more parties. It is so called because in early times two copies of the deed were usually written upon the same skin and subsequently cut apart in a sinuous or indented line, thus giving to each party a copy of the instrument.

The requisites of a good deed are said to be, (1) Competent parties and a sufficient thing or subject-matter. (2) Consideration, either good or valuable, though this in some of the common law conveyances seems not to be necessary. (3) The deed must be written or printed on parchment or paper. (4) It must contain sufficient and orderly parts. (5) It must be signed and sealed. (6) It must be delivered. (7) It ought properly to be executed in the presence of witnesses.

The regular and orderly parts of a deed are: (1) The premises, setting forth the number and names of the parties, together with such recitals as are essential or desirable to a complete understanding of the instrument. (2) The operative words of the deed, together with the *habendum* and *tenendum*, the former being intended to indicate what estate or interest is granted by the deed. (3) The description of the premises conveyed, which should be accurately set forth by metes and bounds. (4) The *reddendum* or statement of what reservation, of rent, etc., is created. (5) The conditions on which the grant is made, if any such there be. (6) The covenants entered into by the parties, *first*, those of the grantor; *second*, those of the grantee. (7) The conclusion, including the date of the execution of the instrument.

Deeds are divided into (1) those which derive their efficacy from the common law. These are deeds of feoffment, gift, grant, lease, exchange, partition, release, confirmation, surrender, assignment, and defeasance. (2) Those which derive their efficacy from the statute of uses. These are deeds covenanting to stand seised to uses, deeds of bargain and sale, deeds of lease and release, and deeds to lead, declare, or revoke uses.

In England, until recently, deeds of lease and release were most commonly used to transfer title to real estate, but by Stat. 8 & 9 Vict., c. 106, a deed of grant alone is made sufficient to convey all sorts of lands, tenements, and hereditaments, whether corporeal or incorporeal.

In many of the United States similar statutes have been passed, and where this is not the case deeds of bargain and sale are generally in use. (See BARGAIN AND SALE.)

In this country the universal adoption of the system of acknowledging and recording deeds has done away with many difficult legal questions formerly raised in this connection. (See ACKNOWLEDGMENT.) (L. L., JR.)

DEEMS, CHARLES FORCE, D. D., LL. D., was born in Baltimore, Md., Dec. 4, 1820. He graduated at Dickinson College in 1839, and in 1841 became the agent of the American Bible Society for North Carolina. In the same year he was elected to a professorship in the University of that State, and five years later was elected professor of natural science in Randolph-Macon College, Va. On his return to North Carolina he became president of Greensboro' Female College, and subsequently entered the pastorate. He had charge of churches in Newberne, Wilmington, and Goldsboro', and was repeatedly presiding elder of districts in North Carolina and delegate to the General Conference of the Methodist Episcopal Church, South. After the

war he went to New York and established an independent church, called "The Church of the Strangers," which was organized in Jan., 1868, and of which he is still pastor. He has been much engaged in journalism, and is the founder of Leslie's *Sunday Magazine*. He is also the founder of the "American Institute of Christian Philosophy." Besides many sermons, addresses, and reviews, he is the author of *What Now?* (1869), *The Home Altar* (1867), and *Who was Jesus?* (1879), the last being an inquiry into the relation of Jesus to history.

DEERFIELD, a village of Franklin co., Mass., near the W. bank of the Connecticut River, 33 miles N. of Springfield. The Connecticut River Railroad and a branch of the New Haven and Hoosac Tunnel Railroad pass through the village. The Deerfield River flows through the town into the Connecticut River, making the Deerfield meadows noted for their tobacco. The town has several hotels, 6 churches, 2 high schools, an academy, and other schools. It was settled in 1670, and in 1704 was surprised and burnt by the French and Indians, who carried into captivity in Canada the family of Rev. John Williams, the pastor of the town. Population, 3543.

SOUTH DEERFIELD (a distinct village) is 5 miles S. of Deerfield village, and is on the Connecticut River Railroad, and on the Hoosac Tunnel extension of the New Haven and Northampton Railroad, at the junction of the branch to Turner's Falls. It has several churches, a pocket-book manufactory, and other factories. It is noted for the "Bloody Brook massacre" in 1675, when Capt. Lathrop and 76 men were killed by the Indians. A marble monument commemorates the fact. The scenery in the neighborhood is picturesque, and Deerfield Mount, 700 feet high, and the Sugar-Loaf, 500 feet high, afford fine views of the Connecticut Valley.

DEFIANCE, a city of Ohio, and county-seat of Defiance co., is on the right bank of the Maumee River, at the mouth of the Auglaize, 50 miles W. S. W. of Toledo. It is on the Baltimore and Ohio Railroad, and on the St. Louis, Wabash, and Pacific Railroad. It is at the head of navigation on the Maumee River, which is here crossed by 7 bridges. It has a courthouse, opera-house, 8 hotels, 3 banks (2 national), 3 weekly newspapers, 10 churches, and 6 schools. Its industrial works comprise a foundry, 2 flour-mills, woollen-mills, and manufactories of agricultural implements, furniture, doors, sash, etc. Here Gen. Anthony Wayne built Fort Defiance in 1794, and about 50 years later the settlement was made. The city was incorporated in 1882; its property is valued at \$1,700,000; its public debt is \$14,000; and its annual expenses about \$30,000. The surrounding country is fertile, and is especially noted for its valuable ship-oak timber, which is sent from Defiance to Quebec by water. Population, 5907; chiefly of German origin.

DE FOREST, JOHN WILLIAM, an American novelist, was born in Seymour, Conn., March 31, 1826. At the age of twenty he travelled in Syria and the Levant for eighteen months, collecting material subsequently used in literature. On his return home he wrote and published the *History of the Indians of Connecticut*, intended as a trial work, his inclination being then towards history. He then resumed his travels, and remained for four years in Europe. Returning in 1856, he published two books of travel, *Oriental Acquaintance* and *European Acquaintance*, and two novels, *Witching Times* and *Seacliff*. On the breaking out of the Civil War he raised a company and entered the national service as a captain in the Twelfth regiment of Connecticut volunteers, serving for two years and a half in Louisiana and about six months in Virginia. He was engaged in forty-six days of fighting, and was once wounded. Late in the war he was transferred to the invalid corps, and after the war to the bureau of freedmen and refugees. He was at different times inspector-general of division, aide-de-camp on the staff of the Nineteenth corps, ad-

jutant-general of the invalid corps, and chief of a district under the Freedmen's Bureau. Three years after the war he left the army and settled in New Haven, Conn., since which he has devoted himself to literature, producing, in addition to the works above mentioned, the novels of *Miss Ravenel*, *Overland*, *The Wetherell Affair*, *Kate Beaumont*, *Honest John Vane*, *Justine Vane*, *Irene the Missionary*, and *The Oddest of Courtships*, besides a large number of magazine stories, articles, reviews, and fugitive poems.

DE HAAS, MAURITZ FREDERIK HENDRIK, a Dutch-American artist, was born in Rotterdam, Holland, Dec. 12, 1832. He studied painting at the Academy of Fine Arts in that city, and for five years under Louis Meyer, the celebrated marine painter, at the Hague. He made several voyages in pilot-boats in the North Sea and English Channel, and also studied along the coasts of Holland, France, and England. In 1858 he was appointed artist in the Dutch navy, but resigned in the following year to come to America. Arriving at New York in October, 1859, he opened a studio and exhibited, for the first time, at the exhibition in the New York Academy of Design, in 1860. He was elected an associate of the academy in 1863, and an academician in 1867. His pictures are brilliant and vigorous in treatment, and show the sea under every aspect.

DE HAAS, WILHELM FREDERIK (1830-1880), a Dutch-American painter, elder brother of the preceding, was born at Rotterdam, Holland, in 1830. He studied at the Academy of Fine Arts, Rotterdam, and afterwards under Bosboom at the Hague. In 1854 he came to New York, and devoted himself to painting coast-scenery. Among his works are *Scene on the Coast of Maine*, *Old Orchard Beach*, *Fishing-Boats off Mt. Desert*, *Boon Island*, *Midsummer Noon at Biddeford Beach*, *Evening at Halifax*, and *Narragansett Pier*.

DE KALB, JOHN, BARON (1721-1780), general in the Revolutionary army, was born at Huttendorf in Bayreuth, Germany, June 29, 1721. He entered the French army in 1743, and rose by successive promotions to be brigadier-general, May, 1761. After the Seven Years' war the French minister, Choiseul, wishing to learn the resources of the colonies and their feeling towards Great Britain, sent De Kalb on a secret mission to America. He embarked in December, 1767, was shipwrecked near Staten Island, Jan. 28, 1768, and suffered great hardship. He executed his trust with ability, and, though arrested on one occasion, escaped detection. He returned to France at the close of 1768, and henceforth continued to feel great interest in American affairs. In 1776 he was engaged by Silas Deane to serve in the Revolutionary army, and in company with La Fayette arrived at Georgetown, S. C., early in April, 1777.

Having been appointed major-general by Congress, he took part in the battles of Brandywine and Germantown. After spending the winter at Valley Forge, he served in New Jersey and Maryland. In April, 1780, he was sent to the aid of Gen. Lincoln in South Carolina, but before he arrived the Southern army had surrendered at Charleston, and the further direction of affairs devolved upon De Kalb until the appointment of Gen. Gates in June. At the disastrous battle of Camden, De Kalb commanded the right wing, and with a Maryland regiment firmly held his ground against superior numbers until Lord Cornwallis, having defeated the militia, concentrated his forces against the Continental troops. De Kalb fought on foot, and fell pierced with eleven wounds. He died three days after the battle, Aug. 19, 1780. La Fayette, on his second visit to America in 1825, laid the corner-stone of a marble monument which Congress had ordered to be erected to his memory in Camden, S. C.

Friedrich Kapp, the latest biographer of De Kalb, was the first to bring to light the circumstances of his birth and early life. He shows that he belonged not

to a noble but to a wealthy yeoman family. The prefix De and the rank of Baron seem to have been assumed to enable the wearer to obtain position in the French army, and the right to them passed unchallenged. See F. Kapp's *Life of Gen. John Kalb* (New York, 1884), which is enlarged from the German edition (Stuttgart, 1862).

DEKKER, EDWARD DOUWES, a Dutch author, was born at Amsterdam, March 2, 1820. He went to Java, in 1841, to take part in the administration of that county, becoming assistant resident of Lebak. But the reforms which he sought to introduce into the relations between the government and the natives were received with little favor, and he resigned his position. Then returning to Amsterdam, he denounced, in a series of articles which attracted much attention, the abuses which he had witnessed. He has published besides: *Max Havelaar of de Koffy-veilingen* (Amsterdam, 1860); *Minnebrieven* (1861); *Idëen* (4 vols., 1862); two dramas—*De Bruid daarboven* (1864), and *De Vortenschool*; *Bloemlezing* (1865); *Nog eens* (1871); *Millionen studien* (1872), and several works on the Dutch Indies.

DE KOVEN, JAMES, D. D. (1831-1879), an American clergyman of the Protestant Episcopal church, was born at Middletown, Conn., Sept. 19, 1831. He graduated at Columbia College, New York, in 1851, and at the General Theological Seminary in 1854. He was admitted to deacon's orders in 1854, and was ordained priest in 1855. He had charge of a church in Delafield, Wis., and in 1859 was made warden of Racine College. He was earnest, eloquent, and uncompromising in his advocacy of High Church views. On account of his extreme position, though he was elected bishop of Illinois in 1875, the election was not confirmed by the house of bishops. He died suddenly at Racine, March 19, 1879. A volume of his *Sermons* was published in 1880.

DE LANCEY, WILLIAM HEATHCOTE, D. D., LL. D., D. C. L. (1797-1865), Protestant Episcopal bishop of Western New York, was born at Mamaroneck, Westchester co., N. Y., Oct. 8, 1797. He graduated at Yale College in 1817, studied theology under Bishop Hobart, and was ordained deacon in 1819. Being ordained to the priesthood in 1822, he became assistant of Bishop William White in Philadelphia. He was provost of the University of Pennsylvania from 1828 to 1833, when he became assistant minister of St. Peter's Church, Philadelphia, and after the death of Bishop White in 1835 he was made rector of that church. In 1838, when the diocese of Western New York was formed, he was chosen bishop and was consecrated May 9, 1839. He made his residence at Geneva, where Hobart College was founded and chiefly supported by his efforts. In 1852 he was commissioned by the American bishops as a delegate to England, and received the degree of D. C. L. from the University of Oxford. He died at Geneva, N. Y., April 5, 1865. His only publications were sermons and addresses.

DE LA RAMÉE, LOUISA, an English novelist, better known by her pseudonym "Ouida," was born at Bury St. Edmunds in 1840. She is of French descent, and at an early age removed to London, where she began to write for periodicals, under the name of "Ouida" (a child's mispronunciation of Louisa). Her first novel was published in *Colburn's Monthly* under the name *Granville de Vigne*, but when issued in book-form was called *Held in Bondage* (1863). This was followed by *Strathmore* (1865); *Chandos* (1866); *Tricotrion* (1868); *Under Two Flags* (1868); *Puck* (1869); *Folle Farine* (1871); *Pascarel* (1873); *Signa* (1875); *Ariadne* (1877); *Friendship* (1878); *Princess Napraxine* (1884). Her novels, full of exaggerations and improbable incidents, are written in a meretricious style, and are often objectionable in moral tone.

DELANO, COLUMBUS, an American statesman, was born in Shoreham, Vt., in 1809. He removed to Mount

Vernon, Ohio, in 1817, studied law, and was admitted to the bar in 1831. He was eminently successful both as a criminal prosecutor and as an advocate. In 1844 he was elected to Congress as a Whig, and strongly opposed the war with Mexico. Having joined the Republican party, he was in 1860 a delegate to the Chicago convention, in which he advocated the nomination of Lincoln as President. In 1861 he was appointed commissary-general of Ohio, and discharged this duty until the national Government assumed the subsistence of all State troops. In 1863 he was a member of the Ohio legislature, and in 1864 was a delegate to the Republican national convention at Baltimore which nominated Pres. Lincoln for a second term. In the same year he was again elected to Congress, served as chairman of the committee on claims, and was re-elected in 1866. He was appointed by Pres. Grant in March, 1869, commissioner of internal revenue, and largely increased its receipts. In the following November, Pres. Grant made him Secretary of the Department of the Interior, which office he held till Oct. 19, 1875, the longest time this office has been held by one person. Mr. Delano has since been extensively engaged in agricultural pursuits and in banking. He has been an earnest advocate of liberal education, and has endowed a hall in Kenyon Grammar School at Gambier, Ohio. He has also been a prominent member of the Protestant Episcopal Church, representing the diocese of Ohio in all the recent triennial conventions of that Church. He resides at Lakeholm, near Mount Vernon, Ohio. His speeches never have been published in collected form.

DELAWARE, one of the States of the United States, contains 1960 square miles, being the smallest except Rhode Island. The surface is generally low and level, but the extreme northern portion, composing about one-fourteenth of the whole, is hilly, overlying azoic rocks, and resembling precisely the adjoining surface of Pennsylvania. Gneiss and felspar are found here, with limestone, serpentine, and granite in circumscribed localities. The limit of this rolling surface may be said to be the Christiana River. South of it the level lands are found, and these sink gradually until along the shores of Delaware Bay and in the southern part of the State there is much marsh- and swamp-land, requiring drainage before it can be used for agricultural purposes. A red-clay region lies next to the northern hills, and covers some ten or twelve miles. The southern border of this passes into the green-sand formation, usually a very productive soil. South of it is a tertiary formation, presenting an alternation of clay and sand, and abounding in organic remains, chiefly shells; while still farther south, and occupying about two-fifths of the State, is the light sandy country, which may be considered of recent formation. The northern hill country has a stony surface and deep-banked and quick-flowing streams; south of the Christiana the slopes are gentle, and the streams low-banked and slow. The drainage in the latter portion frequently requires artificial aid, and there are large "ponds" in the interior, and wide shallow lagoons near the bay and sea-shore, while on the southern border is the "cypress swamp," an extensive area below the drainage level. Taking for more particular description the central county, Kent, containing 682 square miles, a strip of 65,000 acres along the bay-shore contains what are called the salt marshes, subject to occasional overflow at high tide. Next inland is another and wider strip, covering about 180,000 acres, embracing rich alluvial lands in what are called the "necks"—i.e., the spaces between the streams. Still farther inland, and extending along the Maryland line, is the third strip, usually called "the forest," and containing about 200,000 acres. This "forest" region lies along the whole western side of the State south of the Christiana River, and forms the water-shed of the peninsula. It is a wooded elevation, nowhere more than 100 feet above the sea, containing many springs and a number

of marshes, from which issue streams that flow eastward to the Delaware and westward to the Chesapeake.

Influenced by the two great bays that almost surround it, the peninsula has a climate modified and moderated in an important degree; and this proves to be especially adapted, in combination with suitable soils, to the culture of fruits. In the southern half of Delaware nearly all the annual cultivated plants will perfect themselves, and in nearly the whole, except the northern hill section, the peach tree flourishes in a remarkable degree, giving the State a special reputation by its crops. For agricultural purposes much remains to be done by extensive works of systematic drainage in the central and lower parts of the State, and a public work of this kind, under general laws and directed by competent engineers, has been strongly urged by intelligent and scientific observers. Numerous local "ditch companies," to drain limited areas for local benefit, are in existence under the charter of the legislature.

There are no mineral deposits of importance, except iron ore and kaolin in the northern section, and some bog-iron ore in the southern. The two former are profitably worked. The chief interest of the people naturally is agriculture, developed largely within the last twenty years into fruit- and vegetable-growing. The climate is mild and the winters short; stock in the middle and southern sections requires little shelter. The streams are stocked with fish, and resorted to by wild fowl, while crabs, oysters, and other shell-fish abound in the waters of the southern part of the State.

By the census of 1880 Delaware had a population of 146,608, of whom 74,108 were males, and 72,500 females. By counties the distribution, compared with 1870, was as follows:

	1880.	1870.	Increase.	Inc. per cent.
Kent.....	32,874	29,804	3,070	10.3+
New Castle.....	77,716	63,515	14,201	22.3+
Sussex.....	36,018	31,696	4,322	13.6+
Totals.....	146,608	125,015	21,593	17.2+

The comparison as to color and nativity with the census of 1870 is shown as follows:

	1880.	1870.	Increase.
White.....	120,160	102,221	17,967
Colored.....	26,448	22,794	3,626
Native.....	137,140	115,879	21,261
Foreign.....	9,468	9,136	332

Of the foreign-born 5791 were natives of Ireland, 1433 of England, 1179 of the German empire, 285 of Scotland, 208 of Canada, 138 of France, 71 of Sweden, 51 of Wales, 48 of Switzerland, 43 of Italy, and 221 of other countries. Of those born in the United States 26,497 were not natives of Delaware, 11,009 being from Pennsylvania, 9562 from Maryland, 2238 from New Jersey, 1321 from New York, and the remainder from other States of the Union.

There were in the State in 1880 38,298 males of twenty-one years old and upward, of whom 27,447 were native- and 4455 foreign-born whites, and 6396 were colored. There were 28,253 families, occupying 27,215 dwellings. The average number of dwellings to each square mile was 13.89, this density of population being exceeded in eight other States—Connecticut, Maryland, Massachusetts, New Jersey, New York, Ohio, Pennsylvania, and Rhode Island. The average number of acres of land to each family was 44.40. The whole number of farms was 8749 (as against 7615 in 1870, and 6658 in 1860). Of this number 5041 were worked by their owners, 511 were leased for a fixed money-rental, and 3197 were leased for shares of the

produce. The crops of the State in 1880 were as follows :

Crops.	Acres planted.	Product.
Tobacco	4	1,278 pounds.
Barley	19	523 bushels.
Buckwheat . . .	397	5,857 "
Indian corn . .	202,159	3,894,264 "
Oats	17,158	378,508 "
Rye	773	5,953 "
Wheat	87,539	1,175,272 "

Sorghum was also planted, yielding 25,136 gallons of molasses.

Strawberries, blackberries, raspberries, and whortleberries furnish, in most years, large crops, though the quantity varies with the season. The peach crop is still more irregular, being subject to injury by severe or unseasonable cold. It may be expected to fail entirely one year in five. The shipments of this fruit, however, as well as of the "small fruits," are large, and their consumption by canneries and drying-houses established within the State has greatly developed in the last few years. The routes of shipment for fruit are chiefly as follows: by rail northward to Philadelphia and New York, by water to Philadelphia and Baltimore, and by steamers running from Lewes to New York. Referring only to the first named route, there were sent out of the State over it in the five years 1879-83 inclusive, 8,228,495 "baskets" (about 5,000,000 bushels) of peaches. The total crop of that fruit in the State for 1879 was estimated at 4,000,000 baskets, and for 1883 at 3,500,000 baskets. Tomatoes are grown in large quantities, chiefly in Kent county, and numerous canneries operate on them during the crop season.

The live-stock of the State in 1880 was reported as follows: horses, 21,933; mules and asses, 3931; working oxen, 5818; milk-cows, 27,284; other cattle, 20,450; swine, 48,186. The wool-clip of 1880 was 97,946 pounds. The dairy products for 1879 were 1,132,434 gallons of milk, 1,876,275 pounds of butter, and 1712 pounds of cheese.

The State is divided into three counties, originally formed by William Penn: New Castle (north), Kent (central), and Sussex (south); and these are subdivided into "hundreds," corresponding substantially with the townships of other States. Hundreds are again divided for school purposes into school districts. The principal place in the State is Wilmington, whose population in 1860 was 21,258; in 1870, 30,841; and in 1880, 42,478 (to which may properly be added the closely connected suburbs of Browntown, Bancroft's Banks, Dupont's Banks, and Edgemoor, making an addition of 2640, and a total for the city of 45,118). From the earliest colonial times until 1881 New Castle had been the county-seat of New Castle county, but in pursuance of State and local legislation the court-house and offices of record are now at Wilmington. The towns in the State with a population over 500 are: New Castle 3700, Middletown 1280, Newark 1148, Delaware City 1085, Odessa 675, and Newport 535, in New Castle county; Dover (State capital and county-seat) 2811, Smyrna 2423, Milford 1240, Harrington 745, Camden 702, and Frederica 696, in Kent county; Seaford 1542, South Milford 1034, Milton 1026, Laurel 1022, and Georgetown (county-seat) 895, in Sussex county.

The governor is chosen for four years, and is not immediately eligible for re-election. He has no approval or veto in connection with laws passed by the legislature. He appoints the secretary of state (for a term corresponding with his own), the chancellor and judges (for life or during good behavior), the attorney-general (for five years), the State superintendent of free schools, the county record officers, justices of the peace, notaries public, etc.; and he has power to remit fines and penalties and grant reprieves and pardons. The elections are held biennially, in the even-number

years, on the Tuesday after the first Monday of November. The legislature sits biennially at Dover, beginning its sessions on the first Tuesday of January in the odd-numbered years. The senate has 9 members, 3 from each county, and the house of representatives 21 members, 7 from each county—there being no regard to population in the apportionment. Senators are chosen for four years (3 being elected in the year of the presidential election, and 6 the second year thereafter), and representatives for two years. The senate constitutes the court in the trial of impeachments, and two-thirds of the senators must concur in order to convict. The State treasurer and the auditor of State are elected by the legislature for terms of two years. The judiciary includes a chancellor and a chief-justice and 3 associate justices (one of these residing in each county), of the superior court, the courts of general sessions, and oyer and terminer. The chancellor, with the associate justice of the county, holds the orphans' court in each county. The chief-justice, with two associates, holds the superior court and court of general sessions in each county. The court of last resort, called the court of errors and appeals, is composed of the chancellor and the chief-justice and associate justices.

The debt of the State at Jan. 1, 1884, was stated as follows: 4-per cent. bonds, \$625,000; school bonds, bearing 6 per cent. interest, due 1906, \$156,750; Delaware College land-grant fund, bearing 6 per cent. interest, \$83,000—total, \$864,750. Against this gross amount assets of the State were credited as follows: mortgage on Junction and Breakwater Railroad, \$400,000; mortgage on Breakwater and Frankford Railroad, \$200,000; investments in bank-stock, \$73,050—total, \$673,050. The State also credits as assets the investments of the school fund, which, exclusive of a bond of the State itself for \$156,750, amount to \$338,999 in bank-stocks, etc. The revenue of the State for the year 1883, from taxes, interest, and dividends, and other sources not special in their character, amounted as follows: from licenses, \$74,223.83; Philadelphia, Wilmington, and Baltimore Railroad taxation, \$40,000; other railroads, \$1,184.73; interest from Junction and Breakwater and Frankford and Breakwater Railroads, \$24,000; the total, including sums from other sources, being \$149,069.56. The disbursements for the year from the general fund were stated to be \$138,183.11, the principal items being: executive, \$2000; judiciary, \$10,075; salaries of other State officers, \$7787.50; Delaware State bonds and coupons, \$24,250; interest on school-fund bonds, \$9405; amount of appropriation for schools, \$25,000; interest on debt to Delaware College, \$2490; school-books, \$2842.78; expenses of the general assembly, \$46,701.56; appropriation to colored schools, \$5000.

The annual valuation of Delaware in 1880 for tax purposes was as follows, according to the U. S. census: real property, \$50,302,739, personal, \$9,648,904—total, \$59,951,643. There was no direct State tax on the people (the derivation of the revenue from special sources being mostly shown above); the county taxes amounting to \$248,275; those of cities, towns, etc., to \$223,574.

The public-school system, which up to 1875 had remained unchanged for many years, and was much neglected except in Wilmington and a few other localities, was in that year materially amended by act of the legislature, and is now in an improved condition. The schools are supported by local taxation, raised in each school district upon a vote of the people to that effect, and the distribution of the State fund. The State fund was begun in 1796 from the proceeds of marriage and tavern licenses. In 1829 it had accumulated to \$158,160.15. In 1836 the State received its share of the surplus funds of the United States Treasury, amounting to \$286,751.49, and this was added to the school fund, which in 1882 amounted to \$495,749. The proceeds of the investment of this

amount, with the revenue derived from certain licenses appropriated to school purposes, amounted in 1880 to a total revenue for distribution to the districts of \$26,606.95. Besides this, the tax levied and collected locally in 1880 was \$151,044.94, making a total expenditure for school purposes of \$177,651.89. According to the report of the State superintendent, in 1880, there were in the State 512 schools, with 25,053 white children and 2216 colored children in attendance. The average number of months per year in which the schools were open was 7.53. There were 423 teachers employed (248 male, 175 female), with salaries amounting to \$138,818.97, the average monthly salary of male teachers being \$30.83, and of female \$24.79. The total value of school property was \$440,788, as follows: houses, \$331,260; grounds, \$75,669; furniture, \$31,505. The education of colored children is not a part of the general system, and is not under the charge of the State superintendent. The school-taxes paid by persons of color are set apart for the education of colored children, and to these is added a specific annual sum (in 1884, \$5000) appropriated by the legislature from moneys in the State treasury. This money is paid to the treasurer of the "Delaware Association for the Education of the Colored People," a voluntary organization formed soon after the war, and which established, in co-operation with the United States Freedmen's Bureau, a system of schools for colored children in this State. The taxes derived from colored people are also paid over by the several county treasurers to the treasurer of the Delaware Association, and from his hands they are distributed to the schools. It is required under the law that the taxes paid from each hundred shall be expended for schools therein, and that the sum annually appropriated from the State treasury shall be expended in equal shares in the three counties. During the school year 1883-84 there were in the State 65 schools open, under the supervision of the actuary of the Delaware Association above named, and 4 others, in Wilmington, in charge of the board of education of that city. The highest number of pupils enrolled in the 69 schools, in any month, was 3409. The total expenditure for the 67 schools of funds derived from taxes and from the State treasury was \$8243.46. Delaware College, at Newark, an old institution, but reorganized upon its present basis in 1870, received from the State as an endowment the income of the proceeds (\$83,000) of the sale of the State's share (90,000 acres) of the agricultural land-grant made by Congress under the act of 1862. This college receives students of both sexes. By the census of 1880 the population of the State, ten years old and upward, numbered 110,850 and of these 16,912 were returned as unable to read, and 19,414 as unable to write. Of the latter class, 6630 were native whites, 1716 foreign-born whites, and 11,068 native colored.

Delaware forms a diocese of the Protestant Episcopal Church, the bishop residing at Wilmington. It composes, with the remainder of the peninsula, the Roman Catholic diocese of Wilmington, whose bishop also resides in that city.

There is no penitentiary, and no asylum for the deaf and dumb, blind, or insane. Convicts are kept in the county jails, and the indigent afflicted classes in the county almshouses. Provision is made for the instruction of the blind, feeble-minded, and deaf-mute children in the training-schools of other States, usually of Pennsylvania. The pillory and whipping-post are maintained as part of the penal methods of the State, and are set up at each of the three county-seats convenient to the jail. The punishment, under the law, is chiefly imposed for larceny and other grades of theft, and is not administered to females.

The manufacturing interests of Delaware are proportionately large, and have increased rapidly since 1860. They are mostly located in the northern section of the State, at and near Wilmington. By the census of 1880 there were in the State 10,250 males, 16 years

old or over; 1426 females, 15 years old or over; and 962 children, engaged in manufactures. There were 746 manufacturing establishments, with an invested capital of \$15,655,822, and an annual product of \$20,514,438. There were 8 establishments devoted specifically to the manufacture of cotton goods, having a capital of \$874,570, running 46,188 spindles and 822 looms, and giving employment to 797 persons. There were 9 establishments engaged in the manufacture of iron, with a capital of \$1,431,469 and employing 867 persons. There are at Wilmington two large "yards" for the building of iron ships, three car-shops, four rolling-mills, numerous carriage- and morocco-manufactories, and a variety of other establishments. At New Castle there are large iron-works, and also factories of textile goods. On the Brandywine, above Wilmington, are several cotton-manufactories and two paper-mills of large productive capacity, besides the very extensive gunpowder-manufactories of the Messrs. DuPont, the first of any note established in the United States. At Newark and Newport there are also paper-mills, textile factories, etc., while there are canneries of fruits, vegetables, game, etc., at many points in the State.

The railroads of the State are as follows: (1) The Philadelphia, Wilmington, and Baltimore, traversing the northern portion diagonally from Claymont, 23 miles south-westward, to the Maryland line; (2) the Delaware Railroad, from Wilmington south-eastward to New Castle, and thence traversing the central part of the State south to Delaware, on the Maryland line, in all about 97 miles; (3) branches of the Delaware Railroad, including on the west side the Dorchester and Delaware, the Delaware and Chesapeake, and the Townsend branches, and on the east side the Smyrna branch, the whole having 28½ miles of road within the State; (4) the Junction and Breakwater and associated lines, connected with the Delaware Railroad at Harrington, and having an ocean and bay outlet—chiefly for New York trade—at Lewes (the Delaware Breakwater), the whole of this system having about 64½ miles within the State; (5) the Kent County and Smyrna and Delaware Bay Railroad, with 18 miles; (6) the Wilmington and Northern, with about 13 miles; (7) the Delaware Western, with about 17½ miles; and (8) the Pomeroy, Newark, and Delaware City line, with about 17½ miles within the State. (*Poor's Railroad Manual* for 1882 places the railroads of the State at a total of 278.38 miles.)

The Chesapeake and Delaware Canal, one of the oldest canals in the country, extends from Delaware Bay across the State, and thence into the "Eastern Shore" of Maryland to waters connected with Chesapeake Bay; its length is 13½ miles. It was completed in 1829 at a cost of \$2,250,000, partly by aid of the general government. In crossing the water-shed elevation it has a long summit level in a deep cut, the extreme depth of this being 90 feet. This canal is largely used by steamboats and sailing vessels engaged in the trade between Chesapeake and Delaware Bays. It is now proposed, however, to make a ship-canal, capable of accommodating the largest ocean-going vessels, across the peninsula, to connect the two bays, and numerous surveys have been made of routes crossing Delaware south of the present canal. Its construction is now (1884) declared to be assured at a near time. The State of Delaware constitutes one customs district under the United States laws, with a collector located at Wilmington and deputies at New Castle and Lewes. The commerce is not extensive; whatever foreign trade there is mainly enters and leaves the port of Wilmington. The coastwise trade is of more importance, and many cargoes of fruit, grain, timber, etc., go in small vessels out of the numerous navigable streams that flow into Delaware Bay.

The expedition of the Swedes which effected the first permanent settlement of Europeans within what is now the State of Delaware—and the first anywhere

on the western banks of the Delaware River—was under command of Peter Minuit. (The several spellings of his name, Menewe, Minnewitz, etc., are due probably to the different ways of pronouncing it, but careful writers on Delaware history usually give it as above.) The expedition came over early in the year 1638, having left, probably, at the close of 1637. It arrived at Christina (now Wilmington), where the settlement was made, in the month of April. Previously, however—from 1631 to 1632—there had been a small settlement of Dutch, landed by David Petersen De Vries, at the Hoorn-kill, now Lewes, just within the entrance to Delaware Bay. The settlers were all killed by the Indians the next year after their arrival, and though De Vries revisited the place near the end of 1632 he made no attempt to resume the settlement.

The Indians who occupied lower Delaware were known later to the English as Nanticokes; toward the middle of the eighteenth century the survivors of them left Delaware in a body and went to the north branch of the Susquehanna River in Pennsylvania. Heckewelder, the Moravian missionary, relates that in his boyhood he had seen some of them pass through Bethlehem, carrying the bones of their principal chiefs, disinterred in lower Delaware, on their backs. This was about 1748, and these were probably the last Indians in the State. The tribes in the northern section were chiefly known as Minquas, and belonged to the family usually spoken of in Pennsylvania history as the Lenni Lenape. Their relations with the whites—Swedes, Dutch, and English successively—appear to have been uniformly friendly.

The period of Swedish control in Delaware extended from 1638 to 1655, when Gov. Stuyvesant, of Manhattan, with his expedition, celebrated in the humorous pages of Washington Irving's *Knickerbocker*, took Fort Casimir, at New Castle, and Fort Christina (Wilmington), and brought the colony under Dutch rule. In 1664 it passed into control of the English under the Duke of York's general authority, and the government was administered by his governors and their deputies from New York until the arrival of William Penn in 1682. The "three counties on Delaware," then known as New Castle, St. Jones, and Whorekill (Hoorn-Kill), or New Deal, having passed by the Duke of York's deed to Penn into the proprietary control of the latter, they joined with the Pennsylvania counties in one legislative body, and so remained until 1703, when they set up their own assembly, which met at New Castle until about the time of the revolution, when the capital was fixed at Dover. Like Pennsylvania, they continued under the Penn proprietary and the English colonial system until the revolution. A new constitution was then framed (1776) and the old government set aside. In 1791 a new Constitution was adopted, and in 1831 this was revised, since which time until now (1883) there has been no change in the fundamental law, though in 1852-53 an earnest but abortive effort was made to secure its material amendment, a convention being held and a new constitution framed and submitted to the people; it was, however, not adopted by such a majority of votes as was required under the existing constitution, and so fell. Delaware was the first of the States (1787) that voted to adopt the federal constitution.

In the revolution Delaware bore a somewhat conspicuous part. At the adoption of the Declaration of Independence the majority in favor of the step substantially depended upon the decision of the Delaware delegates, who voted yea at a critical time. Besides the troops sent to the field at the beginning of the conflict, and which served temporarily, the State raised a regiment of the "Continental" establishment, which served with much credit throughout the war subsequent to the battle of Trenton, the remnant of it fighting almost to the end in the battles in the South. No engagement of note took place within the State,

though Washington's army lay for a short time along Red Clay Creek, near Wilmington, facing the British under Gen. Howe, and a conflict there was avoided only by the flank march of the former into Pennsylvania just before the battle at Brandywine in September, 1777.

Until after the Revolution the population of Delaware was almost entirely of English descent, with the exception of the Swedish and Dutch infusion which had survived by descent from the original colonists. In the lower counties especially the purity of the English blood is still notable. After the troubles in San Domingo and the Revolution in France a number of French families of distinction settled in northern Delaware, and since the war of 1812 the inflow from other States, as well as the arrival of European immigrants, has much changed, as well as increased, the population of New Castle county.

At the outbreak of the rebellion, Delaware, though urged by commissioners from the seceding States to join in it, refused to do so and remained loyal to the Union. There were sent to the national army from the State, during the war, 10 regiments of infantry, 1 regiment of cavalry, 1 troop of cavalry ("emergency" service), 1 battery of heavy- and 1 battery of light-artillery.

For details, descriptive and historical, relating to Delaware, the following works are of importance: *A History of the Original Settlements on the Delaware*, by Benjamin Ferris (Wilmington, 1846); *A History of New Sweden*, by Israel Acrelius (Historical Society of Pennsylvania, 1874); *Annals of Pennsylvania [including the Delaware counties] from 1609 to 1682*, by Samuel Hazard (Philada., 1850); *Life and Correspondence of George Read*, by William Thompson Read (Philada., 1870); *A History of the State of Delaware*, by Francis Vincent (vol. I., Philada., 1870); *Reminiscences of Wilmington*, by Elizabeth Montgomery (2d ed., Wilmington, 1872); *Memoirs of John M. Clayton*, by Joseph P. Comegys (Historical Society of Delaware, 1882); *Huffington's Delaware Register* (Dover, 1838); *Annals of the Swedes*, by Jehu C. Clay (Philada., 1835).

In addition to these the collections of the Delaware Historical Society at Wilmington, and the Pennsylvania Historical Society at Philadelphia, contain a large amount of documentary and other information, and the New York volumes of Dutch records, translated by Brodhead and O'Callaghan, furnish abundant references to the Colonial period until the overthrow of the Dutch power at Manhattan. Among pamphlets of value upon special Delaware topics may be named Professor James C. Booth's report (1837-8) on the State's geology; a report by Dr. L. P. Bush (1872) on the climatology and diseases of Delaware; an address (1876) on *Delaware's Revolutionary Soldiers*, by W. G. Whiteley; *Lives of the Chancellors*, by Daniel M. Bates; *Report of the Proceedings in the Pea-Patch Case, before Hon. John Sergeant, arbitrator*; *Argument (1874) of the Delaware Commissioners in the Fishery Question [with New Jersey]*; Foote's *Historical Sketch of Drawyer's Presbyterian Church, Odessa, Del.* (1842). (H. M. J.)

DELAWARE, a city of Ohio, county-seat of Delaware co., on the W. bank of Olentangy River, here crossed by 4 bridges, 20 miles N. of Columbus. It is on the Cleveland, Columbus, Cincinnati, and Indianapolis Railroad, at the junction of the Springfield branch; also on the Columbus, Hocking Valley, and Toledo Railroad. It is a handsome city, with fine county-buildings, an opera-house, 3 banks (2 national), 1 daily and 4 weekly newspapers, 13 churches, and 2 handsome public school-houses; also railway-shops and manufactories of woollens, flour, wagons, chairs, cigars, castings, etc. Delaware is the seat of the Ohio Wesleyan University, which is one of the leading schools of the Methodist denomination. There are theological, normal, and medical schools, and a female college connected with the university. Near the town is a State reform-school for girls. Within and near the city are several chalybeate springs, and there is a fine sulphur-spring, giving the town a reputation as a sanitary resort. Delaware is the birthplace of ex-President R. B. Hayes. It was founded in 1808; incorporated as a city in 1873; valuation, \$3,500,000; public

debt, \$80,000; yearly expenses, \$25,000. Population in 1880, 6894.

DELAWARES. A tribe of American Indians who, on the settlement of Pennsylvania, were found established on the Delaware Bay and River, while closely affiliated tribes stretched from the Potomac on the south to and beyond the Hudson on the north. They were of Algonkin descent, and claimed to be the source of all the Algonkin tribes—a claim that was admitted by the other tribes in the title of “grandfathers” which they gave the Delawares. They were in many respects one of the most interesting of Indian tribes, both from their traditional history and the peculiar relations which they bore to the whites.

The Lenni Lenape, as the Delawares named themselves, had a tradition to the effect that, hundreds of years ago, they resided in a distant country on the west of the continent. Migrating eastward they found the country east of the Mississippi in possession of a powerful people called the Alligewi, who had many large towns. A great war ensued, the Alligewi were defeated and fled down the Mississippi, and the Lenni Lenape occupied their country in common with a tribe called the Mengwe or Minquas, who had followed them from the West. They finally became settled on the eastern coast, centring on the Delaware, while branching tribes stretched north and south, the Mohegans of the east being a direct outgrowth from the Delawares.

The tradition goes on to relate that wars broke out between them and the Mengwe, or Iroquois, as they were known to the English. In these wars the Iroquois confederacy was opposed by a yet stronger alliance between the Delawares and their related tribes. Finally the Iroquois, pressed by the French settlers in Canada on the one hand and the Delawares on the other, sought to relieve themselves of the enmity of the latter by inducing them to lay down their arms and assume the position of mediators between the warring tribes. The Delawares claim to have heard this scheme favorably, and to have consented to become “women,” as all unwarlike tribes were scornfully denominated. This story is denied by the Iroquois, who claim to have conquered the Delawares in battle and forced them to become “women.” The latter story is far more probable, as the former seems alien to the Indian character, while the Iroquois are known to have dominated the tribes throughout a wide territory. This position of the Delawares is an interesting anomaly in the history of Indian tribes.

It was with the Delawares that the European settlers of the Middle States first came into contact. The Dutch began to trade with them in 1616 on the Delaware. The Swedish settlers were well received, and made missionary efforts among the Indians, Luther's *Catechism* being translated into the Delaware language by Campanius. The Quaker settlers, under William Penn, by their fair and peaceful dealings, established still more friendly relations. The story of Penn's treaty—by which, it is said, he purchased his province from the Indians as the rightful owners—describes one of the most picturesque incidents in early American history. The relations between the Quakers and the Indians continued amicable. Penn's memory was long venerated by the tribes, and it is claimed that no Indian ever injured a Quaker within the limits of Pennsylvania. Another venerated character in the history of the Delawares is their great sachem, called Tamanend—Anglicised as Tammany. Little of his history is known, and he is perhaps wholly a traditional character; but the legendary memory of his wisdom and virtue is still warmly entertained. The name is still employed as a political designation.

In 1742 some trouble arose with the Delawares, who declared that they had been defrauded in a treaty called the “walking treaty.” In settlement of this dispute an Iroquois chief was called in, who sharply rebuked the Delawares for presuming to treat for land. They were *women*, and had no claim to the land, which

belonged to their masters. He ordered them to vacate the disputed territory and remove to Wyoming or Shamokin on the Susquehanna. His peremptory command was meekly obeyed. After this retreat the Delawares gave up their peaceful habits and became warlike and energetic. In 1755 many of them, irritated by outrages of the whites, joined the French in their war with the English, and took part in the battle of that year, known as Braddock's defeat. The enmity of the Pennsylvanians thus aroused finally resulted in an unprovoked massacre of the inhabitants of a small settlement known as the Conestoga Indians. Efforts were made to protect these inoffensive people, but the incensed borderers slaughtered them under the very eyes of the authorities. After this murderous outbreak the Delawares withdrew for safety into the wilds of the Susquehanna region.

Early efforts had been made to Christianize the Delawares, in which the Moravians were particularly successful. Settlements of Moravian converts were made in 1741 at Bethlehem and Nazareth. These Christian Indians always continued peaceful and friendly to the whites, although they were subjected to brutal outrages from lawless settlers during the exasperation of the French and Indian wars. The warlike Delawares took part in the celebrated “Pontiac conspiracy” of 1763, in which the lake tribes attacked Detroit, while the Delawares and some other tribes besieged Fort Pitt, the present Pittsburgh. Their raids extended along the whole frontier, and great outrages were committed. Gen. Bouquet, marching to the relief of Fort Pitt, was ambushed by a party of Delawares at Bushy Run. A fierce fight ensued, which ended in a disastrous defeat of the Indians and the relief of the border. In 1774 an unprovoked invasion of the Indian country took place by a party of land-hunters, said by some to have been led by Col. Cresap. A Delaware chief, named Bald Eagle, was causelessly killed, scalped, and his body set adrift in his canoe. Terrible reprisals were made by the Delawares, Shawnees, and other tribes, led by a celebrated chief called Logan, whose family had been ruthlessly butchered. The war that ensued spread along the whole border, the settlements suffered severely, but the Indians were finally defeated and forced to peace.

The pressure on the Delawares had before this time caused a general migration westward. By 1768 they had all removed beyond the Alleghenies. The Moravian missionaries emigrated with their flock to Ohio, where the number of Christian Indians increased. During the revolutionary war a part of the Delawares joined the British, others remaining neutral. They all made peace after the fall of Fort Duquesne. A treaty between the Delawares and the government was signed in 1778, the first treaty ever made between the United States and an Indian tribe. The Christian Indians, who then had three towns on the Muskingum, the Delaware town being at Gnadenhütten, continued peaceful but friendly to the colonists during the Revolution. The hostile Indians, angry at the neutrality of the Christians, seized them and removed them to Sandusky, Ohio, in 1781. Thence, when they grew short of food, a party returned to save some of their crops. The neighboring settlers, hearing that Indians had appeared on the Muskingum, attacked them, and, though no resistance was made, ninety of them were brutally massacred. This unprovoked outrage threw the Christian Indians into despair. Most of them removed to Canada, where their descendants still remain.

The warlike Delawares, continuing hostile to the Americans, participated in all the Indian wars of the remainder of the century. Four hundred Delaware warriors took part in the disastrous defeat of the St. Clair expedition of 1791, which resulted in the loss of 894 whites. They were present also in the Indian defeat by Gen. Wayne in 1794, and were forced the succeeding year to conclude peace. In the war with

England of 1812 the Delawares remained faithful to the United States. In 1818 they ceded all their lands by treaty to the United States, and removed, with the exception of a small band, to a reservation on the White River, Missouri. By a further treaty, made in 1829, they agreed to move still farther west, and to accept a reservation in Kansas at the fork of the Kansas and Missouri Rivers. This was to be secured to them forever as a permanent home. Their reservation in Kansas consisted of 375,000 acres, which they employed in agriculture and stock-raising, and gained an excellent reputation. In 1853 they sold the United States all their lands except a limited reservation in Kansas, on which they gave up the most of their Indian habits, built themselves comfortable houses, and progressed in agriculture. Yet their experience in Kansas was like that of many other tribes. They suffered from incursions of the wild tribes and of lawless whites. A party of settlers entered their reservation, seized a piece of land on the Missouri, and laid out a town which they called the city of Leavenworth, without interference from the commander of the adjoining Fort Leavenworth. Other parties quickly followed, and were defended by the military in their aggressions. The Indians were personally maltreated, their property stolen, their timber destroyed, etc. Yet they quietly submitted, trusting to the government for redress, which failed to come. In 1860 and 1862 a treaty was made with them by which most of their lands were conveyed to the Leavenworth, Pawnee, and Western Railroad, they receiving payment in bonds of the company. In 1866 they finally sold the remainder of their reservation to the Missouri River Railroad, and in 1868 removed to the Indian Territory, where they settled on lands on the Verdigris and Caney, bought from the Cherokees. Here they were induced to give up their tribal organization, accept lands in severalty, and become citizens of the United States. This they did, receiving farms of 160 acres each. Thus the ancient tribe of the Delawares ceased to exist, though their old clan divisions of the Turkey, Turtle, and Wolf are still retained. When first known they numbered about 6000, but they are now reduced to about 1000. The Delaware language is one of the best known of the Algonkin dialects, its study having given rise to a number of works on the subject. The greater part of the Delawares at present are members of the Cherokee nationality, but some are settled with the Kiowas and Comanches.

(C. M.)

DELBRÜCK, MARTIN FRIEDRICH RUDOLPH, a German statesman, was born at Berlin, April 16, 1817, and was the son of the preceptor of the two children of Frederick William III., who afterwards became Frederick William IV. and the Emperor William. He studied in the schools of Zeitz, Magdeburg, and Halle, in which latter city he commenced the study of law, which he completed at the Universities of Bonn, Göttingen, and Berlin. He practised at the bar of Halle during 1839 and 1840, after which he entered the civil service, becoming, after two years' provincial service, assistant in the ministry of finances, and then in that of commerce. He devoted himself specially to the study of economic questions, and became, in 1859, a director of the division of commerce and industry. To him principally are due the commercial separation of Prussia and Austria, and the commercial treaties of the smaller German states with Prussia, which put the latter at the head of a sort of customs confederation, very favorable to its political preponderance. In 1862 Bismarck, on being raised to the presidency of the ministry, declared himself in favor of Delbrück's ideas, and gave them a powerful support. The latter now extended his operations, obtained the assent of all the governments of the Zollverein to the commercial treaty already concluded, and made treaties of commerce with France, England, Belgium, and Italy. In acknowledgment of these and other services he was made president of the federal chancery, August,

1867. He employed the great influence given him by this position to aid the growth and transformation of the Prussian monarchy. During the events of 1870 he visited the various states of Northern Germany, and concluded with their rulers a new series of treaties, which completed the German unity, in advance of the proclamation of King William as Emperor of Germany. He prepared the constitution of the new empire, presented it to the parliament in the name of the Confederate States, and had it adopted without amendment, and almost without debate, in December, 1870. He continued, during the succeeding five years, president of the imperial chancery. His great reputation declined during this period. He was accused of a prodigal use of the French war contribution in unfortunate industrial enterprises, and his resignation in April, 1876, was attributed to these financial errors. During 1874 and 1875 he was a member of the Chamber of Deputies, but resigned his membership as incompatible with his other duties. Elected later to the Reichstag he there vigorously combated, in the question of the tariff, the change of opinion of Bismarck towards protectionist ideas (May, 1879), and also in 1880 vigorously opposed the Elbe navigation act, presented by Bismarck. In 1873 he received from the University of Leipsic the degree of LL. D.

DELEPIERRE, JOSEPH OCTAVE (1802-1879), a Belgian historian and antiquary, was born at Bruges, April 12, 1802. He studied law at the University of Ghent, practised as an advocate at Brussels, and entered the diplomatic service. In August, 1849, he received the appointment of Secretary of Legation and Consul-General for Belgium, at London. He died in London, August 17, 1879. Among his works are: *Histoire du Règne de Charles-le-Bon*, in collaboration with I. Perneel (Brussels, 1830); *Les Traditions et Légendes de Flandre* (Lille, 1834), translated into English by the author, as *Old Flanders* (London, 1845); *Précis des Annals de Bruges, depuis les temps les plus reculés, jusqu'au commencement du XVIIe siècle* (Bruges, 1835); *Le Roman de Renard*, from an ancient Flemish MS. (1838); *De l'Origine des Flamands*, with a sketch of Flemish literature; *La Belgique illustrée par les Sciences, les Arts, et les Lettres* (1840); *Galerie des Artistes Brugeois*, since Van Eyck (1840); *Marie de Bourgogne* (1841); *Examen de ce que renferme la Bibliothèque du Musée Britannique* (1846); *Histoire Littéraire des Fous* (1860); *Analyse des Travaux de la Société des Philobibliens de Londres* (1862); *Essai historique sur les Rébus* (1874); *Tableau de la Littérature du centon chez les Anciens et chez les Modernes* (1875, 2 vols.), etc. He has also published reprints of rare texts, and of macaronic pieces, such as: *Aventures de Tiel-Ulenspiegel* (1835); *Vision de Tyndalus*, a mystic narrative of the 13th century; *Macaroneana, ou Mélanges de littérature Macaronique des différents peuples de l'Europe* (Paris, 1852); *Nouveaux Mélanges de Littérature Macaronique* (London, 1862); with other works on like subjects.

DELITZSCH, FRANZ, a German exegete and Hebraist, was born of poor parents at Leipsic, Feb. 23, 1813. He studied divinity in the University of Leipsic; and took a professorship in theology at Rostock in 1846, at Erlangen in 1850, and at Leipsic in 1867. By persevering study he had become master of the great body of rabbinical and Jewish literature. Among his works are *Geschichte der Jüdischen Poesie* (1836); *Beiträge zur mittelalterlichen Scholastik unter jüden und Moslemen* (1841); *Jesurum* (1838); and a large number of exegetical works, including commentaries on Habakkuk (1843); Canticles (1851); Genesis (1852; 4th vol., 1872); Hebrews (1857); Psalms (3 vols., 1859-74); Isaiah (3d ed., 1879); Job (2d ed., 1876); the Solomonic writings (1873, 1875); *Biblisch-theologischen und apologetisch-kritischen Studien* (with the aid of Caspari, 1845-48); *Biblischen Psychologie* (1855); *Neue Untersuchungen über Entstehen und Anlage der Kanonischen Evangelien* (1853); *System*

der christlichen Apologetik (1869); *Handschriftliche Funde* (1861-62); *Sakrament des wahren Leibes und Blutes Jesu Christi* (1844; 6th ed. 1876); *Jesus und Hillel* (1867); *Jüdische Handwerkerleben zur Zeit Jesu* (1868); *Ein Tag in Kapernaum* (1871); and many other works. His Hebrew version of the New Testament is of vast importance, and has been adopted by the British and Foreign Bible Society. His son, JOHANNES DELITZSCH, born in 1846, died at Rapallo, Italy, Feb. 3, 1876. He was author of *Lehr-system der römischen Kirche* (1875). Another son, FRIEDRICH, born at Erlangen, Sept. 3, 1850, is author of *Assyrische Studien* (1874); *Assyrische Lesestücke* (1878); and *Wo lag das Paradies?* (1881); and is since 1877 professor of Assyriology in Leipsic.

DELIUS, NICOLAUS, a German author, especially noted as a critic of Shakespeare, was born at Bremen, Sept. 19, 1813. From the gymnasium of his native city he passed to the University of Bonn and afterwards to that of Berlin, where he devoted himself to linguistic studies. He also visited France and England before entering upon his professorial career. In 1841 he began to deliver lectures at Berlin, and after a year's experience as editor of a newspaper in Bremen settled in Bonn in 1846. Here he was made professor extraordinary in 1855, and ten years later became full professor. Delius lectured for some time on Sanscrit, but afterwards gave more attention to romance literature and especially to Shakespeare. His first publication was *Radices Præcriticæ* (Bonn, 1839), an appendix to a grammatical work by Lassen, but two years later appeared his first essay in the field in which he was to acquire renown. This was an edition of *Macbeth* (Bremen, 1841), and was followed by various works on Shakespeare's text, his critics, and the English stage in his time. His edition of Shakespeare's works (7 vols., 1854-61) has been enlarged and improved (1882). Besides his books on this subject Delius has been a frequent contributor to the periodical press, treating both of Shakespeare and of the early literature of France. He has published editions of Wace's Old French poem, *Saint Nicolas* (Bonn, 1850), and of *Provençalischen Liedern* (Bonn, 1853); and a treatise on the Sardinian dialect of the 13th century (Bonn, 1868).

DELLA CRUSCA, the name of an Italian academy of literature and philology, founded at Florence, Italy, in 1582. Such academies were numerous in that period, and this one seems to have been an outgrowth from the Florentine Academy, founded by Cosmo I., primarily for the study of the works of Plato. They bore curious names: two later ones were called *Dei Lyncei* ("of the Lynxes"), to indicate that they were sharp-eyed and unrelenting in their contest with falsehood and error; and *Del Cimento* ("of the Experiment"), because they used the Baconian method. Thus we have the *Accademia della Crusca* ("of the Sieve"), indicating the purpose to sift the wheat from the chaff, especially with reference to the Italian language, which was being sadly corrupted. It had not a long life, but it has marked a period in Italian philology by its publication, in 1613, of the *Vocabolario della Crusca*. As might be expected, it gives undue importance to the Tuscan dialect, and it was severely criticised by Beni in his *Anti-Crusca*. It also published valuable editions of the ancient poets. It assailed the poet Tasso, but was so prejudiced and unjust that critics have sided with the poet in the controversy between them. The short life of the academy was a brilliant one; it eclipsed all other Italian associations of a similar kind.

The name *Della Crusca* was also adopted by an association of English poets under the patronage of Mrs. Piozzi (Thrale) during a residence at Florence in 1785-86. They printed, but did not publish, *The Florentine Miscellany*. Their high-flown and sentimental poetry awoke the anger of William Gifford, who ridiculed them in his satires, *The Baviad* and *The Mæviad*, particularly the former.

(H. C.)

DEL MAR, ALEXANDER, an American mining engineer, statistician, and political economist, was born in New York, Aug. 9, 1836. His father, Jacques Del Mar, a Spanish mining engineer, had become a resident and citizen of the United States. Alexander, however, was educated in Spain, returning to the United States in 1849, and spending two years in mercantile business in New York. He then went back to Europe to complete his education. When he returned in 1854 he became connected with the New York press, writing chiefly on financial subjects. He edited for some time *Hunt's Merchants' Magazine*, the *New York Social Science Review*, and the *Commercial and Financial Chronicle*, which he originated, and contributed to *De Bow's Review* and other periodicals. In 1862 he published *Gold Money and Paper Money*; in 1865 *History and Principles of Taxation*; and in 1866 *Essays in Political Economy and Statistics of the World*. In the latter year Pres. Johnson appointed him director of the bureau of statistics, which position he held for four years, issuing meantime reports on American navigation interests and on the customs revenues. In 1872 he published a *History of the Rate of Interest*, and in the same year went to Russia as the American delegate to the Statistical Congress held in St. Petersburg. In 1875 he was one of the supervisors of the census of the city of New York. In 1876 he aroused an agitation against the demonetization of silver, which had been quietly effected in Congress. He was made a member of the silver commission, and helped to remonetize the silver dollar. His *Report on the Comstock Lode* (Washington, 1876), in which he predicted its speedy exhaustion, greatly enhanced his professional reputation. He has since resided in San Francisco, and has explored all the mining districts of the Pacific States. He has charge of various hydraulic mining-works in California and Brazil, but besides these professional duties spends much time in literary work on kindred subjects. His *History of the Precious Metals* (London, 1880) was begun in 1855, and embodies the researches of twenty-five years. His latest completed work is a *History of Gold-Mining in Brazil* (London, 1882).

DELPHI, a city of Indiana, county-seat of Carroll co., is on the left bank of the Wabash River, on the Wabash, St. Louis, and Pacific Railroad, and the Indianapolis, Delphi, and Chicago Air Line Railroad, 18 miles N.E. of Lafayette. It is also on the Wabash and Erie Canal. It has a court-house, jail, 2 opera-houses, odd fellows' hall, 3 hotels, 2 banks, 2 weekly newspapers, 6 churches, a graded school, and high-school. Its industries comprise factories making bentwood furniture, staves, spokes and hubs, carriages, wagons, and portable-engines; 3 flour-mills, and 7 patent lime-kilns, which burn 1,500,000 bushels of lime annually. Delphi was settled in 1840, and incorporated in 1868. Its property is valued at \$1,525,000, and its public debt is \$45,000. Its inhabitants are almost entirely of American birth. The surrounding country furnishes excellent brick-clay and limestone, and the buildings of the city are chiefly of brick. Population, 2040.

DELPHIN CLASSICS, the name given to an edition of all the important writers of Greece and Rome, prepared for the use of the dauphin of France, the son of Louis XIV., whence the title reads *in usum serenissimi Delphini*. It was prepared under the direction of Bossuet and Huet, the tutor and sub-tutor of the prince, by thirty-nine of the best scholars of France. The series was re-edited in England in 141 volumes 8vo, between the years 1819 and 1830, by Abraham John Valpy, with the assistance of George Dyer, who prepared all the original matter except the preface. This reissue was criticised because, although good when published, the Delphin Classics had been already superseded and were of little value except as rare books. The Virgil and Horace, however, are exceptions, and have been used until almost the present time.

(H. C.)

DEMOCRATIC-REPUBLICAN PARTY. The overthrow of the Anti-Federal party in 1788 left practically but one, the Federal party, in the country (see ANTI-FEDERAL, and FEDERAL). For the first three years after the inauguration of the new Government in 1789 all the public men of the country were nominally Federalists. In States like Massachusetts, where the Anti-Federalists had made their strongest opposition, they had announced at the end of the struggle their intention to support the Constitution before the people; that is, to become Federalists for the time. Jefferson, Madison, Edmund Randolph, Burr, all were nominally Federalists in 1790; indeed, the idea prevailed that there was thereafter to be but one party in the United States, and that the Government was to be administered without party contests.

Hamilton's project for the assumption of State debts by the Federal Government in 1790 brought out the first semblance of party opposition, which was fanned to a flame by his plan for the formation of a national bank in 1791. These, however, were but prominent instances of a general course of nationalizing policy, in which Jefferson could see only a design to finally subvert the State governments and establish a strong central government controlled by a single interest, that of commerce, and subjecting all other interests and the rights of individuals to that. It was for this reason that he and his party associates at once attacked the Hamilton party as monarchists: the king feared by them was not Washington, or Hamilton, or any other single man, but a clique of men united by a common interest. And it must be remembered that, at the worst, the idea of a king, perhaps disguised under another title, as in the case of the stadtholder of Holland, was by no means startling to the generation of 1783-93, and was very often suggested as a possible solution of the difficulties of the Confederation. It was formally broached to Washington by Jay in 1787, though only as a possible final resort. Steuben was sounded as to the willingness of Prince Henry of Prussia to become stadtholder of the United States. When the secret deliberations of the Convention of 1787 were ended, the impression was common that one of their recommendations would be the establishment of an English prince of the blood, the so-called bishop of Osnaburg, as "permanent President," or with some such title equivalent to that of king. The title of "king," in short, was so little hateful at the time that the appellation of "monarchist" was by no means startling. Hamilton, indeed, was no monarchist, though he had urged in the Convention the establishment of a President for life; it was patently absurd to attempt to establish any one but Washington as king, and impossible to induce him to accept such an office. Nevertheless, the assertion of monarchical designs against Hamilton and his supporters, the idea that they were monarchists in theory, and only waited for an opportunity to put their theory into practice, clung, and remained the principal party weapon for many years.

The opening scenes of the French Revolution, from which Jefferson had just returned, suggested a counter-name. If the opponents of monarchy in France were Republicans, the opponents of monarchy in the United States had a fair claim to the same name. So we find Jefferson, in his letter of May 13, 1792, to Washington, claiming the name of Republicans for his followers, "who wished to preserve the Government in its present form;" and for nearly twenty years the name of Republican was the only one acknowledged by the new party. In its first form (1792-93) the party was exceedingly small, without defined principles or limits, with but two or three leaders of national reputation—Jefferson, Madison, and Edmund Randolph—supported by a few Congressmen, Bland, Giles, and Page—and the whole drawn from Virginia. Indeed, the whole was at first a Virginia interest, and may be considered the Virginia type of Federalism, the Virginia method of supporting the Constitution.

The treaty of alliance between France and the

United States, concluded in 1778, purported to be defensive only, but a provision in it for guaranteeing the French possessions in America, and the natural feeling of gratitude for French assistance in the Revolution, inclined many Americans to take part with France in the European wars which that republic declared in 1792-93, particularly against Great Britain. The policy of the Federal party was neutrality, since the ties of its controlling commercial interests were mainly with Great Britain; and the natural feeling of opposition, intensified in Jefferson's case by his theoretical sympathy with the French revolutionists, inclined the Republicans to favor France as far as that could be done without drifting into war. In April, 1793, the whole course of party conflict was mightily influenced by the arrival of Edmond Charles Genet, the envoy from the French Republic. The sending of such an envoy into a foreign country for the purpose of forming a French party, denouncing all opponents as enemies of the people, and finally either overturning the Government or compelling it to assist France, was the ordinary method of the French leaders at the time; and, though not directly successful in the United States, it had indirect effects beyond calculation. The first effect was the formation of "Democratic clubs" all over the country from Boston to Kentucky. They imitated all the follies of their Jacobin prototypes of France—cut their hair short, affected a new simplicity in dress and manners, changed the aristocratic title of "Mr." to the more modest name of "Citizen," and with all the zeal of new converts not only approved to the full all the doings of the French revolutionists, but made the most desperate efforts to discover tyrants in their own country in order to signalize their patriotism. It is hard to say which is the more amusing, the half-hearted Quixotism with which a Democrat of 1793-95 assimilated himself to Brutus by hinting a doubt of Washington's financial honesty, or the horror with which his Federalist neighbor regarded him as a Jacobin and revolutionist, with a list of suspects in his pocket and a guillotine in his back yard. But the real offence and the real work of the Democratic clubs lay in an entirely different direction. Heretofore, suffrage and political discussion were equally the province of the middle and upper classes, the former confined to freeholders, the latter to their abler representatives. When the right of suffrage was allowed to wealth without a freehold, it was allowed with a sort of protest; and the American feeling was thus spoken by Franklin in 1766: "Many who have no freeholds have nevertheless a vote; *which, indeed, I don't think was necessary to be allowed*" (italics as in original). With all their follies, the Democratic clubs introduced universal political discussion; and that, if unchecked, meant universal suffrage in the near future. Here lay the real point of contact and union between them and the Republicans, and the impassable barrier between them and the Federalists. The Democratic club was the New England caucus spreading into other States, and its deliberations were regarded by the Federalists very much as Hutchinson and Gage regarded those of the New England caucus—as an unwarranted intrusion into matters that did not concern it.

The coalescence of the Republicans and Democrats into a single national party was effected by the so-called "Whiskey Insurrection" in 1794 and the conclusion of Jay's treaty with Great Britain in 1795. If the Democrats did not favor the former, they at least did not severely condemn it, since one of their cardinal principles was that any general repugnance to a law argued the iniquity of the law. Washington's direct condemnation of the Democratic clubs as the instigators of the insurrection diminished the number of clubs without diminishing the number of Democrats; these were driven into tacit alliance with the Republicans. Jay's treaty, which secured a ten years' safety to American commerce, and with it to American neutrality, completed the union, and in effect formed the Democratic-Republican party. The name "Republican" still was

used exclusively by its members, while the name "Democrat" was applied by its opponents as a term of contempt, equivalent to Jacobin or revolutionist; but the latter name was much more appropriate than the former, for the new party had no predilection for the idea of the United States as a unified republic, while its only logical growth was toward universal suffrage, an elective judiciary, exemption of the individual from governmental interference, the preference of the smaller and more democratic units of society to the larger and more republican, and all the methods by which weaker or individual interests are to be preserved against larger or combined interests. In this sense the names are now (1884) properly taken by the opposing Republican and Democratic parties, but the former follows Democratic methods, and the latter accepts Republican theory so far that it is often hard to find a line of division between them.

By the union of the two elements Jefferson was now the head of a national party, and no longer of a simple Virginia faction; and it speaks much for his political capacity that the reins never slipped from his fingers during the transformation. Indeed, his seat was firmer than before. His prominence in the outbreak of the French Revolution gave him a claim upon the allegiance of the Democratic leaders which Madison, his only rival in ability, could not dispute; and Monroe, his only possible competitor in this respect, was, like all the other Democratic leaders, a man of very inferior ability. Throughout the Union every man who felt the pressure of Church, State, or classes bearing heavily upon him looked to Jefferson in his hopes of relief. Electors until about 1824-28 were generally chosen by State legislatures, so that there is no record of the general popular vote at the Presidential elections of 1789 and the following thirty-five years. We can only know that when Washington refused to be a candidate for a third term Jefferson narrowly missed being his successor. Instead of the four votes of Kentucky, which had been given to him in 1792, he had now all the votes south of the Potomac and Ohio, except one from North Carolina and one from Virginia; and north of the Potomac he had fourteen of Pennsylvania's fifteen votes, and four of Maryland's seven votes. In the aggregate he received 68 votes to 71 for John Adams, and became Vice-President; nothing but the two straggling Southern votes prevented the positions of the two men from being reversed.

This defeat, so amazingly near to a victory, like the Republican party's defeat in 1856, gave Jefferson's party a standing which it had not before. It had been a matter of extreme difficulty for the nation to assert its existence even in foreign affairs by the adoption of the Constitution, and the country was not at all ready for even the indirect methods of asserting its existence in domestic affairs which made up Hamilton's Federalist policy. Without some such methods of conciliating State feeling as were afterwards followed by the Whig, and still more by the Republican, party, it should have been evident that every occasion of discussion would only increase Jefferson's strength toward the North, now that Washington, the Federalist pillar of support in the North, was out of politics. Unfortunately for the Federalists, the "X, Y, Z mission" to France (see FEDERAL PARTY) in 1797-98 roused an American storm of indignation against France, which comprehended the Democratic party also. In Congress their party force melted away. Some acted perforce with the Federalists; others found urgent business to attend to at home; only Gallatin showed a nerve and power in politics which, but for his foreign birth, would have made him a serious competitor to Jefferson for the party leadership. For a little space the Democratic party was out of the combat, and the triumphant Federalist majority pressed on to the organization of a standing army, the passage of the alien laws, and the passage of a sedition law. All these three steps were, in the view of the Democrats, directly levelled at them.

The first they thought unwarranted by any danger of French invasion or of slave insurrection, and only designed to support the Government in arbitrary arrests of Democrats. The second, with their provisions for fourteen years' residence as an essential to citizenship, and for the arrest and transportation, at the President's order, of any alien whom he should consider dangerous, they looked upon as a direct attack upon a large mass of their own party. The third, which made it a crime to print or publish any "false, scandalous, or malicious" writings tending to defame the Government, President, or Congress, to bring them into contempt, or to excite the hatred of the good people of the United States against them, was certainly a direct attempt to stop party-newspaper criticism. And it was certain, while the machinery of Government was in Federalist hands, to be directed only against one party: Hamilton was to be at liberty to print the most contumelious personal attacks on the President himself, while "Judge" Peck was to be arrested for circulating a Democratic petition against the sedition law. But how were they to be resisted? In Congress alone? The whole series of laws was expressly modelled on the English precedent of 1791-93, and the arrest of members of the British Parliament for seditious language so late as 1882 may serve to show us why the Democrats of 1798 apprehended a possible wholesale arrest of Democratic members of Congress for the same offence, if such a step should prove necessary for perpetuating the Federalist hold on power. There was but one stronghold left—the State legislatures—from which to resist the supposed intentions of the Federalists, and but two of the State legislatures, those of Kentucky and Virginia—allied by blood, political sympathy, and former connection—were available at the moment. Two series of resolutions, the famous Virginia and Kentucky resolutions of 1798, were at once prepared, the former by Madison and the latter by Jefferson, and passed with little opposition, except in Virginia. They form the first declaration of principles of the new party. Both assert State sovereignty plainly; and, as State sovereignty is not only the putative but the real father of nullification and secession, a few words of explanation seem to be in place before analyzing the resolutions.

State sovereignty, the idea that the States had voluntarily formed the Union, and only voluntarily remained in it, was the formal belief of nearly all public men, and the hearty belief of many of them, until 1861. It was not until 1830, when a State's sovereign right to nullify national laws was first plainly asserted, that Jackson, Edward Livingston, and the other Democratic leaders modified the right of secession into a right of revolution under intolerable misgovernment, with a correlative right in the Federal Government to resist such a revolution. It was not until 1861, when the attempt to secede was openly made, that a hitherto unsuspected popular force compelled the national leaders to treat secession as rebellion. And yet neither Jefferson nor Madison, when they said State sovereignty, appear to have really meant State sovereignty to the full. The private correspondence of both, particularly of the former, shows that their governing desire was to have constitutional questions settled by a convention of the States. If a majority of the States pronounced against a State's claim that the Federal Government had transcended its powers, the State must yield and obey. But in that case what becomes of the State's "sovereignty"? Calhoun was more logical. When he said State sovereignty he meant it, and secession was a part of his possible train of action. Jefferson's "nullification" is to be effected by a convention of the States; Calhoun's, by the sovereign power of the State itself. To both secession seemed a possible calamity, but to Jefferson's thinking it was to be avoided by the maintenance of individual rights and the avoidance of class-government; while to Calhoun's it was to be avoided by an impossible yielding to the demands of a single section and of the interest of slavery which controlled it. The assertion of State sovereignty, then, in

these resolutions is only the assertion of a particularist feeling, made in the only way in which such an assertion could be made at the time.

The Virginia resolutions were eight in number. They express the State's condemnation of the alien and sedition laws, its regret that the general phrases of the Constitution have been so perverted as to allow of their passage, and its desire that other States should concur with it in arresting the evil. The third resolution is the essential one. It is as follows: "That this assembly doth explicitly and peremptorily declare that it views the powers of the Federal Government as resulting from the compact to which the States are parties, as limited by the plain sense and intention of the instrument constituting that compact, as no further valid than they are authorized by the grants enumerated in that compact; and that in case of a deliberate, palpable, and dangerous exercise of other powers not granted by the said compact the States who are parties thereto have the right and are in duty bound to interpose for arresting the progress of the evil, and for maintaining within their respective limits the authorities, rights, and liberties appertaining to them." The word "interpose" has been most vigorously attacked by Von Holst as equivalent to Calhoun's idea of nullification. It is therefore fair to remind the reader of the different manner in which the two "interpositions" were to be effected, and to admit, on the other hand, that the word "respective" is at least a very awkward word for an apologist for the resolution.

The Kentucky resolutions were nine in number, the first being the essential one, as follows: "That the several States composing the United States of America are not united on the principle of unlimited submission to their general Government; but that by compact, under the style and title of a Constitution for the United States and of amendments thereto, they constituted a general Government for special purposes, and delegated to that Government certain definite powers, reserving, each State to itself, the residuary mass of right to their own self-government; and that, whensoever the general Government assumes undelegated powers its acts are unauthorized, void, and of no force; that to this compact each State acceded as a State, and is an integral party; that this Government, created by this compact, was not made the exclusive or final judge of the extent of the powers delegated to itself, since that would have made its discretion, and not the Constitution, the measure of its powers; but that, as in all other cases of compact among parties having no common judge, each party has an equal right to judge for itself as well of infractions as of the mode and measure of redress." The fallacious idea here is in the word "compact:" the whole history of the country proves that the existence of the States is not due to their own power, but to the fixed preference of the whole country for the State form of local government, and that the whole country, by its own settled method of amending the Constitution, may at any time modify, diminish, or increase the powers of the States at its discretion. If the whole country chooses to give each State an opportunity of pronouncing on the change, that certainly does not make "each State an integral party," for we can hardly imagine a voluntary party to a "compact" who may be compelled to diminish his own powers. A line of citations from Jefferson's own correspondence is therefore given below to show that he himself was hampered by the indwelling consciousness of this fact; that a convention of the States was the real "party" which was to judge of infractions and the mode and measure of redress; and that his mythical State sovereignty was only particularism in a more ambitious dress than it has yet ventured to assume in other constitutional countries.

Both the Kentucky and the Virginia resolutions were sent to the other States, but received no support from them. In the following year Virginia reiterated her resolutions and followed them with a long commentary

by a committee of which Madison was the chairman—the once celebrated "Report of 1800." It defends the resolutions as containing nothing dangerous or revolutionary, but quietly assumes the existence of a "compact" between the States. Jefferson made no defence of the Kentucky resolutions, which, indeed, were then passing under the name of George Nicholas of Kentucky, but in the following year (1799) procured the passage of a supplementary resolution containing this clause: "That the several States who formed that instrument [the Constitution], being sovereign and independent, have the unquestionable right to judge of the infraction, and that a nullification by those sovereignties of all unauthorized acts done under color of that instrument is the rightful remedy." The last paragraph, standing alone, can easily and naturally be referred to the idea of "nullification" by the convention of States, but the word "several" in the preceding paragraph is difficult to reconcile with this view. And the difficulty is increased by the paragraph which followed the word "remedy" in Jefferson's original draft: "That every State has a natural right, in cases not within the compact [*casus non fœderis*], to nullify of their own authority all assumptions of power by others within their limits." It is not known whether Jefferson himself omitted this paragraph from the final draft, but the extracts from his correspondence below seem to show a flat opposition between this paragraph and his subsequent opinions. If the paragraph is admitted to be Jefferson's settled doctrine, he must be considered the father of nullification, even in the form given it by Calhoun.

In spite of the popular excitement over the hostilities with France, the last two years of Adams's administration show a steady increase of Democratic strength in the doubtful Middle States, Pennsylvania, New Jersey, and New York, owing to the unwise prosecutions in those States under the sedition law. The first test election came in New York in April, 1800, for the legislature which was to choose presidential electors. In that State, Aaron Burr had assumed control of the Democratic machine, and he managed it so well as to carry the State. In the presidential election Democratic electors were chosen by the whole South except Delaware, by Kentucky and New York, and eight of Pennsylvania's fifteen electors were Democrats. Jefferson and Burr received 73 electoral votes to 65 for their opponents, but the equality of their vote rendered a further contest in Congress necessary, in which Jefferson was finally chosen President (see FEDERAL PARTY). The Congress which met in 1801 was also Democratic in both branches, and before the end of Jefferson's first term the tide had set so strongly that the Federalists could depend on but three States—Massachusetts, Connecticut, and Delaware.

From the victory of 1800-01 the national history of the party becomes absorbed in the history of the country (see UNITED STATES), which it governed very steadily until 1840. Its policy was that for which the keynote was struck in Jefferson's first inaugural: "A wise and frugal Government, which shall restrain men from injuring one another, which shall leave them otherwise free to regulate their own pursuits of industry and improvement,—this is the sum of good government, and this is necessary to close the circle of our felicities." To this test every proposed measure was to be brought. There was to be no protection of any interest, no "paternal government;" and the less the Government did, the better it fulfilled its functions. The specifications of the general principle in the inaugural and elsewhere are as follows: universal suffrage, on the principle that "every man who pays or fights shall vote;" peace, commerce, and honest friendship with all nations, entangling alliances with none; the support of the State governments in domestic concerns, and of the general Government in foreign affairs; absolute acquiescence in the decisions of the majority; the supremacy of the civil over the military authority; economy in the pub-

lic expenses; the payment of the public debt; direct taxes in preference to customs; and avoidance of standing armies and of navies. In carrying out this policy Jefferson and Madison (his Secretary of State) were assisted by a corps of new men, mostly brought into prominence by the elections of 1800-01. Prominent among them were Albert Gallatin of Pennsylvania, a naturalized Swiss, who remained Secretary of the Treasury until 1814, and then went into the diplomatic service; James Monroe of Virginia and Robert R. Livingston of New York, who together accomplished the cession of Louisiana in 1803; Aaron Burr, president of the Senate, soon to be driven from the party for suspected treachery in the election of 1800; George Clinton, governor of New York; his greater nephew, De Witt Clinton, the founder of the New York canal system; and Eldridge Gerry of Massachusetts, afterwards governor of his State and Vice-President. In Congress, for the next dozen years, the party was not ably represented. In 1803, John Quincy Adams, the son of the late President, left his former party and gave strength to his new party friends; Henry Clay was in the Senate for a time (1806-07), and in 1807, William H. Crawford of Georgia entered the Senate. Outside of these names the main party strength still came from Virginia. From this State came the eccentric John Randolph, for four years the party-leader in the House, and thereafter independent of, and often opposed to, the party; John W. Eppes and Thomas Mann Randolph, sons-in-law of the President; and William B. Giles, Wilson C. Nicholas, and John Taylor, his confidential friends. Joseph B. Varnum, a managing Massachusetts politician; Samuel Mitchill of New York, who mingled natural science with politics; Michael Leib, an ultra Pennsylvania Democrat; Nathaniel Macon, a rigidly and severely honest politician, who served as a Representative and Senator from North Carolina for thirty-seven years (1791-1828); and Stephen Roe Bradley of Vermont, make up the list of men who managed the party until 1811. In their management of it they found at once that their strict construction of the Constitution must be modified in practice. Their acquisition of Louisiana in 1803 and the embargo in 1807 had absolutely no constitutional warrant; both were evidently exercises of the sovereignty which the Democrats denied to the Federal Government in home affairs. But in their real party purpose, the extension of the right of suffrage, they were steadily successful in all the States against the opposition of the Federalists. State after State repealed its property or other qualifications, and, though the restrictions had never been severe, their repeal was sufficient to give quite a new character to politics and to bring in new men as leaders in the course of the next decade. In their purpose to reduce expenses and pay off the debt the party-leaders were successful in the most unstatesmanlike fashion. In Europe, Great Britain and Napoleon had become chronic antagonists, the former respecting no law on the ocean, and the latter respecting no law upon the land. All the world with the exception of the United States had been drawn into the whirlpool of their contests, and only a strong navy could gain from Great Britain any respect for the commerce of the United States. But the support of a navy would have checked the payment of the debt, and the party-managers took strong ground against a navy. Most of the vessels which the Federalists had built were broken up and sold; cheap and useless gunboats were substituted for them; and support of the "gunboat system" and opposition to a navy became the touchstone of Democracy until the Constitution's victory over the *Guerriere* in 1812. To take the place of a navy, the Democratic majority in 1807 enacted the Embargo Law, which prohibited commerce altogether. When this had aroused a dangerous discontent in New England, the commercial district of the country, the "Non-Intercourse Law" was substituted in 1809. It forbade commerce with Great Britain and France until one or both should withdraw their edicts against Amer-

ican commerce. In this way the party mismanaged foreign affairs until it was forced into war in 1812.

In 1809, Madison took Jefferson's place as President. There had been much opposition to his nomination. Monroe estimated his claims to the Presidency as equal to Madison's, and George Clinton and his New York supporters felt that Virginia had no exclusive claim to the Presidency. Federalist opposition was so weak that Madison's nomination for the Presidency by the Congressional caucus was decisive. The same body gave Clinton the second place on the ticket. But in 1812, when Madison and Gerry were nominated by the caucus, discontent became revolt. De Witt Clinton had succeeded to his uncle's leadership in New York and to his uncle's aspirations. The Federalists adopted him as their candidate for the Presidency, and he thus obtained the votes of New England (except Vermont), New York, New Jersey, Delaware, and five of Maryland's eleven votes. Though he was defeated by 89 votes to 128 for Madison, yet the whole revolt had depended on Pennsylvania's twenty-five votes. The increase of Pennsylvania's western vote saved the whole vote of the State to Madison: had it gone to Clinton, it would have made him President by 114 votes to 103. A part of the bargain which had secured Madison's nomination by the caucus had been an agreement that he would abandon the peace policy and declare for war against Great Britain, for the system of no navy and restrictions on commerce had confessedly failed. New party-leaders had entered Congress with popular support behind them—William H. Crawford in the Senate, and Henry Clay of Kentucky, Felix Grundy of Tennessee, Langdon Cheves, William Lowndes, and John C. Calhoun of South Carolina, and Peter B. Porter of New York, in the House, being the leaders of the "War-hawks." These made their party a war party, and war was declared June 18, 1812 (see UNITED STATES).

The end of the war of 1812 left the country in severe straits. The long delay to prepare for war, the attempt to support it wholly by means of loans, and the pronounced hostility to the loans in New England, where alone they could be floated, had brought the national credit very low, and the first step of the dominant party was to charter a new national bank to take the place of Hamilton's, whose charter had been allowed to expire in 1811. This was not accomplished until April 10, 1816; the charter was to run twenty years; the capital was to be \$35,000,000, one-fifth cash, four-fifths Government stocks; the Government was to have the appointment of five of the twenty-five directors; and the bank was to have the custody of the public funds, except in cases when the Secretary of the Treasury should decide to place them elsewhere, when he was to report his reasons at once to Congress. In the same year a slightly protective tariff on woollen and cotton goods became law. This was also a departure from Jeffersonian canons. But manufacturers were still a part of the Democratic party, and looked to it for protection. Jefferson himself, in his correspondence at this time, acknowledges a considerable change of feeling in regard to protection, and accepts its theory to a considerable extent as a preparation for possible war and the means of national independence. In 1819-20 a still more protective tariff passed the House, but failed in the Senate; and in 1824 and 1828 new tariffs were passed which raised the average duty to about 37 per cent. in the former year and nearly 50 in the latter. In a third respect the Jeffersonian theory was abandoned. About 1822 the policy of improving rivers and harbors and of building roads and canals at national expense was fairly begun, and during Adams's administration (1825-29) was carried out very thoroughly. The check which was given to the process in 1829 is curious and instructive.

The political history of New York, the largest State in the Union, with the greatest diversity of interests, is a good example of the development of Democracy.

While the suffrage was limited to freeholders political contest was limited to three great families, the Clintons, Livingstons, and Schuylers, and their adherents by blood or marriage. The influence of the last-named disappeared with Hamilton's death in 1804. The other two maintained for years after 1800 a war of varying successes, in which the State civil service was made open use of as a political weapon. De Witt Clinton usually maintained a superiority, but his self-confidence steadily drove from him his leading supporters, who gradually coalesced into the Bucktail or Tammany faction, and overthrew him. By this time the suffrage had been so far widened that no one man could manage a party in the State; and about 1821 the little knot of Bucktail leaders, soon to be known as the "Albany Regency," made its appearance. Their first principle was always to control the State by the political use of its civil service; and their second, to throw their leading men from time to time into the national service, there to maintain that theory of State rights which would leave the State of New York to manage its own concerns under the guidance of the Regency. Strict discipline, faithfulness to friends, unsparing punishment of desertion, made up the Regency's code of action. In 1825 the Regency was in favor of William H. Crawford for President, as he had been the "regular candidate" of the Congressional caucus, the customary nominating body since 1797. But there were then other candidates, all nominally Democrats: Henry Clay, Speaker of the House, John Quincy Adams, Monroe's Secretary of State, and Andrew Jackson, a private citizen of Tennessee nominated by the legislature of his State. The friends of these candidates refused to take part in or be bound by the action of the caucus, and the electors made no choice, Jackson having 99 votes, Adams 84, Crawford 41, and Clay 37. In the following February the House of Representatives was to choose between the three highest on the list. Crawford was now so paralyzed as to be a hopeless candidate, and his vote in the House was but four States. The Clay vote went to Adams, and he was chosen by thirteen States to seven for Jackson. The fact that Jackson had had a plurality of both the popular and the electoral vote, and yet had failed of the election, woke to life the spirit of democracy, which had been accumulating under the gradual widening of the right of suffrage, and it soon became evident that Jackson was to be the "popular" candidate in 1828. Until this became evident the Regency trimmed between Adams and Jackson, with a strong inclination to the former; Sept. 26, 1827, Tammany Hall suddenly "pronounced" in favor of Jackson, and the whole Regency influence in the State went with it. Already the Regency had a member ready for national service. Martin Van Buren had in 1821 been elected to the United States Senate, and he conscientiously held all the "strict-construction" views of the Constitution which were so necessary for the continuance of the Regency's power. Van Buren's natural powers and the importance of New York's accession recommended him to the Jackson party and its head. In 1828, Jackson received a majority of the popular and electoral vote, and became President. Van Buren became his Secretary of State, and his appearance in the Cabinet marks the beginning of a development of Jackson's views in the direction of orthodox "strict construction." Before his election he had been no opponent of the Bank of the United States or of internal improvements or of a protective tariff, and had tried to induce Monroe to make the civil service non-partisan; after his election his whole drift is in the opposite direction. The conclusion seems inevitable that advancing democracy in New York had successfully secured, through one of its members, the lead of the national Democracy, and that it had thus reasserted the original Jeffersonian theory, together with that of rotation in office, which had hardly been more than a speculation with Jefferson.

For this period see, in general, Hildreth's *United States*; Schouler's *United States*; Tucker's *United States*; Ham-

mond's *Political History of New York*; *Statesman's Manual*; 1-9 Benton's *Debates of Congress*; Ingersoll's *Second War with Great Britain*; Van Buren's *Political Parties in the United States*; Gillet's *Democracy in the United States*; Jefferson's *Works*; Madison's *Writings*. For biography see Randall's *Life of Jefferson*; Rives's *Life of Madison*; Parton's *Life of Burr* and *Life of Jefferson*; Adams's *Life of Gallatin*; Austin's *Life of Gerry*; Garland's *Life of Randolph*; Pinckney's *Life of Pinckney*; Dallas's *Writings of Dallas*; Adams's *Memoir of John Quincy Adams*. For authorities of an opposite cast see FEDERAL PARTY. The "Kentucky and Virginia resolutions" and Madison's "Report of 1800" are in 4 Elliot's *Debates*, 528-580. The authorized Democratic defence of them is in 1 Benton's *Thirty Years' View*, 347-360; the severest criticism of them in Von Holst's *United States*, 144-171. In connection with this latter, to show that Jefferson's thought was a "nullification" by national convention, and not, as Von Holst assumes, by a single State, the reader is referred to 3 Jefferson's *Works* (the edition of 1833, in four volumes), 429, 452, 453, 462, and 4: 163, 199, 221, 306, 374, 396. The last two citations are as follows: "But the chief-justice says, 'There must be an ultimate arbiter somewhere.' True, there must; but does that prove that it is either party [the Federal Government or a State]? The ultimate arbiter is the people of the Union, assembled by their deputies in convention at the call of Congress or of two-thirds of the States. Let them decide to which they mean to give an authority claimed by two of their organs." "If the two departments [Federal and State] should claim each the same subject of power, where is the common umpire to decide ultimately between them? In cases of little importance or urgency the prudence of both parties will keep them aloof from the questionable ground; but if it can neither be avoided nor compromised, a convention of the States must be called to ascribe the doubtful power to that department which they may think best." But see also the proposed protest of 1825 at page 415 of the same volume.

II. (1825-60). One of Jefferson's theories (which he had never thoroughly put into practice) was that an essential part of the republican system was a popular control of all officials through frequent elections. But the national civil service was different from that of a village or town: its officials were appointed, not elected. How were these to be reached? Evidently through removal by the President: when the people "desired a change" they could obtain it by changing the President, and could reach appointive officers through his power of removal. On this specious basis, this attempt to limit the administrative machinery of a great republic to the simple methods of a New England town, was built the Democratic theory of "rotation in office," slightly enforced by Jefferson, long familiar in New York and Pennsylvania, and finally enforced to the full by Jackson and Van Buren. Within the first year of the new Administration the removals of department officers, marshals, district attorneys, revenue officers, and land agents numbered 176, and of postmasters 491. Removals under former Administrations had been as follows: Washington (eight years), 9; John Adams (four years), 10; Jefferson (eight years), 39; Madison (eight years), 5; Monroe (eight years), 9; and John Q. Adams (four years), 2. Within three years the Administration had thoroughly "reformed" its civil service.

In the course of this process the Administration came into collision with the national bank, which refused, in June, 1829, to remove one of its subordinate officers for political reasons. Jackson was prepared by nature to see in any such institution one of "deadly hostility to republican institutions;" and this refusal of the bank to obey the will of the Democracy, as expressed in his election, only served to draw him to notice the bank as he had not noticed it before, and to bring out his natural opinion of its nature. His first annual message (in December, 1829) expressed doubts as to the constitutionality of the bank's charter, and the committees of both Houses reported that the charter was constitutional. The next year he renewed the suggestion more strongly, and no attention was paid to it. In 1831 he again renewed it, and this time brought conflict. His open opposition to the bank had prepared all the ele-

ments of the opposition (see WHIG PARTY) to support the bank. A presidential election was impending, and the opposition hoped that a conflict would alienate from him all his supporters who believed in the bank, and that this defection would defeat him. The bill to re-charter the bank was at once prepared, ostentatiously introduced by an Administration Senator from Pennsylvania, passed the Senate June 11, 1832, and the House July 3, and was vetoed by the President July 10. The constitutional reason assigned was the want of power in Congress to charter any such institution, but a more popular and comprehensible reason was the one word "monopoly," which occurs sixteen times in the message, besides many other synonymous words, such as "exclusive privileges," "special favors," etc. A two-thirds majority could not be obtained to pass the bill over the veto, and the whole question was relegated to the presidential election in November. In this Jackson was re-elected, and this result he looked upon as a popular decision in his favor. He allowed the Congress then in existence to expire in March, 1833, and then proceeded to obtain by removal and appointment a Secretary of the Treasury who would do his will against the bank. The charter of 1816 directed the public funds to be deposited in the bank or its branches, "unless the Secretary of the Treasury shall at any time otherwise order and direct," in which case he was to give his reasons to Congress as soon as it should meet. Such cases had often arisen in Southern and Western towns where the bank had no branches: Jackson used it to attack the "mother bank." Oct. 1, 1833, the new Secretary of the Treasury, Taney, by direction of the President, suspended further deposits in the bank, and at the next session of Congress assigned as his main reason the suspected insolvency of the bank. However contrary to the spirit of the law, this "removal of the deposits" was certainly a political master-stroke. In the new Congress the House was in favor of the President, but the removal avoided all need of management or discussion to get a verdict in his favor. It presented the verdict signed and sealed, and threw upon the opposition the labor of reversing it. This was never done. Succeeding Congresses were Democratic, and refused to help the bank, and it secured a charter from Pennsylvania. The Senate of 1833-34 was anti-Jackson, and passed a vote of censure upon him, March 28, 1834; but this vote was expunged from the record Jan. 16, 1837, when the political majority had changed. During all this contest there were subsidiary events—investigations, charges and counter-charges of bribery and corruption, and commercial distress—but the only process here considered is that by which the President made his party an anti-bank party.

In other matters Jackson applied similar discipline to the party, but he possessed the Tudor characteristic of knowing when it was necessary to yield. His veto of the Maysville road bill, May 27, 1830, really ended the internal improvement system, and yet he was compelled several times afterward to yield and sign such bills. When they were passed within the last ten days of the session he disposed of them by a "pocket veto," retaining them without signing them; when a veto could win support he used the veto; but even when he yielded, his influence went against the system so strongly that under his successor, Van Buren, the tools held by the Government were finally sold off at auction. His policy was much the same in the matter of the tariff. He declared strongly against protection, but when the protective tariff of 1832 was passed by the assistance of Democratic votes, he signed it. When South Carolina undertook to nullify the law, he declared his intention to suppress by force any resistance to it, but at the same time the whole influence of the Administration in Congress was thrown in favor of the Verplanck bill, reducing duties to a revenue standard. In this manner the President managed his party, perpetually quarrelling with sections of it, never with the whole; always applying a steady pressure to influence its course, and

yet always ready to yield for the moment; and as a result there was behind him at the close of his second term of office in 1837 a completely organized party, the Regency's conception enlarged into national proportions. New men had come in at or shortly before the political revolution of 1829, and in leadership the party was almost entirely new. Chief among the leaders were Van Buren, Jackson's Vice-President and destined successor; Hugh L. White, a Tennessee aspirant to the Presidency, whose disappointment at the President's antagonism to him was already driving him over to the opposition; and Thomas H. Benton, once a bitter Tennessee enemy of Jackson, now a Senator from Missouri and Jackson's trusted lieutenant, honest, verbose, and self-sufficient. Other leaders, prominent already or soon to be so, were John Holmes, an old leader in Maine; in New Hampshire, Levi Woodbury, Jackson's Secretary of the Navy and Treasury, Isaac Hill, an editor and the party manager of the State, Franklin Pierce, afterwards President, and Charles G. Atherton, whose name is connected mainly with the "gag resolutions" by which he endeavored to check slavery debate; in Connecticut, Isaac Toucey and John M. Niles; in New York, C. C. Cambreleng, the special advocate of free trade, and the leaders of the "Regency" (see BARNBURNERS); in New Jersey, Garret D. Wall and Peter D. Vroom; in Pennsylvania, James Buchanan, afterwards President, George M. Dallas, afterwards Vice-President, and Henry A. Muhlenberg, the most popular leader in his State; in Virginia, Philip P. Barbour and Andrew Stevenson; in Mississippi, Robert J. Walker, a Pennsylvanian by birth and education and the framer of the "revenue tariff" of 1846; in Tennessee, Felix Grundy, Cave Johnson, and James K. Polk; in Kentucky, Richard M. Johnson, the supposed slayer of Tecumseh and the avowed foe of imprisonment for debt; and in Ohio, William Allen, who disappeared from politics in 1849 until his election as governor of the State in 1874. This was the school of politicians which received the control of the party from Jackson, and kept it until slavery proved too strong for them. Their leading characteristic was caution: Van Buren's reported unwillingness to say positively whether the sun rose in the east or in the west, on the ground that east and west were "only relative terms," is not a violent exaggeration of his school's characteristic. On the surface all was a cautious watchfulness of and deference to the general sentiment of the party; under the surface was the vigorous direction of the expression of the sentiment which was to be obeyed. For this purpose the system of nominating conventions was carefully elaborated. This method of nomination occurs but a few times in our history before 1825, and these exceptional instances were the first blind gropings of the New York "Bucktails" towards the future development. When the Congressional caucus broke down in 1824 as a presidential nominating body, that function was appropriated for a few years by State legislatures. In 1831-32 the first national nominating conventions were held by the Anti-Masons and National Republicans, but nominations of a lower grade were still the result of mob caucuses. Before 1836 the Democratic party-leaders had fairly completed that national organization which succeeding parties have only copied, local conventions sending delegates to county, district, or State conventions, and district conventions being the unit of national conventions. In this way the party was so marshalled that in 1836 Van Buren was elected Jackson's successor over all the elements of the opposition (see WHIG PARTY).

In warring upon the bank Jackson's only alternative had been to make deposits in selected State banks, commonly known as "pet banks." This sudden influx of available wealth led all the banks to increase issues, and new banks, often without capital, imitated them. All these notes were received for public lands until the "specie circular" of July 11, 1836, directing agents to receive only gold and silver for lands, sent the whole tide of paper-money back to the Eastern States for

redemption. The result was the "panic of 1837." Throughout it Van Buren and the other leaders held the party to the *laissez faire* policy, refused to interfere with the business of the country, and bent all their energies to the passage of the "Independent Treasury" or "Sub-Treasury" Act. This made each official responsible, under bonds, for the safe-keeping and transfer of the public moneys which he should collect, and made the Government its own banker. On all points the party was now at one, and its national convention at Baltimore, May 5, 1840, for the first time formulated a platform. It defined the Federal Government as "one of limited powers, derived solely from the Constitution," and declared that "the grants of power shown therein ought to be strictly construed by all the departments and agents of the Government, and that it is inexpedient and dangerous to exercise doubtful constitutional powers." It opposed the expenditure of the national revenues for any system of public improvements, the charter of a United States bank, or the protection of manufacturers by the tariff, and favored a tariff for revenue only and an independent Treasury. The leading points of this platform were repeated by every succeeding convention until 1864, and form the only historical basis of the party. Of the other leading Jeffersonian ideas, universal suffrage was now accepted by all parties, and "rotation in office" has proved to be successful only in cheating the people and debauching the politicians.

Van Buren was nominated for the Presidency, but the Whigs succeeded in beating him and gaining control of the new House of Representatives. Nevertheless, the party's organization kept it well in hand throughout the trying term of John Tyler. It regained control of both Houses in 1842, and Tyler himself, like Calhoun and the other South Carolina and Virginia nullifiers of 1830-32, had drifted fairly back to the Democratic party. But this latter faction had none of the caution which marked the leaders of 1828-36. To the one the party was all, and slavery only an incident; to the other slavery was all, and the party only an incident. The new accession brought with it one controlling desire for the annexation of Texas. With this object Calhoun had entered the Cabinet, and this object he succeeded in accomplishing. Delegates from Southern States to the Democratic convention were pledged to annexation; and when Van Buren declined to support it he cut himself off from any chance to obtain the Democratic nomination, since a two-thirds majority was necessary for that purpose, according to the time-honored rule in Democratic conventions. Polk was nominated; the votes of New York and Michigan were given to him by the refusal of the abolitionists to vote for Clay; the vote of Pennsylvania was given to him through a letter from him to Kane of that State, in which he declared himself a free-trader with a leaning toward protection; the vote of Louisiana was given to him by unblushing frauds in Plaquemines parish; but only the vote of New York was a necessity, and he was elected.

Texas was annexed, and the war with Mexico followed. Texas was a slave State when annexed, but the other annexed territory, California, Utah (including Nevada), and New Mexico (including Arizona), brought with it the seeds of division and war. A large part of the Northern wing of the party approved the Wilmot proviso of 1846, excluding slavery from the new territory (see FREE-SOIL PARTY); but to the Northern leaders the party was still everything, and the Southern wing, which was necessary to the party, would not tolerate the proviso. The Wilmot-proviso men were "read out of the party," and the doctrine of "popular sovereignty," the natural, not constitutional, right of the people of a Territory to decide the status of slavery within their limits, made its appearance instead of the proviso. Of course it was only a device to throw the burden of decision off the Democratic party, but it was for the time a successful device. The Whig party split

gradually into two parts: the Democratic party not only remained united, but gained continual accessions from Southern Whigs. A State schism in New York (see BARNBURNERS) defeated its nominees, Cass and Butler, in 1848; but in 1852 this schism had skinned over, the Whig party had gone to pieces, and the Democratic nominees, Pierce and King, received the electoral votes of all but four States, and were elected.

The position of the party at Pierce's inauguration was one of triumphant success and of imminent peril. It was the only national party, for the Southern Whigs had nearly all abandoned their former organization; but the unnatural growth of its Southern wing had thrown the party out of all natural proportion. To be sure, it had carried one more State in the North and West than in the South in 1852, but the majorities in the former sections were regularly small, and due mainly to the Free-Soil and Whig divisions, while in the latter they were heavy and reliable. This one circumstance was sufficient to give the South a new claim to the control of the party, and from this time until 1860 the proportion of Southern leaders in the party steadily increased. A large part of them were moderate men, but even the Whig accessions, such as A. H. Stephens and Robert Toombs of Georgia, and Clingman of North Carolina, had little of the old Democratic caution; while the new Southern element—JEFFERSON DAVIS of Mississippi (see his name) and Robert C. Breckinridge of Kentucky being the most conspicuous representatives—was distinctly aggressive and altogether wanting in caution. In the North and West there was nothing to balance these influences. There was now a heavy vote there, one great leader, Stephen A. Douglas of Illinois, and a number of second- and third-rate men: the old Northern leadership had disappeared. Douglas was the putative father of the doctrine of "popular sovereignty" which had saved his party from the fate of the Whigs, and he valued it far above its deserts. In the cases of Utah and New Mexico he had endeavored to apply it because the status of slavery in those sections had not been settled, and could not be settled without a sectional conflict. When the Territories of Kansas and Nebraska came to be organized in 1854, no such difficulty was in the way. Both lay north of latitude 36° 30', and slavery had been forbidden in both by the Missouri compromise of 1820. But there was a difficulty in getting Southern votes to extinguish the Indian title in the new Territories; and, further, the desire to be consistent moved Douglas to apply his pet doctrine of popular sovereignty in this case also, the Missouri compromise and its positive prohibition of slavery to the contrary notwithstanding. Moved by both influences, he introduced in the Senate, in Jan., 1854, his "Kansas-Nebraska Bill," the most pregnant in consequences of all our national legislation. It organized the two Territories in the usual manner, but declared that the Constitution and laws of the United States were in force in them, except section 8 of the Missouri Compromise Act (the prohibition of slavery), "which, being inconsistent with the principle of non-intervention by Congress with slavery in the States and Territories, as recognized by the legislation of 1850, commonly called 'the compromise measures,' is hereby declared inoperative and void." It has been denied that this was a "repeal" of the Missouri compromise; but the voiding of the Missouri compromise, being based on subsequent legislation, and not on the antecedent Constitution, is evidently a repeal, and nothing else; and it cannot be held the repeal was in the legislation of 1850, for that had no assertedly exclusive constitutional ground, and was only a measure of expediency. From every point of view it flung again into the political arena a question once disposed of, and the final result was the disruption of the Democratic party, just as the Whig party had been disrupted over the status of slavery in the Mexican annexation.

The passage of the Kansas-Nebraska Bill in the Senate was not a difficult matter. Fifteen of the thirty-one

States were slave States; their Senators were unanimous on any question relating to slavery; and but two Northern votes were necessary to give them a majority in any event. The House was a different field, and here the passage of the bill was not effected until May 22, 1854, by a vote of 113 to 100. In the affirmative were 44 Northern votes, all Democrats, and all the Southern votes but those of 9 border-State members; in the negative, 91 Northern votes, mainly Whigs. But the passage of the bill roused an excitement in the North greater and deeper than had before been known there. A section of the Northern Democratic party broke off from the organization; new and ambitious leaders came forward to head the revolt; the great body of Northern Whigs joined them; and the Republican party, with Whig principles and Democratic methods, was born (see REPUBLICAN PARTY). In the elections of 1854-55 Democratic candidates were defeated everywhere, and their leaders were dismayed to find that their opponents, "a mushroom and mongrel" organization, as yet hardly named, were strong enough to elect the Speaker of the House in 1855. From this time there was but one question: Would the whole body of Northern Whigs join the new party? If so, the Republicans would have a solid Northern vote, and could elect the President and control the House. If not, the Democrats could still hope for sufficient Northern strength to control the country. The latter event occurred. A respectable part of the Northern Whigs were conciliated by the nomination of Buchanan, a Pennsylvania man and very cautious in the expression of any views on protection; a still larger portion went into the "Know-Nothing" organization; and the electoral votes of Pennsylvania and Illinois made Buchanan President, though without a complete majority of the popular vote. The four years from 1852 to 1856 had certainly been no successful years for the party.

It is doubtful whether any party-leadership could have successfully directed the storm which the Kansas-Nebraska Bill had now evoked, but it must be confessed that the Democratic leaders did not deserve success by the courses they adopted. In Kansas, Missouri squatters had instantly gained control of the Territorial government. The Free-State settlers therefore organized a State government under the Topeka constitution in 1855, and in the following year the President dispersed it by armed force. Two years later the Free-State settlers gained control of the Territorial legislature, and proceeded in the formation of a State government to which no exception could be taken. But in the closing hours of the pro-slavery legislature a State government had been arranged under the Lecompton constitution, which was not to be submitted to popular vote excepting as to the single question, "With or without slavery?" Douglas and a part of the little remnant of Northern Democrats in Congress here halted, and would go no further; but the Congressional control of the party was now almost entirely Southern, and support of the Lecompton Bill became the test of party fealty. Few as were the leaders of the "anti-Lecompton" faction in Congress, the mass of the Northern Democratic vote was behind it. The furthest concession it could obtain was the submission of the Lecompton constitution to a new popular vote in Kansas, at which it was summarily rejected.

When the national convention met at Charleston, S. C., April 23, 1860, there was division from the start. The Northern delegates came prepared to declare that they had not changed their opinions as to "popular sovereignty" in the Territories, but that they would yield to and abide by the decisions of the Supreme Court [in the Dred Scott case] (see DRED SCOTT CASE). The Southern delegates came prepared to insist on the logical consequences of the Dred Scott decision: that slavery was legal in every Territory; that it could not be abolished or interfered with by Congress or by the Territorial legislature; and that popular control over it only began at the admission of the Territory as a State.

Here the convention split. To have gone before the country on the Southern platform would have been political suicide for every Northern Democratic aspirant to State office or Congress; and the convention adopted the platform reported by the Douglas minority of the committee on resolutions. Thereupon the Southern delegations seceded from the convention, April 30 and May 1, and organized a convention of their own. The border-State delegations remained in the convention, and there took part in fifty-seven unavailing ballots for a candidate. Douglas had about 150 votes, and various border-State candidates about 100, but no candidate had a two-thirds majority of the original (303) votes of the convention. May 3 the convention adjourned to meet again at Baltimore, June 18. There the majority admitted several Douglas delegations to fill vacancies, and the border-State delegates withdrew and unanimously nominated John C. Breckinridge and Joseph Lane, June 28. Their nomination was ratified the next day by the original seceding convention, now in session at Richmond. In the mean time the residuum of the convention had held two ballots, the vote on the second (fifty-ninth) ballot standing 181½ for Douglas, 7½ for Breckinridge, and 5½ for Guthrie of Kentucky. It seems then to have occurred to its leaders that, as there were not 202 votes now in the convention, it would be difficult at least to give Douglas two-thirds of the original number of votes. It was therefore decided that Douglas was nominated, having two-thirds of the present number of votes. Benjamin Fitzpatrick of Alabama was nominated for the second place, but declined it, and Herschel V. Johnson of Georgia was substituted. The secession of the Southern delegations has been denounced as an intentional disruption of the Democratic party in order to secure Lincoln's election as a fair excuse for State secession. The political excuses for their action may be thus stated: Buchanan's experience in 1856 had shown that the party could no longer command a majority of the popular vote, and the chances were now worse for a majority of the electoral vote. Douglas could carry no Southern States, and Breckinridge no Northern States. Then let each poll his full strength in his own section, while the Bell and Everett ticket draws the old Whig strength away from the Republicans: there will be no choice of the electors, and in the House, voting by States, the South can force in Breckinridge in order to save the Union. Some such idea was in the heads of most of the Southern managers; and, though it failed and Lincoln was elected by 180 electoral votes out of 303, it is well to remember that if the "fusion ticket" of the combined opposition had carried New York with its thirty-five votes, or Pennsylvania and New Jersey with their thirty-one Republican votes, the plan would have been so far successful. Whether it would have been successfully carried out to the end may be doubted, but the running of fusion tickets in these three States shows how close had been the calculations of the managers.

See Von Holst's *United States*; Tucker's *United States* (to 1840); Benton's *Thirty Years' View* (to 1850) and *Debates of Congress* (to 1850); Woodbury's *Writings*; Niles's *Weekly Register*; *Democratic Review* (1838-59); 1 A. H. Stephens's *War between the States*; Chase's *Administration of Polk*; Buchanan's *Administration*; Cluskey's *Political Text-Book of 1860*; 1 Greeley's *American Conflict*; *Statesman's Manual* (for Presidents' messages to 1859); Fowler's *Sectional Controversy*. For authorities of an opposite cast see WHIG PARTY and REPUBLICAN PARTY. Electoral and popular votes are most conveniently collected in Spofford's *American Almanac* (1878), 119-169. In biography, see Parton's *Life of Jackson*, Sumner's *Life of Jackson*, Von Holst's *Life of Calhoun*, Hunt's *Life of Livingston*, Amos Kendall's *Autobiography*, J. A. Hamilton's *Reminiscences*, Holland's *Life of Van Buren*, Hammond's *Life of Silas Wright*, Scott's *Life of Hugh L. White*, Hamilton's *Memoir of Rantoul*, Dickinson's *Life of D. S. Dickinson*. Mackenzie's *Life and Times of Van Buren* and *Lives of Butler and Hoyt* are only useful for the confidential letters stolen and published by Mackenzie. The party platforms from 1840 until 1860 and the proceedings

of the Charleston convention are in Greeley's *Political Text-Book of 1860*. See also authorities under BARNBURNERS; DAVIS, JEFFERSON.

III. (1860-82). Since 1860 the national history of the party has been one of opposition, and any sketch of it must be merely complementary to that of the dominant party (see REPUBLICAN PARTY). At the outbreak of the rebellion in 1861 its members and leaders were as eager for the suppression of the rebellion by arms as their opponents. Democrats like Douglas, John A. Dix of New York, Edwin M. Stanton, and Andrew Johnson at once took the name of "War Democrats," and were soon practically Republicans. As the war went on, as its expenses became greater, and as it began to strike at slavery (see ABOLITION) Democrats began to revert to the memories of the anti-slavery conflict and to detest an "anti-slavery war." Their first thought was the assembling of a Federal convention, like that which had formed the Constitution, in order to end the conflict; and this, though as evidently inopportune as an attempt to read the riot act to the contending armies at Gettysburg, became the desideratum of the great mass of the party throughout the war. It could not strike at slavery; it would not consent to the ultimatum of the South, independence; and thus, still striving to maintain its traditions, the party worked its way through the war until 1864, beaten in almost all State elections, and yet maintaining its proportion of the popular vote and of the lower House of Congress. But within the party there were two smaller elements—one which desired peace, even at the price of Southern independence, and another, mainly along the Ohio and Potomac rivers, which desired Southern independence itself as ardently as Southern leaders could have done. "Peace meetings" became the weapon of the one, and secret societies, such as the "Knights of the Golden Circle," were formed by the other. In order to suppress both of these "fires in the rear" the President suspended the privilege of the writ of *habeas corpus*—at first, in April, 1861, as a local military measure, then generally, Sept. 24, 1862, as commander-in-chief, and finally, Sept. 15, 1863, by virtue of an act of Congress of March 3, 1863. The victims of "arbitrary arrest" under this suspension were regularly of the two classes above specified; but as these were all of one party, the conviction that the object of the *habeas corpus* suspension was entirely partisan spread, until the Democratic party was controlled by an active hatred of the "executive despotism" of Pres. Lincoln. When the national convention met at Chicago, Aug. 29, 1864, the platform for the first time dropped the resolutions of 1840, and was solely devoted to an attack on the management of the war. It "explicitly declared, as the sense of the American people, that, after four years of failure to restore the Union by the experiment of war," "justice, humanity, liberty, and the public welfare demand that immediate efforts be made for a cessation of hostilities, with a view to an ultimate convention of all the States or other peaceable means, to the end that at the earliest practicable moment peace may be restored on the basis of the federal union of the States." The phrase "convention of all the States," which sugar-coated the "failure of the war" to the convention itself, was not so successful to the country at large: the nominees, George B. McClellan of New Jersey and George H. Pendleton of Ohio, though they received 45 per cent. of the popular vote, carried but three States, New Jersey, Delaware, and Kentucky, with 21 of the 233 electoral votes, and were defeated. Such a defeat presaged greater evil for the future: that portion of the doubtful vote which loves to be upon the winning side at once concluded that the Democratic party was practically dead; its Congressional representation sank lower and lower; and the only policy of the party seemed to be a chronic readiness to oppose any measure introduced by a Republican. It was only able to enter a formal protest against the method adopted by the dominant party to recon-

struct the lately rebellious States, and its passionate protest only served to make the terms of reconstruction more severe. It could only see that the war was over, that the Constitution's war powers had therefore ceased to apply, and that Congress had no constitutional power to interfere with the right of suffrage in a State. It could not be persuaded that war does not cease at the demand of the conquered or until the demands of the conquerors are satisfied; that some political penalty was to be paid for secession; and that the good offices of a mediator who demanded the entire remission of the penalty were hardly likely to be of much effect. During the period of reconstruction almost the only case in which the Democratic opposition achieved the result which it desired was the acquittal of Pres. Johnson on his impeachment trial by the united vote of the Democratic Senators, assisted by seven of their opponents.

Since 1850 the party had been constantly engaged in struggles with which its fundamental principles had no connection: universal suffrage, individual liberty, opposition to governmental protection in any form, and the preference of State to central government in fairly doubtful matters, had been dimmed in the eyes of Democrats themselves by the long contest against abolition, war, and reconstruction. When the national convention met at New York, July 4, 1868, it for the first time in the party's history pronounced against universal suffrage and "hard money." Compelled to choose between the admission of the enfranchised negroes to the right of suffrage and the jurisdiction of the States over that privilege, it chose the latter. Its leaders had opposed the issue of legal-tender paper money in 1862-63 as destructive to the interests of the mass of citizens. But the money had been issued; it had been used in the purchase of bonds; the "fifties" did not state on their face that the principal was to be paid in coin; and the convention proposed that they should be paid in "lawful money of the United States"—that is, in greenbacks. As both fifties and gold were then at a premium, the former of about 10 per cent. and the latter of about 38 per cent., and as they came to an equality in the course of the following year, it must be confessed that the party proposed to sell one of its fundamental principles, its denial of the "legality" of Government paper money, at a very low rate. Pendleton, Gen. Hancock, Thomas A. Hendricks of Indiana, and Andrew Johnson were the leading candidates before the convention, but no one seemed able to command the requisite vote. On the twenty-second ballot the Ohio delegation stampeded the convention into nominating its president, Gov. Horatio Seymour of New York, one of the most trusted party-leaders. His letter of acceptance was a temperate appeal to doubtful voters to elect a Democratic President as a counterpoise to the absolute power of the dominant party in Congress. But the nominee for Vice-President, Frank P. Blair of Missouri, had already publicly declared that a Democratic President must "trample into dust the usurpations of Congress known as the Reconstruction Acts," "compel the army to undo its usurpations at the South, and disperse the carpet-bag governments." No such programme was desired by the country, and the nominees were defeated, receiving 80 of the 294 electoral votes, but retaining their proportion of the popular vote.

This election ended the party's resistance to reconstruction, and the work was finished under its silent protest. But the thoroughness of the work had prepared the way for a reaction. The forcible means by which many of the reconstructed State governments had to be supported, the manner in which many of the reconstructed constitutions had disfranchised all persons prohibited from holding office by the fourteenth amendment—that is, most of the influential whites—and the consequent future difficulty of "supporting the pyramid for ever on its apex," had wearied and disgusted many of the Republicans. A successful movement was begun in Missouri in 1870 to obtain

"universal amnesty and universal suffrage" by a union of Democrats and "Liberal" Republicans, and in the two following years it took larger proportions. A "Liberal Republican" convention was held in Cincinnati, May 1, 1872; but instead of nominating a leading candidate acceptable to all Democrats, it chose Horace Greeley of New York, a man of great ability, unselfishness, and honesty, but a veteran Whig and Republican editor, who had been the Black Douglas of every political battle against the Democrats since 1840. Hard as the road was, the Democratic party was obliged to take it. It was easier to sign a platform offered from another convention, accepting the results of the war, than to offer it as an original contribution to American politics; and the convention at Baltimore, July 9, adopted the Cincinnati platform and ratified the Cincinnati nominations of Greeley and B. Gratz Brown of Missouri. As might have been expected, Democratic refusals to vote more than counterbalanced any Republican accessions, and the nominees received but 66 out of 352 electoral votes. About 30,000 "straight-out" Democrats abandoned the nominations altogether, voting for Charles O'Connor of New York and John Quincy Adams of Massachusetts. Some Democrats still take pride in declaring that they "took no part in the Greeley movement," thereby really meaning that they left all the inevitable humble pie to be eaten by their more unselfish party associates. Released from the incubus of unavailing opposition to accomplished facts, the party at once began to show signs of returning vitality. The State and Congressional elections of 1874-75, the "tidal wave," resulted in general Democratic success through the North, even Massachusetts electing a Democratic governor; and at the meeting of the Forty-fourth Congress, in Dec., 1875, the House of Representatives had a Democratic majority of over 60. In this House the party maintained a majority until 1881, and for the last two years of this period it controlled the Senate also; and yet it succeeded in making hardly any change in the general policy of the dominant party. Of course, one great reason for this was that it controlled but one House during most of the time, and a professed apologist might assert that the abuses which had grown up were too great for reformation except by an entire change in the control of the Government. But in either case the real reason would be untouched. In the Southern States the government had been transferred, by the reconstruction acts of March, 1867, to such persons as were not ineligible to office by the fourteenth amendment. Most of the States thus passed at once under control of negroes and of a few white Republicans, who were called by their opponents "scalawags" if of native birth, and "carpet-baggers" if immigrants from the North. By removal of disabilities, and the consequent increase of the white vote; by the entrance to politics of a new generation of whites free from disfranchisement; by the employment of every engine of interest, force, and even fraud,—the masterful white race had in 1875 regained its supremacy in every State but South Carolina, Florida, and Louisiana, and these three followed in 1877. But this supremacy was, in its way, as precarious as that of the antecedent negro governments: to maintain it the whole white vote had to remain united, and all whites, whatever their real opinions, whether they were old Whigs, Native Americans, Secessionists, Union men, Protectionists, or Greenbackers, had but one common name—Democrats. In the Forty-fourth Congress the Democrats would have had a majority in the House without the 58 Democratic votes from the lately rebellious States; but in subsequent Congresses the party majority depended altogether on its growing Southern representation. This was entirely Democratic in but one respect—its desire for State government: in any other respect there was always a fraction of the Southern vote which could not be depended on. Even in the two years (1879-81) in which both Houses

were nominally Democratic no bill was framed to reduce the tariff, a measure to which the party was bound. This useless Southern majority has only brought the party into a condition of helpless dependence upon it.

In 1876, for the first time in half a generation, the convention at St. Louis, June 27, began to come back to its ancient moorings. Its platform denounced the tariff as "a masterpiece of injustice, inequality, and false pretence;" it demanded a tariff "only for revenue," preparation for resumption in 1879 by the accumulation of a sufficient reserve, the postponement of the date of resumption until such a reserve should be accumulated, and a general reduction of expenses. Gov. Samuel J. Tilden of New York was nominated for President, and Thomas A. Hendricks of Indiana for Vice-President. In the North the nominees carried Connecticut, New Jersey, New York, and Indiana; in the South all the States but South Carolina, Florida, and Louisiana. South Carolina was at first claimed for them, but the claim was soon abandoned. They thus had 184 electoral votes, 185 being necessary. In Florida and Louisiana the popular vote, as cast, showed a majority for the Tilden electors. Custom and the growth of Democracy have gradually made the popular vote decisive in the choice of electors; but the form of the Constitution orders electors to be chosen in such manner as the legislature of the State shall direct. In both the States named the legislatures had created bodies called "returning boards," and, by giving them absolute power to alter returns as they should consider just, had practically given them the power to choose all State officers as well as presidential electors. The power of the legislature to do so must be denied in the case of State officers, but admitted in the case of electors: in the latter case the legislature is omnipotent while it follows the forms of the Constitution. In Florida and in Louisiana the returning boards reversed the popular majority on the ground of force or fraud, and the Democratic nominees thus failed of an election. The anger of the party at this result, and its members' personal feeling that they had been defrauded, were very strong, and made the Congressional session of 1876-77 one of the most dangerous in our history. Congress had gradually assumed, since 1817, a power to decide especially on the validity of electoral votes; but Congress could do nothing now, for the House was Democratic and the Senate Republican. All that Congress could do was to create an extra-constitutional commission of five justices of the Supreme Court, five Senators, and five Representatives to report on disputed votes, their decision to be final unless reversed by both Houses. Seven of the electoral commission were Democrats and seven Republicans, and in every case of doubt the responsibility of decision was thrown upon the "odd man," Justice J. P. Bradley. In the cases of Florida and Louisiana the commission decided that the governors had correctly certified the action of the legislature's agent; in the case of a single disputed vote in Oregon it decided that the governor had not so certified. The Democratic candidates were thus finally defeated, to the intensified disgust and anger of the party. The "great fraud of 1876" engrossed all its thought, and would have been the means of Tilden's renomination in 1880 but for an accident. During the consequent investigations a mass of "cipher despatches" came to light, showing attempts to bribe the returning boards in the interest of Tilden, though, as he declared, without his knowledge. The discovery made Tilden assailable, and he was not renominated; but the party is indebted to him at least thus far, that his nomination in 1876 gave the party an economic policy for the first time since 1860.

In 1878 the Western and Southern members of the party yielded for the time to the "silver mania." They had felt in 1868 that the bondholders were making a hard bargain with the Government in insisting on payment in "coin" where coin was not specifically promised. When the relative value of the silver coin, as

compared with gold, began to decrease, silver was "demonetized," or made no longer legal tender, in 1873. In 1878 the Bland bill, supported by all parties, but rather more generally and warmly by the Democrats, became a law over the President's veto: it remonetized the silver dollar and directed its coinage. In the following year the party at last united on a policy, though its dependence on its Southern vote evidently controlled its selection. In cities of over 20,000 inhabitants a Federal election law was in force authorizing the appointment of supervisors of Federal elections; and under this the supervisors claimed powers over any other elections occurring at the same time and place. Federal marshals and deputies exercised the power of arrest at the polls on an attempt to vote; and in New York City this feature of process was certainly made use of for party ends. The further Southern grievances were that Federal troops were alleged to have been used to overawe voters, and that the selections of Federal juries by court officers were partisan and unfair. In the winter of 1878-79 the Democratic House insisted on attaching repealers of these various points to the appropriation bills, knowing that after March 4 the new House and Senate would both be Democratic, and believing that the Republicans would not be willing to change a contest between the House and the President and Senate into a contest between Congress and the President. In March this Congress expired without passing the appropriation bills, and the President called an extra session of the new Congress. Instead of passing the repealers as distinct legislation, and appealing to the country on the vetoes, the majority persisted in adding the repealers as "riders" to the appropriation bills. These were vetoed; a two-thirds vote could not be obtained to override the veto; and if Congress should adjourn without passing the appropriation bills the President had the dangerous power to renew indefinitely his calls to extra sessions until a tractable majority should be found. In the event, the appropriation bills were passed without riders, excepting a fraction of one of them. But the good effects of even these poor attempts at party contest were seen in the platform adopted by the convention which met at Cincinnati, June 22, 1880. Its economic principles are thus stated: "No sumptuary laws; separation of Church and State, for the good of each; home rule [State government]; honest money, consisting of gold and silver and paper convertible into coin on demand; a tariff for revenue only; free ships [free trade in ships]; no discrimination in favor of transportation lines, corporations, or monopolies; and public land for actual settlers." On this platform Winfield S. Hancock of Pennsylvania and William H. English of Indiana were nominated. The popular vote was extremely close, the Democratic candidates falling about 7000 votes behind their opponents in a total vote of 9,000,000. In such a delicate balance party management told heavily, and the Democratic leaders succeeded in losing votes in two opposite directions on the tariff issue. The tariff statement in their platform cost them the votes of protectionists, and their weakness in evading discussion of it when forced on them by their opponents cost them the votes of many of their own party, who naturally took evasion to be a confession of inability to defend successfully. Thus Hancock received but 155 of the 369 electoral votes, and was defeated.

The general elections of 1882 showed very sudden and great changes, though none of them can yet be called permanent, and most of them were mainly due to retrievable Republican errors. The Democratic gains were almost wholly in the North and West. Here they elected the governors and a majority of the legislatures in Connecticut, New York, New Jersey, Pennsylvania, Nevada, Colorado, and California, the New York majority (193,825) being the largest recorded in a State election; and in Massachusetts and Kansas they elected the governor, without securing the control of the legislature. In all these States, and in Ohio, Indiana, Illinois, Michigan, Wisconsin, and Iowa, the Congressional

gains were so great as to give the party control of the House of Representatives of 1883-85 by 191 votes out of 325. The final advantage of these successes remains to be seen. There is no such record in the Southern States. They remain generally Democratic. But a strong spirit of disaffection has been developed in the old Whig States of North Carolina, Florida, and Tennessee; in Virginia, where the Whig vote was formerly strong, though seldom successful, the opposition has ousted the Democrats from control of the State, and wherever the negro vote can be successfully divided the white vote shows many signs of disruption. In the North there are as yet no States reliably Democratic in a presidential election. New Jersey is the nearest to this definition, as its electoral votes have four times (1864, 1868, 1876, and 1880) been Democratic since 1860; and New York next (1868 and 1876), but a large part of the Democratic vote of New York State is in New York City, and is controlled by an oligarchy whose demands as the price of its services make it rather more dangerous as a friend than as an enemy. Since 1860, Democratic electoral votes have been cast but once by California (1880), Connecticut (1876), Indiana (1876), Nevada (1880), and Oregon (1868); but the close division of the vote in the State elections of these States has made them fairly doubtful in presidential elections.

The attitude of the mass of the party during the war may be found in S. S. Cox's *Eight Years in Congress*, from p. 303; W. H. Hurlburt's *McClellan and the Conduct of the War*; and 2 B. R. Curtis's *Works*, 306 ("Executive Power"). A much more extreme view, with an evident desire to be judicial, is in Harris's *Political Conflict in America* (down to August, 1868). The views of the extreme peace party will be found in the writings of H. C. Dean; Vallandigham's *Speeches*; Van Evrie's *Youth's History of the Civil War*; Bledsoe's *Is Davis a Traitor?* and "Centz's" *Davis and Lee and Republic of Republics*. See also Spencer's *Life of Bayard*; McPherson's *Political History of the Rebellion, History of the Reconstruction*, and *Political Manuals*; *Tribune Almanac*; Pike's *Prostrate State*; *The Nation* (1865-82). (A. J.)

DEMOGEOT, JACQUES CLAUDE, a French author, was born in Paris, July 5, 1808. After teaching for two years in the seminary in which he had received his early education, he entered the University of Paris in 1828. He was afterwards professor in the colleges of Beauvais, Rennes, Bordeaux, and Lyons. In 1834 he became professor of rhetoric at the Lycée Saint-Louis in Paris, and still remains in this position, though he has also at times supplied the place of other professors. He has published an essay on *Ausonius*, a history of the College of Lyons, a French version of Shakespeare's *Romeo and Juliet*, and a poetical translation of Lucan's *Pharsalia*. His essay on *Les Lettres et l'Homme de Lettres au XIX^e Siècle* (1856) was crowned by the Society of Authors. His *Histoire de la Littérature française* (1852) is a brilliant sketch of his countrymen's achievements in literature. It has reached its nineteenth edition, and has been translated into English by C. Bridge (1874). Demogeot has also prepared an *Histoire des Littératures étrangères* (1880), as well as good text-books on French literature. Selections from his numerous historical and literary contributions to the *Revue des Deux Mondes* and other periodicals have been published under the title *Notes sur diverses Questions de Métaphysique et de Littérature* (1877). Under the pseudonym of "Jacques" he has published some works.

DEMURRER, the name applied at law, in both civil and criminal practice, in equity, and under the codes of reformed procedure, to a pleading the substantial nature of which is that it admits the facts of the previous pleading in the cause to exist as alleged, but denies their sufficiency or validity as a cause of action or defence.

AT LAW, a demurrer may be put in at any stage of the pleadings. It may be on the ground of the insufficiency of the previous pleading either in form or in substance; that is, it may be either on the ground that the case shown by the opposite party is stated in an

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inartificial manner or that the same is essentially insufficient. A demurrer may also be general or special. A general demurrer simply excepts generally to the previous pleading, without showing specifically the grounds of objection. A special demurrer adds to this a specification of the particular grounds of exception. All demurrers for lack of form only must, by stats. 27 Eliz. c. 5 and 4 Anne, c. 16, be special in their nature. Where a demurrer is filed the same will be understood as admitting all such matters of fact as are sufficiently pleaded; it does not, however, admit facts which are ill pleaded, even though they may not be in the particular pleading demurred to, for, as a rule, the court will on demurrer consider the whole record, and give judgment for the party who on the whole appears to be entitled to it.

IN EQUITY, a demurrer is an allegation of a defendant which, admitting the matters of fact alleged by the bill to be true, shows that as they are therein set forth they are insufficient for the complainant to proceed upon or to oblige the defendant to answer; or that for some reason apparent on the face of the bill, or on account of some omission of some matter which ought to be contained therein, or for want of some circumstances which ought to be attendant thereon, the defendant ought not to be compelled to answer to the whole bill or to a certain part thereof. A demurrer in equity may be either to relief or to discovery. Demurrers to relief are either (1) to the jurisdiction of the court, (2) to the person of the complainant, (3) to the matter of the bill either as to form or substance.

(1) A demurrer to the jurisdiction of the court may rest either on the ground that the subject is not cognizable by any municipal court of justice, that it is not within the jurisdiction of a court of equity, or that some other court either of law or equity possesses the proper jurisdiction.

(2) A demurrer to the person of the complainant may rest either on the ground that said complainant is not entitled to sue by reason of some personal disability, or that he is not entitled in the particular character in which he sues.

(3) A demurrer to the matter of the bill for lack of form may be either on account of the inartificial construction of the bill, for multifariousness, or for want of proper parties or misjoinder of parties. Multifariousness is the joining of two or more distinct grounds for relief in the same bill. This will not be allowed except by permission of the court. Demurrers to the matter of a bill for lack of substance may be for any cause which the defendant thinks to be sufficient to entitle him to have the bill dismissed.

Demurrers to discovery may be based on much the same grounds as demurrers to relief. They may also be made (1) when the answer may subject the defendant to penal consequences, (2) when the answer is immaterial to the purpose of the suit, (3) when the answer would involve a breach of some confidence which it is the policy of the law to preserve inviolate, (4) where the matter sought to be discovered appertains to defendant's title, and not to the complainant's.

Where a demurrer in equity is sustained, the decree is that the bill be dismissed or the discovery sought for disallowed either in whole or in part. If it be overruled, the defendant is ordered to answer over. Both in law and at equity demurrers may only be filed for defects apparent on the face of the pleadings. They cannot be aided by any new matter alleged by the party filing them.

In practice, a demurrer to evidence is a declaration by one party in a suit that he will not proceed therein for the reason that the evidence adduced by the opposing party is insufficient to maintain the issue. Upon a demurrer to evidence being filed, the jury is always discharged, the matter being subsequently argued before the court. Judgment is then entered either for or against the party demurring, according as the court may think his demurrer well or ill taken. (L. L., JR.)

DENISON, a city of Grayson co., Tex., 4 miles S. of the Red River and 9 miles N. of Sherman. It is a terminus of the Houston and Texas Central Railroad, and of 4 lines of the Missouri Pacific system. It has a handsome opera-house, 5 hotels, 2 daily and 3 weekly newspapers, and 9 churches; also flouring- and cotton-ginning-mills, manufactures of ice, of artificial stone, of carriages, brooms, etc. It is a fast-growing city, the centre of large railroad interests. Vast quantities of fruit are shipped northward from this point. The town has gas- and water-works. In 1883 the property valuation was \$5,000,000, the public debt \$52,000, and the annual expenses \$18,000. Denison was founded in 1872, incorporated in 1873. In 1880 the population was 3975; estimated in 1884 at 8000.

DENISON, GEORGE ANTHONY, an English clergyman, was born at Osington, Nottinghamshire, Dec. 11, 1805. He was educated at Eton and Christ Church College, Oxford, where he graduated, in 1826, with high classical honors. In 1828 he was elected a Fellow of Oriel College, Oxford, and also obtained the university prize for a Latin essay. In January, 1830, he became a tutor at Oriel, and in 1832 was ordained. He then held the curacy of Cuddesden, Oxfordshire, still retaining his tutorship for four years. In 1838 he became vicar of Broadwindsor, Dorset. In August, 1845, he was appointed vicar of East Brent, Somerset, and soon after examining chaplain to the Right Rev. Richard Bagot, bishop of Bath and Wells. About this time the modifications of the relation of the established church to the state, resulting from parliamentary reform, began to manifest themselves. One of the first questions which arose was that of national education. On this Mr. Denison took decided ground; believing that the education of the people belonged solely to the church, he opposed all schemes of government education. He strenuously resisted every attempt made to subordinate the church to the state, and even published objections to the presence of the bishops in the House of Lords, as tending to that result. In 1850 he joined in the protest of several high-church clergymen against the decision in the Gorham case. Two years later he was successful in procuring the revival of Convocation, after 135 years of abeyance, though its powers were now limited. In 1851 Bishop Bagot had appointed Mr. Denison arch-deacon of Taunton, but in 1853, the latter being charged with unsoundness in doctrine with reference to the Eucharist, resigned his chaplaincy. To show his belief, he then preached and published three sermons on *The Real Presence*. In 1854 proceedings were commenced against him on account of these sermons, and two years later an ecclesiastical court convicted him and deprived him of all his church preferments. Appeal was taken to the Court of Arches and the judgment set aside on a point of law, and this decision was finally confirmed by the judicial committee of the Privy Council in February, 1858. The dean, who had always been affectionately regarded by his parishioners, was triumphantly welcomed by them on his return. In the previous autumn he had established among them the beautiful custom of Harvest Home, and for this, in 1868, he prepared a special service. Still continuing his protest against the tendency of the age to indifference and secularism he had, in 1855, withdrawn from the diocesan education board on account of its acceptance of compromises which he opposed. He returned occasionally, in later years, when there seemed some prospect of effectually resisting the government policy. On account of these questions he declared against Mr. Gladstone in 1853, and twelve years later was one of the most active in causing the University of Oxford to reject him as its representative. When ritualism began to appear in the Church of England, Dean Denison claimed for it a right to exist, though he adopted ritual only in part. After many years of active service in Convocation he finally withdrew from it in 1878, on account of its treatment of ritual and other

important questions. In his autobiography, *Notes of My Life* (1878; 3d ed., 1882), he sets forth fully his position on the questions which have agitated the Church of England in his time, and candidly acknowledges that in most cases he has been the champion of a losing cause.

DENISON UNIVERSITY, at Granville, Licking co., Ohio, was established in 1831 by the Ohio Baptist Education Society. In its earlier years it was only a literary or higher academic school, with a theological department. For a considerable time it was conducted on the industrial plan, a large farm affording employment to those who were not skilled in any trade. Rev. John Pratt, a graduate of Brown University, first had charge of the institution, and remained in connection with it till 1859. In 1842 the scope of the school was enlarged, and a new charter obtained by which it became known as Granville College. Rev. Jonathan Going, D. D., was its first president. He was followed in 1846 by Rev. Silas Bailey, D. D., who in turn was succeeded in 1853 by Rev. Jeremiah Hall, D. D. Rev. Samson Talbot, D. D., was president from 1863 till his death in 1873. In 1875, Rev. E. Benjamin Andrews, D. D., became president, and was succeeded by Rev. Alfred Owen, D. D., in 1879.

The college for the first twenty-five years occupied a farm $1\frac{1}{2}$ miles west of Granville village. It was removed in 1856 to the hill overlooking the town, where it still remains. It has passed through many vicissitudes, and at times has seemed near extinction, but it has always rallied and become stronger than before. During the incumbency of Dr. Bailey the question of its removal to Lebanon was agitated, and the controversy that followed resulted in his resignation. For a part of one year the work of the college ceased entirely. During the incumbency of Dr. Hall considerable additions were made to its resources, and in consideration of a subscription of \$10,000 by Hon. Wm. Denison of Adamsville, Ohio, the name was changed to Denison University.

The expenses, however, had so exceeded the endowment that in 1866, after thirty-five years of effort, the value of the property was estimated at only \$40,000. At that time fresh exertions were made to put the university on a sound financial basis. During the next five years \$175,000 were added to the endowment, and new buildings were erected, worth at least \$35,000. In 1878, Mr. W. H. Doane erected a building for the use of the library at an expense of \$12,000. In 1881, the fiftieth anniversary of the opening of the institution, another \$100,000 was added to the endowment. The present value of the property, now wholly free from debt, is given in the last report of the treasurer as \$400,691.29.

The college has ever maintained a high reputation for thoroughness and excellence of instruction, having numbered among its professors such men as John Stevens, Paschal Carter, W. H. Stevens, F. O. Marsh, and others who are affectionately remembered by hosts of former pupils. It has also maintained a high religious character, broad and catholic in spirit, but positive and earnest in its support of the tenets of revealed religion and of the Holy Scriptures as the authoritative revelation of God. It has passed through the period of its weakness and struggles, and has gained a foundation and character that make its future assured. (A. O.)

DENMARK. The transference of the Duchies of Slesvig and Holstein to Prussia has not marred the prosperity of the Danish Kingdom. The small sea-girt state, with apparently few natural elements of prosperity, maintains a position of greater independence, and perhaps greater influence, than other European states of much larger area and population. The alliances of its royal house with other reigning families of Europe have exceeded in extent and rank even the famous marriages of the Coburgs or the Hohenzollerns. Its present king, who came to the Danish throne in 1863, by appointment of the great

powers of Europe, ratified by the Danish *Rigsdag*, or Legislature, has six children; the eldest, a son, is heir apparent, and has married the Princess Louisa, daughter of the late King of Sweden and Norway, and niece of the reigning king; the second, a daughter, Alexandra, is the wife of Albert Edward, Prince of Wales; the third, a son, is King of Greece, and his queen is the Grand Duchess Olga Constantinovna, a cousin of Alexander III., the reigning Czar of Russia; the fourth, a daughter, is married to Alexander III., Czar of Russia; the fifth, a daughter, the Princess Thyra, is married to Ernest August, Duke of Cumberland, a cousin of the Queen of England. Happily freed from the cares of a vast domain, ruling over an intelligent and loyal people, and not harassed by the anxieties and intrigues which are almost inevitable in larger states, and themselves generally not men of inordinate ambition, some of the kings of Denmark have found time to indulge in antiquarian and archaeological pursuits, as well as in art studies. Their capital, Copenhagen, has more archaeological collections of great value than any other city in Europe; and its art galleries have no superior, and but few equals on the continent. The government is a constitutional monarchy, in which the *Rigsdag* or Diet of two Houses—the Landsting, or Senate, and the Folkething, or House of Representatives, make and amend the laws, and have a partial control over the action of the Sovereign and Council, in executing and enforcing them. The Council or Cabinet are, individually and collectively, responsible for their acts, and, if impeached and found guilty, cannot be pardoned, without the consent of the Folkething, or House of Representatives.

Rarely are there any items of historic interest in the political management of the country. The sessions of the *Rigsdag* are usually occupied with local affairs—the reduction of the national debt, the appropriations for military and naval purposes, the erection of fortifications, or the building of ships of war, appropriations for national museums or educational institutions, and for the personal expenditures of the royal family.

Yet, even here, great principles will sometimes agitate the people and the popular branch of the *Rigsdag*. The ministry were not in 1880–81 in sympathy with the Folkething, and the latter demanded, as the English House of Commons did long ago, that the Constitution should be interpreted as giving them the exclusive right to vote the budget, and that their votes on money bills should be simply registered in the Landsting. This demand the ministry opposed strongly, and the king dissolved the Folkething; a new election showed a larger opposition; two more successive Folkethings were dissolved with no better result, and in 1883 the constitutional crisis came, the ministry resigned, and the Folkething gained its point.

The ports of Denmark are very well fortified, and the navy, though small, is efficient. The army, under the law of July, 1867, and the supplementary law of 1880, consists of all the able-bodied young men of the kingdom who have reached the age of twenty-two years; they are liable to service for eight years in the regular army, and for eight years subsequently in the army of reserve. While the law, if rigorously enforced, would cripple seriously the industrial ability of the kingdom, it is practically so managed as not to prove so heavy and crushing in its effect as the military laws of the German states. Every corps is required to drill each year, during from thirty to forty-five days; and during the eight years of service in the regular army there are two periods of drill; the first lasting six months for the infantry, five months for the field-artillery and engineers, nine months and two weeks for the cavalry, and four months for the siege artillery and technic corps. The second period of drill is only for a portion of the recruits of each branch of arms, especially those who have profited least by the first course. This lasts nine months for infan-

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try, eleven months for the cavalry, and one year for the artillery and engineers. The army of reserve has only a brief annual drill.

The kingdom is divided into five territorial brigades, so distributed that the burden does not come more heavily upon one section of the population than upon another. The cavalry are distributed in the proportion of one regiment to each territorial brigade, and one-half of the artillery is furnished by the first two territorial brigades, and the other half by the other three. The total strength of the army was as follows in September, 1881 :

	Regular Army.		Army of Reserve.	
	Officers.	Rank and File.	Officers.	Rank and File.
Infantry.....	774	26,992	245	10,925
Cavalry.....	128	2,180		
Artillery.....	145	4,755	41	2,068
Engineers.....	59	624		
Total.....	1,106	34,551	286	12,993

The staff of the army was composed at that time of 25 commissioned and 21 non-commissioned officers.

The navy consisted, in December, 1881, of 28 steamers, of which eight were armor-clad ships, and the rest unarmed vessels, mostly of small size. The eight armor-clads had, respectively, the following thickness of armor—steel generally—at the water-line, 12 inches, 8 inches, 5 inches, 8 inches, 5 inches, 4½ inches (two), and 4 inches. They carry in all sixty-eight guns, of which two are 25-ton guns, five 20-ton, four 18-ton, four 12½-ton, eight 6-ton, eight 90-pounders, and thirty-seven 60-pounders. The Danish navy is manned by 1025 men, and officered by 1 admiral, 16 commanders, 36 captains, and 181 lieutenants.

Churches and Education.—The established religion in Denmark is Lutheran, and more than 99 per cent. of the population are professedly adherents to it. There are seven bishops of the Lutheran Church, whose duties and privileges are generally similar to those of the bishops of the Church of England, except that they have no political character, and are not allowed to vote in the legislature. There is complete religious toleration for all religious denominations, except that they must not offend morality or public order. Only 17,670 persons were reported by the census of 1880 as dissenters from the Lutheran Church. Of these 3946 were Jews, 3000 Roman Catholics, 1363 Calvinists of the Reformed Church, 1722 Mormons, 3687 Baptists, 792 Irvingites, 1919 other sects, and 1241 without creed, or of unknown creed. The emigration of Mormons from Denmark to Utah has nearly ceased. Elementary education is widely diffused in Denmark, attendance at school from the age of seven to fourteen is compulsory, and is gratuitous in the public schools to children whose parents cannot afford to pay for their teaching. In higher education there is the great and liberally endowed University of Copenhagen, with its library of 250,000 volumes, its fifty or more professors, and more than a thousand students, and the Royal Library of over half a million volumes. There are 2940 parochial schools of excellent character, very many middle schools, fitting youth of the working classes for the gymnasia or colleges, and 13 public gymnasia, or collegiate schools of high order. About half of the students at the university are in the theological classes.

Area and Population.—The area of Denmark was diminished by the transfer of the Duchies of Slesvig, Holstein, and Lauenburg to Prussia, to the extent of 8524 square miles. The following table gives the present area as officially stated, the population in 1870, 1875, and 1880; and in the lower division, the area and population of the Danish colonies :

Divisions.	Area in square miles.	Population, 1870.	Population, 1875.	Population, 1880.
Copenhagen (Kjöbenhavn) and suburbs. }	13	181,291	.....	235,254
Islands in the Baltic.	8,364	815,331	819,000	865,708
Peninsula of Jutland.....	13,290	788,119	836,100	868,492
Total.....	21,667	1,784,741	1,880,100	1,969,454

Colonies.	Area in square miles.	Population, 1870.	Population, 1880.
Færoe Islands (17 inhabited).....	510	9,992	11,221
Iceland.....	39,756	69,763	72,000
Greenland.....	46,740	9,825	9,531
West Indies { Santa Cruz.....	74	37,821	37,600
{ St. Thomas.....	23		
{ St. John.....	21		
Total.....	87,124	127,401	130,352

Copenhagen (*Kjöbenhavn*, i.e., the Merchants' Haven) is the only large city in Denmark; its population in 1860 was 155,143; in 1870, 181,291; in 1880, 235,254. It has an admirable harbor, one of the finest in Europe, and is a city of great commercial activity. Its libraries, museums, and collections of art are very attractive. The other towns of note are Odense, which had a population in 1870 of 16,721, and nearly 20,000 in 1880; Aarhus, 13,020 in 1870, and 16,000 in 1880; and Aalborg, 11,953 in 1870, and 14,300 in 1880. The land of Denmark is subdivided into great numbers of small estates, the law interdicting the union of small farms into a large landed property; 395 out of each 1000 of its inhabitants live exclusively by agriculture.

Emigration prevents any rapid increase of the population. The number of emigrants, chiefly to the United States, in the decade of 1871–1880 was 38,665; in 60 years ending Dec. 31, 1880, Danish emigration to the United States alone had been 58,606. In 1881 there were 9117 emigrants from Denmark to the United States. In 1882 there were 11,618, and in 1883, to June 30, there were 10,319, making in all 31,054 since 1880 and a total since 1820 of 89,660.

Finances.—The estimated revenue of the Danish Kingdom, from all sources, for the year ending March 31, 1881, was 47,246,558 kroner (the krone or crown being of the value of 26.8 cents in our currency.) The revenue consequently amounted to \$12,662,077.54. The expenditure for the same year was 41,672,448 kroner = \$11,168,216.06.

An important feature in the administration of the finances of the kingdom is the maintenance of a reserve fund of a comparatively large amount, the object being to provide means by which the government could, on sudden emergencies, command the necessary funds. In March, 1868, this reserve amounted to about \$31,500,000, but it has been gradually reduced, mainly in paying off the national debt. The national debt of Denmark was incurred in part by large deficits in former years, before the establishment of parliamentary government; and, in part, by railway undertakings, and the construction of harbors, lighthouses, and other works of public importance. It has been gradually diminishing since 1866. In that year it amounted to 264,221,604 kroner = \$70,811,390; in 1870 it was 234,740,700 kroner = \$62,910,508; in 1875 it was 185,835,623 kroner = \$49,803,947; in 1880 it was reduced to 173,326,628 kroner = \$46,451,536, and is still diminishing. The interest and charges on it in 1881 were \$1,970,068.

The largest sources of revenue are custom-house dues, excise on distilleries, and direct taxes; these constitute about five-eighths of the whole revenue; the remainder is made up of stamp duty and duty on inheritance, the surplus on domains, posts, telegraphs, State railways, law-fees, interest and contribution from reserve fund. The revenue for 1881 showed a surplus of over \$1,500,000.

Commerce, Trade, and Industry.—The commerce of Denmark and its West Indian colonies is carried on mostly with three countries, Germany, Great Britain, and the United States. In 1879 the total imports into Denmark from all quarters were 199,053,000 kroner = \$53,346,204, of which \$19,499,680 came from Germany; \$13,106,665 from Great Britain, and \$3,187,378 from the United States. The exports the same year were 158,063,000 kroner = \$42,360,884, of which \$15,007,500 were sent to Germany, \$17,662,500 to Great Britain, and \$464,265 to the United States. The remaining imports and exports came from and were sent to France, Belgium, Holland, Austria-Hungary, Sweden and Norway, and Russia. The aggregate of exports and imports, which was \$95,707,088 in that year, was materially increased in 1880 and 1881, both years of very large crops of grain and very favorable to the production of live-stock. The imports from Great Britain in 1880 were about \$9,500,000, and from the United States \$4,160,308. The exports to Great Britain the same year were \$26,428,835, and those to the United States only \$641,796. In 1881 the imports from the United States were \$7,126,249, and the exports \$866,408. The exports of Denmark are of butter, grain and flour, live animals, and some manufactured goods. The imports are varied, consisting of cotton, woollen, and silk goods, coal, petroleum, iron, agricultural machinery, sewing-machines, etc. The agricultural crops of Denmark in 1880 were large, producing a calculated value of \$91,388,000, consisting largely of barley, rye, oats, hay, wheat, potatoes, and seed. The harvest in 1881 was still larger, and was said to have been the largest gathered in Denmark for fifty years, and coming at a time when the crop of cereals in most of the countries of Europe was short, commanded high prices. The manufactures of Denmark and its West Indian colonies are of very considerable extent, comprising leather, woollen goods, train oil, refined (and in the colonies raw) sugar, molasses, and syrups, beer, ale, distilled liquors, etc. The Danes are a very industrious people, and the wealth of the kingdom *per capita* is large.

Railways, etc.—In January, 1883, there were 1915 miles of railway open for traffic, of which 810 miles belonged to the state. The length of telegraph lines at the same date was 2200 miles, and the length of wires 5840 miles. There were at the same date 354 telegraph offices, of which 160 belonged to the railway companies and 194 to the state.

On Jan. 1, 1880, the commercial fleet of Denmark consisted of 3271 vessels, of an aggregate burthen of 257,546 tons, an increase in 6 years of 401 vessels with 44,864 tons burthen. Of the whole number 193 were steamers of 48,826 tons. Only 135 of the 3271 vessels exceeded 300 tons burthen.

Money, Weights and Measures.—On Jan. 1, 1875, the decimal system of currency was introduced in Denmark, though with a different unit from that of other countries. The old unit was the *Rigsdaler* or Rix-dollar, whose value was 53.6 cents in our currency. It was divided into 96 shillings. This is now abolished and the new unit is the *Krone* (crown), which is just one-half the *Rigsdaler* and has a value of 26.8 cents in our currency. It is divided into 100 *öre*, the *öre* being worth about $\frac{1}{4}$ of a cent.

The other weights and measures are, the *pound*, which is divided into 100 *koint*, and is equal to 1.102 pounds avoirdupois; the *ship-last* = 2 tons; the *tönne* or barrel of grain and salt = 3.8 imperial bushels; the *tönne* of coal = 4.7 imperial bushels; the *foot* = 1.03 English foot; the *viertel* = 1.7 imperial gallon.

For further information in regard to Denmark see *Koniglich Dansk Hof og Statscalender* (Kjöbenhavn, 1882); *Résumé des principaux faits statistiques du Danemark* (Publié par le Bureau royal de Statistique, No. III., 8 Copenhague, 1881); *Trade of Denmark with the United Kingdom*; *Reports from the Consuls of the United States to the State*

Department (1883 and 1884); Falbe-Hansen (V.) and Scharling (Wm.), *Danmark's Statistik*, 8, Kjöbenhavn, 1878-79; Frank Vincent, Jr., *Norsk, Lapp, and Finn*, 1881. (L. P. B.)

DENNIE, JOSEPH (1768-1812), an American journalist, was born in Boston, Aug. 30, 1768. He graduated at Harvard College in 1790, studied law, and was admitted to the bar at Charlestown, N. H. He became a contributor to the newspapers, and in 1795 removed to Walpole, N. H., where he established the *Farmer's Weekly Museum*, in which he published a series of essays called "The Lay Preacher," which gave him a wide reputation as a graceful writer. In 1799 he was invited by Timothy Pickering, Secretary of State, to come to Philadelphia as his private secretary. This position he held a few months, then became editor of the *United States Gazette*, and finally established the *Portfolio*, at first a weekly, afterwards a monthly magazine, to which many distinguished writers of the time contributed. Dennie's social qualities assisted in giving him a high reputation, and he was regarded in his time as the Addison of America. He died at Philadelphia, Jan. 7, 1812.

DENTISTRY. Among even the rudest and most barbarous of every age and nation the teeth, as organs of use and beauty, have claimed attention and been regarded of importance in giving expression and symmetry to the face, and in the preparation of food for the assimilative process.

Teeth.—Having their origin in the columnar epithelium, they are properly classed with the muco-dermal appendages, and when perfected may be defined as hard prominences projecting from the surface of the mucous membrane, located in the pre-assimilative portion of the alimentary canal. In the human family their most important function is to subserve nutrition by the mastication of food. Regarding them as tactile organs, and as organs of speech by aiding in the formation of articulate sounds, their impairment becomes still more serious, and their preservation, or replacement when lost, a matter of considerable moment.

Since the development of the teeth commences early in intra-uterine life, and continues through infancy and childhood, they may be subjected to certain imperfections in structure (vices of conformation) resulting from imperfect nutrition during this period. Subsequently, when erupted, they hold an important relation with the arterial and nervous system by means of the pulp within the tooth, the alveoli and the dental periosteum surrounding the root, which exposes them to abnormalities which in severity and persistence correspond with the morbid systemic conditions predominating at the time. In addition to this, they are continuously bathed in the oral secretions, which are liable to vitiation from constitutional disturbances as well as from the degeneration of particles of food remaining in the mouth. Add to these the serious and frequent abuse which the teeth receive both from improper use and want of use, and we have recognized some of the factors which contribute to their premature disease, disintegration, and loss, hence necessitating the practice of dentistry and the training of skilled dentists.

Practice of Dentistry.—That from a very remote period some attention was given to the treatment of diseases of the teeth by the Egyptians and Greeks is well attested by the writings of Herodotus, Hippocrates, Aristotle, Celsus, and others; but to the nineteenth century and to the United States of America has been reserved the honor of witnessing the present state of dental proficiency. This has been secured through the energy, industry, and genius of the native artisan, and for its maintenance it is essential that the future dental practitioner shall with unceasing effort pursue his anatomical, physiological, histological, and pathological studies. Familiarity with dental development

and eruption, normal and abnormal, with the numerous and diversified anomalies to which the hard and soft tissues are liable, and the means essential for their protection and preservation, as well as of prosthetic dentistry, embracing the construction and adjustment of artificial substitutes where accident or disease has destroyed the natural organs, is of the utmost importance to those who would successfully practise dentistry.

The following statement embraces some of the more important points which require the attention of the dentist:

Abnormal conditions of the dental tissues:—Caries, necrosis, exostosis, abrasion.

Mechanical injuries of the hard tissues:—Fracture, dislocation, dilaceration.

Abnormal conditions of the dental pulp:—Irritation, inflammation, granulation or polypus, suppuration, death.

Abnormal conditions of the alveolo dental periosteum:—Irritation, inflammation, acute and chronic, hemorrhage, abscess.

Abnormal conditions of the alveolar process:—Necrosis, exostosis, absorption.

Abnormal conditions of the gums, prior and subsequent to the eruption of the teeth:—Inflammation, ulceration, recedence, tumors.

Abnormal conditions of the antrum resulting from diseased teeth.

Tartar or salivary calculus:—Its origin, location, color, influence.

Extraction, replantation, and transplantation of teeth.

Construction of obturators and artificial palates.

Anæsthetics: their administration and influence.

Irregularity of the teeth: its cause and treatment.

Mechanical dentistry: manufacture of artificial teeth, taking impressions, base plates, attaching teeth to bases and securing the same in the mouth.

Dental anatomy.—Man, being both heterodont and diphyodont, has a deciduous and permanent set, which are dissimilar in their shape. The set belonging to childhood is twenty in number, equal in each jaw, and on each side of the median line, as follows: central incisors, 4; lateral incisors, 4; canines, 4; molars, 8—better written thus:

$$c. i. \frac{1-1}{1-1}; l. i. \frac{1-1}{1-1}; c. \frac{1-1}{1-1}; m. \frac{2-2}{2-2} = \frac{10}{10}.$$

The central incisors, standing next to the median line of the mouth, are about one-third wider than the laterals, which are next in order; then the canines, followed by the molars.

The permanent set, or those of adult life, are thirty-two in number, as follows: central incisors, 4; lateral incisors, 4; canines, 4; bicuspid, or pre-molars, 4 first and 4 second, 8; and the true molars, 4 first, 4 second, 4 third, 12 in all—written thus:

$$c. i. \frac{1-1}{1-1}; l. i. \frac{1-1}{1-1}; c. \frac{1-1}{1-1}; b. c. \frac{2-2}{2-2}; m. \frac{3-3}{3-3} = \frac{16}{16}$$

Each tooth is so individualized by its peculiar morphology that one familiar with its shape can give its exact position in the mouth.

Hard tissues of teeth.—Enamel, dentine, and cement, the three hard tissues of which the tooth is composed, are widely different structures. The enamel, covering the exposed portion of the crown, is composed of dense hexagonal fibres compactly united and presenting on the surface a vitreous appearance. It is the most dense structure in the animal economy, consisting in the well-developed adult tooth of organic matter 3 per cent., of inorganic or earth salts 97 per cent. The dentine, of which the large body of the tooth is composed, is made up of tubular and inter-tubular tissue, much less dense than the enamel, containing 27 per cent. of organic matter and 73 per cent. of inorganic. The cement, covering the roots

of the teeth from the neck where the enamel terminates to the apical end, is laminated and much like bone in structure, having within its tissue lacunæ and canaliculi. It is much less dense than either of the other tissues, consisting of 30 per cent. of organic matter and 70 per cent. of inorganic. The sensibility of these three tissues varies with their relative density and the amount of organic matter which they contain.

Tooth-pulp and nerve.—In the centre of the tooth, and having connection with each root, is a cavity known as the pulp-chamber; in this resides the pulp, a highly vascular tissue composed of nerves, blood-vessels, and the remains of the formative tissue; and to this the dentine is indebted for its connection with the nervous and arterial system.

Dental periosteum and alveolar process.—Covering the root, and lining the bony socket in which it is implanted, is the alveolo-dental periosteum, giving nourishment and sensibility to the cemental tissue, and to the alveolar process which forms the dental socket. This process, which surrounds the tooth as it comes into position, is the result of an exceedingly rapid development, and appears to be an outgrowth from the jawbone, stimulated into activity by the presence of the tooth, secondary entirely to it as it follows it into existence, and rapidly disappearing on its removal.

Arrangement and forms of the teeth.—The human teeth, when in normal position, are arranged around the margins of the jaws in two approximately parabolic curves, the superior being the larger of the two, and when closed and at rest it is external in its outer margin to the inferior teeth. The teeth stand side by side in close contact, without the diastemata or interspaces which appear in most other animals; and no one tooth normally rises higher than its neighbor. As the teeth have a labio-lingual diameter which is slightly greater than their lateral, and stand in a curved line without interspaces, they must be wider in their labial or external than in their lingual or palatine aspect. By their peculiar shape, arrangement, and movement they are made most efficient in mastication, since no two teeth oppose each other only, but each tooth (as a rule) in closure of the jaws impinges upon two.

Incisors.—As has been stated, the incisors are four in each jaw. As seen from the front, the crowns are greater in their length than width, making them oblong in shape, with a slightly convex labial surface. Their labio-lingual diameter is greatest at the neck, from which it diminishes to the cutting edge, giving them a wedge or chisel shape, which facilitates the division of food. The crowns of the superior centrals are a third larger than the laterals, while the inferior centrals are a trifle smaller than the inferior laterals. The roots are single and tapering to the point or apical end, giving them a cone-shaped appearance. Of these teeth the superior centrals are the most cylindrical in their roots, all the others being flattened or compressed in their lateral diameter, as if making an abortive effort for a bifurcated fang. The teeth are wider at the cutting edge than at the neck, leaving a somewhat triangular space in that locality.

Canines.—The canines, four in number, are in every respect stronger and thicker teeth than the central incisors. The crown at the cutting edge terminates in a point or cusp, which is on a line with the axis of the root and a trifle nearer the median than the distal edge of the tooth. The labial surface is decidedly more convex than that of the incisors, and the lingual surface, instead of having the concave sweep of the incisors, is irregularly convex, with both diameters of the crown greatest a short distance from the neck. The root is longer and stronger than any other single root. The lower canines differ from the upper in the cusp being a little less pronounced and the root a trifle shorter.

Bicuspid.—The bicuspid are two on each side of the median line of both upper and lower jaws, making eight in all. They have upon their masticating sur-

faces, as their name would imply, two cusps, with a depression between them varying in depth, the outer or labial cusp of the superior teeth being the larger of the two. The shape of the crown is irregularly quadrilateral, with the lingual and labial surfaces decidedly convex, the latter slightly wider than the former. The root is usually single, though much compressed from side to side, and not infrequently is this depression sufficient to divide the pulp-chamber within the root; and in the first bicuspid a result in many instances is the bifurcation of one-third its length. The lower bicuspids differ in their cusps being less pronounced, the root less depressed from side to side, and without the tendency to division. It has much the appearance of a transitional tooth between the superior canine and first bicuspid.

Molars.—The first and second molars, superior and inferior, two on each side of the mouth, eight in all, are the most important in their triturating capacity. Each crown, approaching a square with rounded corners, offers five surfaces—masticating, buccal, lingual, mesial, and distal. The masticating surface is made up of cusps, ridges, and depressions, which aid the functions of the teeth and are utilized and modified by the upper and lower antagonizing each other. The buccal and lingual are slightly convex, with a depression on a line with the axes of the tooth, extending sometimes the whole length of the crown, and usually more marked on the buccal than lingual surface. The mesial and distal (sometimes termed approximating, because next to the adjoining teeth) are nearly flat, though somewhat modified in shape by the crowding of the teeth. The roots of the upper are three in number—two external or buccal, and one internal or palatal; those of the lower are two in number, an anterior and posterior, much flattened or compressed from front to back, showing a tendency to division. The roots of these teeth vary in their length, curvature, and divergence, and their peculiarities in these respects sometimes greatly complicate the operation of extraction.

The *third molars*, *dentes sapientiae*, or wisdom teeth, are four in number, one on each side above and below. The crowns in general conformation are not unlike the first and second molars. They are usually smaller and extremely variable, both in form and position. The roots invariably converge, and not unfrequently form a confluent cone-shaped mass, with the apex curved abruptly backward.

Deciduous Teeth.—The deciduous or temporary set, 20 in number, are relatively smaller than their permanent successors, though resembling them in their general conformation. The deciduous molars, which precede the permanent bicuspids, have their roots diverging more abruptly and at a greater angle from the neck than do those of the permanent molars. This peculiarity gives room for the crypts, which contain their permanent successors, and lie directly beneath and contiguous to them. In all of the deciduous teeth the enamel terminates upon the neck with a thick edge, giving it a constricted appearance and constituting the most marked feature of dissimilarity between the deciduous and permanent teeth.

Dental development and eruption.—During the seventh week of intra-uterine existence there appear epithelial infoldings which are the enamel-germs for the twenty temporary teeth. During the ninth week, while the enamel-organs are progressing in their development, the germs for the future dentine make their appearance in close proximity with the former and almost simultaneously for all the temporary teeth. In the tenth week the walls of the follicle which enclose these germs become rapidly developed. During the fifteenth week the developing germs are progressing in their transformation into the future teeth, and the follicles enclosing them continue their growth. At this early period the enamel-germs for the four first permanent molars make their appearance. In the

sixteenth week the follicles surrounding the germs of the temporary teeth are closed, the crypts encasing them lose their connection with the epithelial surface, and over each is a second inflection for the enamel-germs of their successors, which will constitute the ten anterior permanent teeth of each jaw—viz., four central incisors, four lateral incisors, four canines, four first bicuspids, and four second bicuspids. During the seventeenth and eighteenth weeks the enamel- and dentine-germs of the deciduous teeth commence the process of calcification. From the twentieth to the twenty-fifth week septa are formed between the deciduous teeth, connecting the external and internal plates of the alveolar process, and in them calcification begins. The enamel-organs for twenty-four permanent teeth, which are in a progressive state of development, have established in close proximity to them the dentine-germs. From the twenty-eighth to the thirty-sixth week the crowns of the twenty deciduous teeth are rapidly calcifying, and the germs of the twenty-four permanent teeth, with their surrounding follicles, are progressing in development. At about the fortieth week, or at birth, the roots of the deciduous teeth are forming by the elongation and calcification of the dental pulp, and the follicles enclosing the germs of the permanent teeth have closed and are receding from their proximity to the mucous surface. Three months after birth the crowns of the deciduous teeth are advancing toward the mucous surface by the elongation and calcification of the dental pulp, and the adhesion to its surface of the dental sac, which had previously lined the follicle, forming the cemental matrix or germ. The enamel- and dentine-germs of the twenty-four permanent teeth are just beginning their calcification, and the epithelial inflections for the enamel-germs of the four second permanent molars are present. Seven to nine months after birth we have the eruption of the eight deciduous incisors, superior and inferior, the centrals preceding the laterals by about one month. At twelve to fourteen months the first four deciduous molars are erupted; at sixteen to eighteen months the eruption of the four deciduous canines takes place; at eighteen to twenty-four months of age the four second deciduous molars are erupted, and temporary dentition is complete. At three years of age the twenty-eight permanent teeth are within their bony crypts in various stages of progressive development, those for which provision was earliest made having their crowns well calcified, with the pulps elongating for the growth of the roots; posterior to these the epithelial inflections for the enamel-germ of the four third permanent molars, or wisdom-teeth, make their appearance.

At six years of age, and while the twenty deciduous teeth are still in position, the four first permanent molars are erupted, entirely posterior to them. From eight to ten years of age the eight deciduous incisors are removed by the absorption of their roots, and the permanent incisors gradually take their places. From ten to eleven years of age the eight permanent bicuspids take the place of the deciduous molars. From twelve to fourteen years of age the four permanent canines take the place of the deciduous ones, and the four second permanent molars are erupted. From eighteen to twenty-five years of age the four third molars, having passed through their various progressive stages of development, are erupted; and thus is completed permanent dentition.

The foregoing is the normal arrangement for the development of the teeth, but aberrations occur in the *time*, *order*, and *number* of teeth, sometimes giving rise to what is recognized as interrupted or pathological dentition.

Constitutional peculiarities.—In an effort to classify the peculiarities of tooth-forms and structures, in respect of shape, size, color, density, durability, sensibility, recuperative power, etc., we associate physical characteristics and idiosyncrasies with them; so that

with careful study and observation of the one we must connect with it certain definite characteristics of the other. For instance: in one who is recognized as "lymphatic," with bulky organs—muscles and bones large, but possessing neither remarkable strength nor great density; actions slow, and recuperative power feeble—we shall find the teeth large in size, dull, opaque, and light in color, soft in structure, and loosely held in position by surrounding tissues, without a marked degree of beauty, strength, or recuperative power. Again, where the opposite physical characteristics exist—with structures dense, movements quick, nutrition and recuperation good, with bodily strength and great power of endurance—the teeth will be found to correspond by being firmly fixed in their sockets, dense in structure, well developed in shape and size, with yellowness of color and great strength.

Pathological dentition.—While dentition is unquestionably a physiological process, it is an undisputed fact that during this period occurs the largest number of deaths among children. Almost continuous irritation exists, and so often is the process subject to perversions that its effects often come within the domain of pathology. During the process of dentition there is an increased susceptibility to nervous, respiratory, and digestive troubles, demanding hygienic care, and not infrequently constitutional treatment, in the direction of sedatives and febrifuges. The general health, constitutional peculiarities, and predispositions, habitat, and surrounding conditions, all exert an influence which may aid in producing deviations from normality in dental evolution. The consideration, therefore, of pathological dentition must include disturbance of functional harmony in organs remote, as well as the expressions of abnormal conditions in the oral cavity; it must be credited with causing, modifying, or aggravating systemic disorders, as well as with being influenced by them. "Thus, while dentition is not to be held responsible for all the ills to which human infancy is heir, it is unsafe to ignore its possible pathological complications in any case."

Normal dentition depends upon an absolute correspondence between the elongation of the pulp and its calcification at the growing extremity of the tooth, and the absorption of the mucous membrane and subjacent tissue covering its crown. When the advance of the tooth is more rapid than the removal by absorption of the superimposed tissue, the latter acts as a mechanical obstacle, and the increased pressure may produce congestion, tumefaction, induration, and ulceration. But the direct pressure of the advancing tooth upon the overlying integuments is not the only nor the principal factor in the production of disturbance; the most serious complications result from the resisting gums inducing a backward pressure of the sharp edges of the calcifying tooth upon the nervous and vascular tissue, the uncalcified pulp giving rise to exquisite remitting pains, and a consequent irritability of the general system, which finds expression in sleeplessness, thirst, fever, nausea, diarrhoea, cutaneous eruptions, convulsions, paralysis, and other serious troubles. Under the above conditions it is rational, and in accord with analogy, to expect benefit, and often permanent relief, to follow the entire liberation of the advancing tooth by a thorough division of the resisting gum with the lancet. The manner in which this operation is performed has much to do with its success or failure. The object is not merely to induce a flow of blood, but rather to remove tension. The cuts should, therefore, be made with special reference to the form of the presenting tooth. The incisors and cuspids need only a division of the gum in the line of the arch; the molars require a crucial incision, thus, X, the centre of the crown as near as possible indicating the point of intersection. The cuts should be sufficiently deep to reach the advancing surface, extending fully up to or a little beyond its boundaries, so as to insure the entire liberation of the organ. Usually there is but little

inconvenience attending second dentition, yet occasionally considerable pain and swelling accompanies the eruption of the permanent molars; and especially is this true of the inferior third molars, or wisdom teeth, when they erupt close to, or become impacted in a horizontal position under, the coronoid process. In such cases the gums and adjacent soft tissues participate in the irritation, which extends into the fauces. Mastication becomes impossible, and deglutition difficult and painful; such lesions not unfrequently terminate in suppuration, and when accompanied by unfavorable idiosyncrasies or systemic conditions may cause necrosis, exostosis, ulceration, sloughing of the soft tissues, ankylosis of the jaw, facial paralysis, neuralgia, erysipelas, tetanus, and death. Until the third molars are all erupted it will be the part of wisdom to inspect the mouths of patients suffering from lesions not otherwise explainable in any locality to which filaments of the fifth pair of nerves are distributed, and in all such cases to count dentition as a possible factor. (See Dr. J. W. White's essay on *Pathological Dentition*.)

Dental caries.—Caries is molecular death and decomposition of the hard tissues of the teeth. The theories which have been advanced respecting its cause and progress have been numerous and diverse. At one time it was considered wholly due to chemical agents, acids especially, acting upon the salts of lime in the tooth; at another, an organic change, preceded by an exalted irritability, the result of systemic or local and external influences. Then came the chemico-vital theory, vices of conformation from imperfect nutrition during the development of the tooth being considered a predisposing cause, while vitiated secretions, resulting from either systemic or local conditions, acted as an exciting cause. There has also been advanced a parasitic theory, as well as an electrical one. That the different tissues of the teeth were abnormally charged with negative and positive electricity, and hence were disintegrated by this antagonism, has found numerous advocates; and that some of the lower forms of life developed in the oral cavity were largely the cause of this retrograde metamorphosis, by their mycelium burrowing into the dental tissue, has been ably urged by many authors. No one theory has adequately explained these pathological phenomena; a better appreciation of the systemic and local conditions which contribute to this tooth-destruction might prove of value.

A study, carefully contrasting the teeth of those who live upon dry, solid food with those subsisting largely on fluids and semi-solids, would show a marked difference in favor of the former. The increasing predisposition to toothache and other dental annoyances, which many experience while laboring under mental or physical debility, or exhaustion; the exalted sensitiveness of the teeth during gestation and lactation; the almost uniform certainty of the loss of two or more teeth by the average mother for every child nursed; the greater predisposition of teeth to decay in youth over adult life; the uniformity with which the teeth of a child resemble in conformation and structure those of its ancestors; the certainty with which the influence of a specific taint transmitted from parent to progeny is shown upon the teeth; the recognized fact that dental caries always attacks the external surface of the tooth first, and in such localities as are difficult to keep clean, and from these points advances to the centre;—speak in unmistakable language of inefficiency of protective methods based entirely upon manipulative skill, and at the same time they point with unerring precision to the fact that there are certain physical, mental, moral, dietetic, hygienic, and hereditary causes which are contributing both directly and indirectly to the prevalence of dental caries.

Treatment of dental caries.—For convenience of description and treatment, dental caries has been divided into three stages, viz., superficial, or caries of enamel;

middle, or caries of dentine; and deep-seated or penetrating, where the pulp is involved by exposure. The proficiency and dexterity with which this malady is treated to-day by excavating, shaping, and filling the cavity, is largely due to American genius as developed in the invention of mechanical devices, instruments, and appliances for keeping the operation dry and the cavity to be filled accessible; also for the preparation of the material with which the cavity is to be filled, and its insertion and condensation.

The successful treatment of teeth where the pulp is exposed, either by devitalization or by capping and preserving its vitality, and subsequently filling the crown-cavity, is largely due to American skill. In the former case an application of arsenious acid is made to the exposed organ, and subsequently the dead pulp is removed and the root filled; in the latter, a protective paste of oxide of zinc and creosote, or some other non-irritating substance, is placed over the exposed point, and upon this the permanent filling is condensed.

The varying density, sensibility, and recuperative power of the teeth of different individuals, and of the same individual at different periods of life, make the selection of a material for filling a matter of great importance. It is a well-recognized fact that teeth during the period of their lowest recuperative power and greatest metamorphic tendency will more readily tolerate and be best preserved by plastic fillings possessing a low conductive power and a maximum degree of adaptability.

Gold, tin, amalgams, gutta-percha, oxychloride-of-zinc cements, and phosphate-of-zinc cements constitute the materials now in use for filling; and while it cannot be claimed that any one of these is best fitted for the filling of all teeth, it is most evident that each has its use, and in many special cases some one is far preferable for accomplishing the desired result than either of the others.

A filling material must possess certain attributes, such as ease of introduction into the cavity; adaptability to the walls of the same; density, to withstand attrition in mastication; susceptibility of consolidation; resistance to chemical agents found in the mouth; non-susceptibility to thermal changes; harmony of color; and the absence of injurious influences, either local or constitutional.

In all filling operations the end to be obtained is the restoration of the conformation of the tooth and its functional qualities, the protection of the dentine from irritating and disintegrating agents, and the preservation of the organ for future use. These are secured by properly cleansing and shaping the cavity, careful and thorough insertion of the filling material, and an exact and artistic finish of the surface of the filling so as to be smooth and self-cleansing.

Dental necrosis.—Necrosis may be partial or complete. The dentine only may have lost its vitality by the death of the pulp, or the peri-dental membrane and cement may be involved and the whole vascular supply be cut off, resulting in complete necrosis. In either case the tooth loses its translucency, becomes dull and opaque in color, and may assume any shade from a blue to a dark reddish-brown, this varying with the density and structure of the tooth, age of patient, kind and quality of the dental operation.

This necrosed condition of the tooth may result from medicinal, local, or constitutional causes. When from the latter, with a chronic type of inflammation, treatment is rarely more than palliative, modifying the progress of the disease; in such cases, local applications of dilute sulphuric acid being often made to advantage.

Dental exostosis is a hyper-nutrition, an enlargement of the cement of the root of the tooth; in extent it may be circumscribed; in locality it may be confined to the apex of the root, to either side, or the whole root may be involved, depending in this somewhat upon the cause and its continuation. When confined

to the end of the root, it frequently presents the appearance of a knob; if on one side only, the symmetry of the root is destroyed by the affected side being much thicker, or where the whole root is involved concentric layers are added to the normally developed root until the added cement completely invests it to the neck. Or if it be a multiple-rooted tooth, the two or three roots, as it may be, are united in an irregular cone-shaped mass. Its presence always implies previous irritation in the membrane covering the root, in which there is an abnormal quantity of blood, brought to the part by either local or constitutional conditions. Accumulations of foreign substances upon the necks of the teeth under the margin of the gums, cavities of decay in the same situation, biting off threads or other unnatural uses of the teeth, are all productive of hyper-nutrition. While this abnormal growth may, and often does, produce an uneasy sensation in the tooth and some soreness on pressure, the greater amount of discomfort is of a neuralgic nature, and frequently quite remote in its expression from the seat of the disease. This enlargement of the root, and the close adaptation to it of the walls of the alveolus, making in some instances almost a ball-and-socket joint, renders the removal of the affected teeth extremely difficult.

Abrasion of the teeth is a condition affecting only the cutting edges of the front teeth, usually the upper ones. It has never been satisfactorily explained. When fully developed, both the upper and lower are involved, and present the appearance of an elliptical span which somewhat corresponds with the boundary of the labial commissure when opened, as in the natural position of those who have the lips slightly unclosed. The cause of this abnormality has been attributed by the most careful authorities to an acidulated mucus from the glands of the tongue and the dental surface of the superior lips; the solvent in this case is supposed to be lactic and acetic acids, because both organic and inorganic substances are dissolved.

Mechanical injuries of the teeth, such as fracture, dislocation, and dilaceration, are the result usually of accidental injuries. A fracture of the tooth when the pulp-cavity is not involved, though unsightly and, if to any extent, impossible to remedy except by the substitution of a foreign substance for the lost tissue, does not in any appreciable degree necessitate the loss of the tooth or a diminution of its functions. All such teeth can sooner or later be filled with gold or some other material, to the complete restoration of its contour and functional use. Where the accident has fractured through the root, without displacement of the tooth, if the parts can be held perfectly quiet and in exact juxtaposition, a reunion is possible by the addition of cement, or if the tooth, without fracture, should be entirely dislodged, its replacement is practicable; and where conditions are favorable it becomes firm, with a re-establishment of its usefulness.

Dilaceration of the tooth consists in a forcible displacement of the cap of dentine and enamel of a partially developed tooth from the formative pulp; the development of the hard tissues, continuing in this abnormal position, presents, when completed, an appearance such as would be produced by twisting the coronal portion about its axis, until the corresponding surfaces of the crown and root do not lie in the same planes. A somewhat similar conformation may also be the result of deficiency of space in the alveolar arch at the time the tooth is developing. It is owing to this condition that the roots of the third molar or wisdom tooth are so frequently found presenting various positions divergent from a line with the axis of the tooth. Malformations and irregularities of structure are constantly found in both the root and crown of the tooth, and while not a few are the result of inherited tendencies, an interrupted nutritional process is probably responsible for the majority of such abnormal developments.

Abnormal conditions of the dental pulp.—The dental

pulp occupies the cavity within the crown and the canal of the roots of each tooth; it is the germinal remains of the dentine and its organ of nourishment and sensation. In shape it corresponds with that of the tooth, dividing into as many radiating prolongations as there are roots to the tooth. It varies with age in its shape and anatomical character. It is richly supplied with nerves and blood-vessels, holding its connection with the nervous system through branches of the fifth pair (trifacial, trigeminus), and with the arterial system through the superior and inferior dental arteries—a branch of the internal maxillary. Small lateral processes (primitive dentinal fibrils) are supposed to form meshes and permeate the dentine; their presence there furnishes a rational, and probably a correct, explanation of the peculiar sensitiveness of that tissue.

The most conspicuous physiological change which the pulp undergoes in advancing age is its progressive calcification, which perceptibly diminishes its size and thickens the walls of the pulp-cavity. The pulp, like other vascular tissues, is subject to various lesions, nutritional and systemic as well as surgical and local. Surrounded as it is by an unyielding enclosure, which prohibits it from swelling, it becomes, when inflamed, the seat of severe pain, which may also find expression in parts quite remote. Its irritability may be caused by numerous local conditions, as also by slight or grave systemic disturbances. When in this morbid state the hard tissues surrounding it are exalted in their sensibility, and readily respond to thermal changes and the presence of certain articles of diet, which, were the pulp normal, would make no impression. This condition can usually be relieved by removing the cause and applying antiphlogistic treatment to the gum-tissue around the root of the tooth.

Inflammation of the pulp is attended by a throbbing, lancinating pain, which is usually increased by the patient's assuming a horizontal position. From this engorgement of the vessels the pulp-cavity becomes suffused, and, if no relief is given by an artificial opening, degeneration and suppuration rapidly supervene.

Granulation, or polypus of the pulp, is a condition following long exposure by deep-seated caries and frequent wounding by contact with foreign substances; the appearance it presents is that of a vascular tumor filling up the cavity of decay, having its base at the opening into the pulp-cavity. Teeth so affected are susceptible of successful treatment.

Dental periosteum.—This lining and protective membrane occupies the space between the surface of the root and the inner walls of the alveolar socket, giving nourishment from its respective surfaces to each of those tissues. It is the germinal remains of the cement, and its organ of nourishment and sensation; when stimulated to a hyper-nutrition it causes a deposition of cement to the already completed root, this enlargement being recognized as dental exostosis. Like the dental pulp, it is confined between two unyielding surfaces, and when inflamed becomes the seat of severe pain. It holds its connection with the arterial and nervous system from the same source as does the pulp; its lateral processes permeate the cement and carry nourishment and sensation to the little lacunæ within the body of this tissue. The most frequent, unyielding, and persistent abnormal condition of this membrane is a chronic inflammation, which is accompanied by a thickened and vascular condition of the gums, a discharge of pus around the neck of the tooth, dissolution of the walls of the alveolus, a lengthening of the tooth, and finally its extrusion and loss. An acute and much more painful inflammatory condition is recognized as "alveolar abscess," an accumulation of pus around the end of the root, which, finding no means of exit either through the root-canal and pulp-cavity or along the surface of the root to the margin of the gum, is retained within the socket until its increasing quantity has by pressure upon the surrounding alveolar walls produced their dissolution so

that the pus escapes either into the gum or maxillary sinus. If it takes the former course it rapidly burrows in the direction offering the least resistance, until it is discharged into the oral cavity or on to the external surface through a fistula established in the mucous membrane. During this pathological process, lasting thirty-six or forty-eight hours and sometimes longer, much redness, swelling, and pain is induced, which rapidly subside upon the liberation of the pus; the canal and fistula, having been secured by the previous inflammatory condition, remain as a means of exit for the continued accumulation. If this pus should be discharged into the antrum or maxillary sinus, its lining membrane becomes involved, and if neglected there is soon established a chronic case of diseased antrum with a purulent discharge into the nares and throat. A poultice should never be applied to the outside of the face during the progress of the abscess, as this has a tendency to induce the establishment of a fistula and the discharge of pus on the surface. The most frequent cause of this acute inflammatory condition of the peri-dental membrane is devitalization of the dental pulp.

Hæmorrhage from the alveolo-dental periosteum, whether subsequent to the extraction of a tooth, or a persistent oozing of blood from around the necks of the teeth *in situ*, never occurs in excess except there exists a hæmorrhagic diathesis or a temporary deficiency in tone of blood-vessels and quality of blood from constitutional disturbances. Where continuous bleeding follows the removal of a tooth, the only reliable remedy is a compress upon the lacerated membranes.

The alveolar process is a festooned ridge of spongy bone located upon the superior and inferior maxillæ, so as to form and maintain the elliptical figure characteristic of the human dental arch. It consists of two plates, an outer and an inner one, which are connected by numerous transverse septa, forming interspaces (sockets) in which are implanted the roots of the teeth. The mass of loose, spongy bone which makes up the alveolar socket is secondary to, and in its persistence dependent upon, the individual tooth which it surrounds. It is rapidly built up as the tooth is developed, and usually as promptly absorbed on the removal of the organ.

In a strumous diathesis necrosis of the process not infrequently follows the establishment of an acute alveolar abscess; and especially is this the case in children with diseased deciduous teeth. The process is also subject to a hyper-nutrition which may result in the filling up of the socket and extrusion of the tooth, or in thickening the external wall to the unsightly protrusion of the lips, without disturbance of the normality of the teeth. Its absorption or dissolution results from the extraction of the teeth, or, as previously stated, from chronic thickening and suppuration of the peri-dental membrane.

The gum, which is continuous with the mucous membrane of the inside of the lips, the floor of the mouth, and the palate, but differs from this principally in its greater density, is subject to lesions resulting wholly from the teeth, either in their evolution or abnormal conditions subsequent to eruption. The advancing tooth, whether it be of the deciduous or permanent set, may cause the inflammation and tumefaction of the superimposed tissue, with subsequent ulceration, or it may be white and indurated. With the progress of dental caries to the encroachment on the neck of the tooth, the sharp edges of the enamel may act as an irritant on the surrounding soft tissue; inflammation in the alveolo-dental periosteum would, from its continuity with the membrane covering the gums, induce an abnormal condition in the latter. Accumulations of foreign substance on the necks of the teeth, improper use of the brush, harsh and unsuitable dentifrices, as well as advancing years, all contribute to the recession of the gums from the necks of the teeth.

Tartar, or salivary calculus.—The teeth are constantly bathed in a fluid which is furnished by the salivary and mucous glands opening into the oral cavity. The character and quantity of this secretion are modified by systemic conditions and by articles of diet, but under all circumstances it is made up largely of water, holding in solution a small quantity of organic matter and a very variable amount of inorganic material, the latter being chiefly carbonate and phosphate of lime. The accumulation of solid matter found upon the necks of the teeth (varying in quantity, color, and density) is largely due to the constituents of the secretions in which they are constantly bathed, these being deposited upon those portions of the teeth where there is the least friction in mastication; hence tartar is found in the largest quantity on the lingual surface of the inferior incisors and external and buccal surfaces of the superior molars. The accumulation in these localities is also facilitated by the fact that the sublingual and submaxillary glands throw their secretions directly upon the former surface, and the parotid empties its supply upon the latter. The color of the tartar varies from a light cream to a dark brown or black; the density varies with the color, the lightest shades being the softest, and the hardness increasing as the color darkens. Its influence upon the hard tissues of the teeth is benign or protective, but when it has accumulated in large quantities and encroaches upon the surrounding soft tissues, or in smaller amounts under the margins of the gums, it causes inflammation of this tissue, and also of the alveolo-dental periosteum; both of these, together with the walls of the alveolar socket, are from the mechanical influence of the tartar finally absorbed and the tooth loosened and lost. Much of the discomfort resulting from this condition is of a neuralgic character, and frequently quite remote from the seat of the disease.

Extraction of teeth.—The removal of a tooth firmly implanted in its socket without the use of an anæsthetic is an operation attended with so much suffering that few submit to it except for the purpose of gaining relief from pain—present or prospective; but since the introduction of nitrous oxide gas, with its reputed comparative freedom from injurious influences, thousands of teeth are annually sacrificed which could with the aid of dental skill be made comfortable and serviceable for many years. To appreciate fully the extent of the injury done by this wanton sacrifice of human teeth would necessitate the collection and publishing of a complete record of the operations of those who perform only this one branch of dentistry. The flaming advertisements for the “painless extraction of teeth” are some of the most conspicuous relics of the charlatanism which has so successfully and unfortunately brought into disrepute the profession and retarded its advancement. When the extraction of a tooth is deemed advisable, three conditions are to be observed: first, the removal of the entire organ; second, to do this with as little injury as possible to the surrounding tissue; third, with no unnecessary pain to patient and without delay. To accomplish this, the operation should be divided into three stages: (1) properly and efficiently seizing the tooth: embraced in this must be the selection of the instrument; (2) the application of such force and in such direction as to break up the membranous connection the tooth holds with its socket; (3) the removal of the tooth from the mouth. To do these things effectually the operator must be familiar with the number and shape of the roots, the density of the surrounding alveolar tissue, and the condition of the alveolo-dental periosteum, the varying conditions of these structures adding much to the simplicity or complexity of the operation. The anterior single-rooted teeth, somewhat cylindrical and cone-shaped, admit of a rotary motion in breaking up their membranous connection, while the flattened or more compressed roots prohibit this, and must be

loosened by an in-and-out motion or by elevating and depressing the hand. In the extraction of molars a recognition of the fact that the outer or external wall of the alveolus is less dense and less thick than the inner, and that these are multiple-rooted teeth, is all-important.

The necessity for tooth-extraction arises: (1) from a desire for relief from pain; (2) to anticipate or cure an external fistula; (3) to prepare the mouth for artificial substitutes; (4) to relieve and correct an overcrowded arch; (5) to remedy defects from malformed and misplaced supernumerary teeth; and (6) where the condition of the tooth, from disease or injury, precludes the possibility of reparation. The instruments in use are the key, the forceps, and the elevator. The use of the key is chiefly confined to the country physician, and, though usually effectual in its results, is poorly adapted to the purpose, because the force is applied at a right angle to the axis of the tooth; and where much resistance is offered considerable injury is done to the surrounding tissue. The forceps now in use are all constructed upon the principle of lengthening the crown of the tooth and applying the force on a line with its axis. The various shapes of the beaks correspond with the necks and bifurcations of the roots of the teeth; and when the application is made to the tooth or root to be removed, the pressure upon the tooth in closing the handles of the forceps is diffused over the greatest possible surface so as to avoid the danger of cutting or crushing it, or, in the effort of its removal, of its slipping off. In selecting forceps for a single-rooted tooth the edge of both beaks should be sharp so as to readily separate the gum from the neck of the tooth, and from the process also if necessary. They should be concave, with the external or labial beak slightly wider than the internal or lingual, to correspond with the shape of the tooth. For the upper molars, three-rooted teeth, the external beak should be wide, with a sharp point in the centre, and a concave sweep each side, so as to fit between and on the two buccal or outer roots, while the palatine beak should have a single concave sweep to fit the single palatine root. For the inferior molars, having an anterior and posterior root, both beaks are wide, with a sharp point in the centre, and concave each side. These teeth are frequently very difficult to extract, because of their bifurcation and the convergence of the end of the roots embracing within a strong section of alveolar process which must frequently be dislodged from its bed before the tooth can be removed. The undetermined shape of the roots of the third molar, with their abrupt curvature posteriorly and crowded condition between the second molar and base of the coronoid process below and tuberosity above, renders their extraction difficult. Especially is this so with the inferior molars when they become impacted. The forceps for these should have beaks of equal width, with concave sweep to fit the neck of the tooth. It is in the extraction of the inferior wisdom-tooth that Physic's forceps, used upon the principle of an elevator, often proves invaluable. Success in the extraction of either teeth or roots depends largely on forcing the instrument as near the apex of the root as possible; with this precaution less force is needed and much less liability of fracturing the root incurred. To secure this it often becomes necessary to pass the beak of the forceps up entirely outside of the alveolus, cutting the latter through and removing the loosened portions with the root. In selecting extracting instruments an efficient set for the removal of all roots and teeth could be comprised in twelve forceps and a heavy, lance-shaped elevator, those for the superior first and second molars being what are termed *right* and *left*.

The instruments most improved in every particular which can be procured for the extraction of teeth are the result of many modifications, with the view of an especial adaptation to each particular tooth with its

complications. For the ease and success with which the dental surgeon performs his most difficult operations in the removal of teeth and roots he is indebted to the zeal and persistent efforts of the American dental instrument-maker and his desire to utilize the suggestions of the dental surgeon.

Replantation and transplantation of teeth.—Success or failure in this peculiar department of dentistry depends much upon the idiosyncrasies or peculiarities of constitution. With all favorable surroundings it is rarely possible to preserve the vitality of the pulp. The tooth having been dislodged, the vessels furnishing the vascular supply are necessarily broken, and a reunion of these can only take place under the most advantageous conditions. This being the case, it is preferable under all circumstances, where the dismemberment has been complete, before replacing the tooth in the socket to slightly enlarge the apical foramen and withdraw the entire pulp, and fill the cavity with a preparation of gutta-percha or some other indestructible material. This prevents the alveolar abscess which is almost sure to follow the disintegration of the devitalized pulp, and obviates the necessity of subsequently drilling into the tooth and filling the pulp-chamber from an external and artificial opening. In order to secure the inserted or replaced tooth firmly with the readjustment of the alveolus and gum, complete rest and freedom from motion must be obtained by the application of properly adjusted ligatures attached to the adjoining teeth. In the earlier days of American dentistry the transplantation of teeth was extensively practised, but the operation having proven so unsuccessful in the large majority of cases, it has grown into disuse, and now the effort is rarely made to place in an alveolar socket a tooth which had not previously grown there. In the replantation of teeth the result has been quite the reverse from that of the former operation, owing in a great measure to the necessity for exact adaptation of the tooth to the socket, and while transplantation has become almost obsolete, removal or dislodgement and replantation is yearly growing more in favor, many morbid conditions, as alveolar abscess, severe periodontitis, and exostosis, having all been successfully treated in this way.

Obturbators and Artificial Palates.—The abnormal conditions which these mechanical appliances are intended to remedy are fissures of varying magnitude through the palate (cleft palate), arising from congenital or accidental causes, the former dating from birth, the latter the result of accident or disease. Where the deformity arises from an arrested development the fissure is always longitudinal and on the median line of the palate, while in those cases resulting from accident or disease the loss of tissue may be partial or entire, with scarcely a resemblance in any two cases. Nor does a congenital fissure necessarily bear any other resemblance to an acquired one than the fact that both represent loss of structure or a want of entirety in the palatine arch. When the defect is of such magnitude or the conditions are so unfavorable as to render surgical operations doubtful or impracticable, mechanism comes forward with properly adapted appliances and supplements the surgeon's skill. Obturbators for the purpose of closing perforations of the palate are of an ancient date, and though crude and only partially effective, were valued. A piece of sponge, a cotton wad, or a thin piece of leather were all used as stoppings, serving a temporary purpose and being easily removed; but the impropriety of sustaining in position an obturbator of any material by pressure upon the lateral walls of the opening will be readily recognized from the fact that absorption is thereby induced and the opening continuously enlarged, which necessitates repeated additions to the plug. Persistent and untiring effort on the part of a few who have pursued the subject in all its bearings has evolved a truer and more comprehensive appreciation of the functions to be restored and of the means adapted for that end;

so that artistic and scientific skill has succeeded in the manufacture and adjustment of appliances which now so completely relieve the inconvenience of these lesions, whether congenital or acquired, that only critical inspection detects the imperfection.

Metallic plates, gold or silver, formerly constituted the material from which the majority of appliances used for closing lesions of the palate were made, and many ingenious pieces of mechanism were constructed for such purposes; but recently vulcanized rubber and celluloid have almost entirely superseded the use of metals. These substances being lighter and readily moulded into shape and adapted to openings and inequalities, much more artistic and efficient results can be obtained from their use. Dr. Kingsley, of New York, to whom the author is indebted for many suggestions on this subject, says: "It is of the greatest importance that all such instruments should be executed in the most perfect manner, and made to fit accurately all the parts with which they are to be in contact, so that they may not produce the slightest irritation or exert undue pressure upon any of the surrounding parts." Especially is this the case in acquired lesions, where the system is in a condition predisposed to inflammatory symptoms from slight irritations. In the construction of these appliances the methods are not unlike those used in the making of an artificial denture. An accurate impression of the parts, from which to secure a model of the opening and surrounding tissue, is the first and most essential step, and, in many cases, not the least difficult. Plaster of Paris being the only reliable substance with which to obtain an exact counterpart of the defect, much care is required in extemporizing an impression-cup of wax, block-tin, or sheet gutta-percha, in which the plaster in a plastic condition shall be gently pressed to the parts desired to be moulded. From the cast obtained from the impression a metal die can be secured; then upon this exact model the obturbator must be constructed out of gutta-percha or celluloid. In many lesions, both acquired and congenital, the loss of tissue is confined to the posterior part of the soft palate; in such cases an unyielding appliance is not only undesirable, but inadmissible, where perfect articulation is to be attained. The constant vibration of these soft tissues would only tolerate with comfort a substitute possessing elasticity and flexibility; the elastic rubber is the material which is admirably adapted for this purpose.

The history of obturbators for remedying defects in the hard palate dates back several hundred years, but that embracing the successful application of an artificial velum, which in a moderate degree fulfils the functions of the natural curtain of the palate, is a history of methods confined to the last forty years, developing the struggle of a few earnest men for an end which has only been attained by thought, ingenuity, and labor. A full recognition of the character, cause, and peculiarities of the lesion, as well as the function of the organ in health, was found to be an essential step towards success; a knowledge of the muscles to be propitiated and of the instruments they would tolerate was requisite to a successful artificial velum. "Muscular power cannot be given to a piece of mechanism, but the material of which it is made may be so soft, elastic, and flexible that it will yield to, and be under the control of, the muscles surrounding it, and thus measurably bestow upon it the function of the organ it represents."

Anæsthetics.—Anæsthesia, in the modern sense, was first induced at the suggestion of Dr. Horace Wells, a dentist of Hartford, Conn., who, on Sept. 11, 1844, inhaled nitrous oxide gas, and while under its influence submitted to the extraction of a tooth, the operation proving painless. In October, 1846, Dr. W. T. G. Morton, a practising dentist of Boston, Mass., first publicly demonstrated his discovery of the anæsthetic power of sulphuric ether upon a patient in

the Massachusetts General Hospital. The use of ether and chloroform for many years entirely supplanted the anæsthetic originally employed, but during the past fifteen years the use of nitrous oxide gas has been revived, and it is now more generally used than any other anæsthetic agent in dental and other minor surgical operations. Its advantages are reputed safety, combined with great rapidity of action and the almost entire freedom from unpleasant sensations which it secures to the patient both during inhalation and subsequent to the operation. Headache, following the use of the gas, is, however, of frequent occurrence, and many cases are reported in which lifelong invalidism has been attributed to its influence. The impression produced upon the nervous system by anæsthetics is so profound that with susceptible constitutions unpleasant results will occasionally follow, whatever anæsthetic may be employed; and, as nitrous oxide gas is more frequently used than any other agent, the number of such cases may be absolutely greater, even while relatively less, than with ether or chloroform.

The fatality which has attended the administration of chloroform, owing to the heart-paralysis and brain-anæmia which it produces, has been so great—an aggregate of 500 deaths being now reported—that its use in general surgery, except in special cases, has by many been abandoned. In ordinary dental practice chloroform as an anæsthetic should be absolutely interdicted. In safety sulphuric ether compares favorably with nitrous oxide gas, very few fatal cases having resulted from its use, and it is claimed by many that when properly administered a fatal result is impossible.

The following rules should be observed in giving any anæsthetic: Loosen the clothing around the neck and chest, in order that respiration may be free. Be sure that the stomach contains neither solid nor liquid food; vomiting often occurs during the progress of anæsthesia, especially when ether is used, and food may, during this act, be drawn into the air-passages and death from suffocation ensue. With ether or chloroform the patient should be placed in a reclining or semi-reclining position, in order that the flow of blood to the brain may be favored by gravity, and the heart be thus relieved of a portion of its labor. Nitrous oxide gas weakens the force of the heart so little that with this agent this precaution is not necessary, and the upright position may be maintained throughout.

The first effect of all anæsthetic agents is decidedly exhilarating, all the forces being stimulated; this condition, however, is followed by a stage of depression more or less profound. Loss of consciousness, but not of sensation, comes very early in this stimulant stage, and then trifling surgical operations may often be performed without conscious suffering; but, except in the early part of that stage, it is unsafe to operate before anæsthesia is complete, otherwise the shock from the operation may, by reflex action, produce paralysis of the vital centres, weakened as they are by the narcotic effect of the anæsthetic employed. Neglect of this rule is chiefly responsible for the great mortality which has attended anæsthesia in dental operations.

Dr. W. F. Litch, of Philadelphia, to whom the author is indebted for valuable suggestions on this subject, says: "A good general test for complete anæsthesia is the entire muscular relaxation which usually attends total loss of sensibility; the arm of the patient when lifted drops heavily to the side. This test, however, does not apply to anæsthesia by nitrous oxide gas. Complete anæsthesia by that agent is attended by muscular rigidity and twitching, with more or less lividness of the face and lips. A critical test is to touch with the finger the edge of the eyelid; the conjunctiva covering the eye being very slow to lose sensation, absence of movement when the eyelid

is thus touched is full evidence that the anæsthesia of the general system is very profound."

With ether, and especially with chloroform, a due proportion of air must be given with the vapor. Nitrous oxide gas must, on the contrary, be given as nearly as possible absolutely free from air. When dangerous symptoms arise, suspend the anæsthetic at once, place the head of the patient lower than the body, draw the tongue forward, dash cold water in the face, and, if necessary, resort to artificial respiration and the use of the electric battery.

Dental irregularities.—The deviations from the normal positions are, in the permanent set, of almost every conceivable variety, and when they occur are properly designated "dental irregularities." In the deciduous set, unless associated with some other deformity, abnormal arrangement of the teeth is very rare, seldom amounting to more than a slight malposition of one or two of the incisors, either of a congenital origin or resulting from the mischievous habit of thumb-sucking or the prolonged use of an artificial nipple; in neither case need they occasion any uneasiness regarding the position of their successors or be considered of sufficient importance to warrant an effort for their correction. Abnormal arrangement of the permanent teeth is of a much more serious character, and, whether involving one or two only or all of the anterior teeth, interferes more or less with their functions, both in regard to mastication and the formation of articulate sounds. It predisposes them to disease, endangers their durability, and may very seriously interfere with their beauty, and greatly impair and distort the expression of the countenance. The causes which contribute to the great variety of malpositions which they assume may be hereditary and congenital or from various mechanical influences, as follows: Prolonged retention or premature extraction of the deciduous teeth; accidental mechanical influences, such as disproportion of the size of the teeth and jaws, imperfect development of the maxillary bones, concomitant variations, thumb-sucking, tumors on the gums, injury to the jaw, persistent nursing in infancy from the one breast, cicatricial tissue from a burn or scald; abnormal development in one organ or locality, modifying the condition of structures subsequently perfected. This is verified in the fact that congenitally enlarged tonsils—which necessitate the continuous opening of the mouth for breathing—invariably induce a narrow and deep arch and protruding front teeth. The foregoing conditions, each of which may contribute to the malposition of one or more of the permanent teeth, can very properly be classified under two influences—developmental and accidental. The former operates prior to the eruption of the teeth, the latter subsequently and wholly through mechanical influences. Of developmental causes Dr. N. W. Kingsley says: "No one of extended observation will hesitate in believing that there is a faculty or power at work modifying materially the physique of the present generation, . . . and that it is in the accumulated, the intensified, effect produced by the law of inheritance that the most striking and destructive results are to be witnessed."

"The primary cause of any general disturbance in the development of the permanent teeth, showing itself particularly in their malposition, is directly traceable to a lesion of the trigeminal nerve; it is an interference, more or less prolonged, with one of the prominent functions of that nerve. The function of the trigeminus, whether stimulated or interrupted, is that which supports, regulates, and governs the nutrition of the tissues to which its terminal branches are distributed." Essential, therefore, to a perfect dental development is a well-balanced physical and nervous system without hereditary taint.

In the correction of irregularities in the position of the teeth appliances as varied in construction as are the malpositions may be used; but in all cases the first and

most important object to be secured is a fixed point from which the force is to be exerted. This is to be obtained by plates of metal or hard rubber firmly attached to the teeth in position; with these a force either direct and positive or gradual and continuous is applied to the mal-placed teeth to pull or push them into the position they should occupy. In the application of force two systems are in vogue, which may be designated by the terms "positive" and "gradual." In the former a nut or screw is turned; the force is direct and complete for the time; the tooth is moved and held at rest for a period of twenty-four or forty-eight hours, when another turn of the nut brings the tooth nearer the desired position; and the process is thus continued until the tooth occupies its place in the arch. In the gradual system elastic ligatures and wires, in combination with springing- and section-plates, are used; the force is constant from the time of its application until the appliance is removed for renewal, and so, by lengthening or shortening the springs and ligatures as the tooth has been pulled or pushed, the force is renewed, and increased if desired, until the deformity is corrected. When this is effected by either method, if the natural occlusion of the opposing tooth does not maintain the correction, it must be held in position by a fixed plate or ligature until the alveolar process around the root of the tooth has become adapted to its new position.

Preliminary to the effort for correcting the malposition of teeth some important considerations are to be noted, which must be influential in deciding for or against the operation—namely, age, health, endurance, and desire of the patient; the probable durability of the teeth and extent of the deformity; the resistance offered by the density of surrounding structures, and the crowding of the adjoining and occlusion of the opposing teeth; the tendency to return to their original position, and the possibility of keeping them, when corrected, in their normal place in the arch.

In the extraction of the natural teeth for the purpose of procuring room for correcting an irregularity the tooth selected should invariably be one of the bicuspids. These teeth are less durable than either of the six anterior, and can be removed with little detriment to either speech or expression of countenance.

Mechanical dentistry.—The present application of this term includes the construction and adaptation of substitutes for the natural teeth, also the manufacture of appliances for the correction of every class of oral deformity, whether it be fissure in the hard and soft palate, malplaced teeth, or fracture requiring surgico-mechanical treatment. The mechanical dentist should be able to construct every mechanical appliance for the restoration of function or the concealment of deformities. The materials which have been used for the construction of dental substitutes within the present century are bone, ivory, the teeth of sheep, human teeth, and porcelain. These have been placed upon bases of ivory, the metals silver, gold and platinum, porcelain, hard rubber, and celluloid; and retained in the mouth by ligatures and clasps attached to natural teeth *in situ* or by adaptation to the gums and hard palate, with or without an air-chamber in the plate. When the latter is supplied, it is called a suction- or atmospheric-pressure-plate. If both an upper and lower denture were constructed, they were held in position by means of springs uniting them upon the principle of a hinge. Where practicable, a single tooth is still attached to a natural root by means of a wood or metal pivot; and this has for many centuries been the custom.

Modifications and improvements in materials and methods have simplified and made more successful many operations. The introduction of porcelain and gold crowns has made valuable many roots that were previously considered worthless, and has also increased the durability of the operation of pivoting more than twofold. Formerly, pivoting was confined to single roots, and the preparation of the root and the crown

for its attachment was all done while the patient remained in the chair; now, after the root is prepared, an impression is taken of it and the adjoining teeth in calcined plaster; from this a cast is made which accurately represents the condition of the mouth. In the laboratory with this cast the tooth and pivot are put into complete readiness for insertion, which is usually done in a comparatively short time, and quite as successfully and readily upon multiple as single roots.

The work of dental prosthesis should begin immediately upon the loss of the teeth, and be continued to the full accomplishment of its purpose. It is not enough to make what is known as a "temporary set," and allow it to be worn as long as it can be endured, but to make a denture that shall fulfil every requirement in form, color, and expression, conserving to the best possible limit the functions of mastication and articulate speech. The bases of hard rubber and celluloid, with the addition of continuous gum-work, afford the opportunity and make this aim incumbent upon every worker in prosthetic dentistry.

A tendency to decomposition is a very serious objection to teeth and plates constructed of animal substances, but notwithstanding this the teeth of such materials were used long after the manufacture of those made from porcelain. In fact, human teeth are still largely used, because of the inability in many special cases to find mineral substitutes which present anything but a conspicuously artificial appearance. In the manufacture of artificial dentures, whether partial or complete, of porcelain teeth upon metal or other basis, from the primary through all the progressive steps to their completion, the utmost care is essential. The accurate impression is only to be had in plaster of Paris; the cast from this must be a fac-simile of the mouth; the die and counter-die must be accurate representatives of that; and every subsequent act must be with a skilled hand and an artistic eye if the result is to be more than an apology for a substitute for the natural organs. As the essential steps for the construction of an ordinary denture upon a metal base have been described in the *ENCYCLOPÆDIA BRITANNICA* under *DENTISTRY* its repetition is unnecessary here.

Continuous gum.—This term is used to designate the fastening of porcelain teeth to plates by means of a fusible compound applied on the base-plate and around the teeth, moulded and colored to represent the natural gum, and finally fused, thus making an almost homogeneous mass of the teeth, gums, and plate. Though not wholly of American origin, it has only in this country been brought to a degree of perfection that places it without a rival in all of the essential characteristics which inhere in a faultless denture. In its construction the preliminary steps, such as taking the impression, making the cast, die and counter-die, and swedging the plate, are the same as in any ordinary metal-base plate. The plate itself must be of platinum, the teeth moulded single and without gums, and of a peculiar shape and adaptation to the process. In their selection and arrangement upon the plate is offered an opportunity for a display of the utmost artistic skill, that their color, shape, and position shall all harmonize with the complexion, conformation, and expression of the countenance. The "body," composed of finely-pulverized feldspar, quartz, and kaolin colored to a proper tint with titanium, now in a plastic condition, is built upon the plate and around the teeth to a degree of fulness corresponding with the absorption of the alveoli and gums; upon this, after biscuiting, is placed the gum-enamel, made largely of pulverized feldspar colored with gold oxide. Again placed in the furnace, it is fused at a heat of about 280° Fahr. To complete the work, it is necessary that the case be subjected two or three times to the furnace-heat, with an addition each time of the gum-enamel to the surface; and when finished it represents in adaptation, durability, and beauty as complete a denture as it is possible to construct.

Vulcanite.—The announcement in 1851 of Nelson Goodyear's process for making the hard-rubber compound subsequently termed "vulcanite" turned the attention of those interested in the manufacture of various small articles for use and ornament to the adaptation of this material, which was announced to be a substitute for horn, bone, and ivory, susceptible of being colored, and possessing the plasticity of gutta-percha, while it was exempt from the action of heat, cold, and acids. In 1855 the first patent was obtained for making a dental plate in hard rubber, in which the teeth were secured before the compound was vulcanized. This was the first published suggestion of this use of the new material, which contained not only the adaptation of vulcanite, but also the use of the mould as now employed.

Vulcanite is used in dentistry for making base-plates for artificial dentures, obturators, and inter-dental splints. In making a piece of rubber-work for the purpose of supplying a denture or concealing a defect, the greatest possible care is necessary in order to procure an accurate impression of the parts upon which the appliance is to rest. For this purpose plaster-of-Paris is preferable wherever it can be used. The impression-mould obtained by it must be so prepared that the model made from it can be readily separated. The cast is now trimmed, and the points corresponding with the soft spots in the mouth slightly scraped. The trial-plate is next to be made of paraffine and wax. The articulation is taken as for metal-work, using the trial-plate as a metallic one. There are teeth especially designed for rubber-work, arranged in sectional blocks or single, with porcelain gums, the joints being at convenient places to give proper shape and contour to the denture. Plain teeth without gums can be used where they rest upon the natural gums, or where the latter are concealed by the lips. These are preferable to teeth with artificial gums, where they can be used, because they are susceptible of a more natural and artistic arrangement. The denture in this condition should be tried in the mouth to ascertain its correctness, and if not satisfactory, the necessary alterations should be made. The set is now placed on the plaster cast, and the whole imbedded with much skill and care in the flask. The trial-plate of wax and paraffine is then to be removed and the rubber substituted. The sections of the flask are now brought together and gradually though firmly closed under a moderate heat, so that the rubber may be forced into the inequalities of the cast and teeth, and made to assume a fac-simile of the counterpart of the mouth. A minute description of this accurate and painstaking labor would require more space than can be appropriated to it in this article, but every progressive step must be made with precision and care in order to secure success.

The flask is now placed in the vulcanizer, with water just sufficient to cover it. The top of the vulcanizer is tightly screwed on, and the temperature gradually raised during a space of not less than a half hour. When the vulcanizing point, 320° Fahr., is reached, the flame is lowered and the heat held uniform for an hour to an hour and a quarter, varying with the quantity and quality of the rubber.

The vulcanizing completed, the temperature is gradually lowered until the flask can be removed and the sections carefully separated; the denture is then subjected to the finishing process, which is done with files, chisels, scrapers, and sand-paper; the polishing being finally completed with a felt wheel upon a lathe with pulverized pumice, chalk, etc.

Celluloid.—Celluloid consists of white linen fibre reduced to a pulp by the action of nitric and sulphuric acids, with the addition of about 30 per cent. of camphor, and 3 per cent. of coloring matter, with which lead or zinc is added in quantity sufficient to tone it down and produce a pinkish color, well representing the gums and palate. The acids and volatile constituents are driven off, and the mass condensed into

"blanks" by pressure in metal moulds, under a continuous heat of 180° Fahr. for some days.

In the construction of dentures from this material the utmost care must be observed in all preliminary work, so that from the impression of the mouth shall be made plaster casts and block-tin dies, representing accurately not only the alveolar ridge, but the surrounding depression, as well as of the rugæ covering the anterior part of the palate. Upon this metal cast is constructed a trial-plate of sheet-lead or paraffine and wax, and upon this the teeth, having been selected of the appropriate color, size, and form, are arranged, with paraffine and wax built around them, to represent the loss of alveoli and gum, and fulfil in every particular the prosthetic requirements of the case, the correctness of the model having been ascertained by its adjustment to the mouth. The proper investment of the cast, trial-plate, and teeth with plaster in a flask for the purpose, is a matter of great care, that the whole shall be maintained in the desired position without possible danger of disarrangement. The opening of the flask, the removal of the trial-plate from the matrix, the substitution of the celluloid, making suitable provision for the escape of the surplus material, the necessity of freedom from moisture and grease while in a plastic condition, and for a gradual, firm, and constant pressure while under a proper degree of heat in the furnace, are all matters to be observed and executed with the utmost care and accuracy. The success or failure of celluloid as a base for artificial teeth depends wholly upon its proper manipulation. It is a fibrous substance, and every effort should be made to keep its fibres closed, and sufficient heat used in altering its form by the moulding process to make it thoroughly plastic and remove all tendency to return to a previous shape or condition. As the cast or model is of tin, and the matrix lined with the same, it is not necessary to make the plaster investment absolutely dry, but all excess of water must be driven off; and this will have been accomplished when the steam ceases to rise through the "steam-escape" of the heater. If the heater compressing the celluloid be a closed one, a heat of 320° Fahr. may be attained, but to do this with safety and freedom from the danger of combustion all air or oxygen must be completely cut off from the celluloid. If the machine be not air-tight, 250° Fahr. is the limit to which the heat can with safety be raised; with this lower temperature the material cannot be rendered quite so plastic. Pressure must in all cases be gradual, constant, and even; and if the dryness be maintained the celluloid will be increased in density, toughness, and durability.

The advantages claimed for celluloid by those most familiar with its use and working are its unlimited artistic possibilities, resemblance in color to the natural tissues, ready toleration by the mucous membrane and soft tissues, elasticity under strain, adaptability for partial or complete dentures, and the readiness with which it can be applied to the correction or concealment of all oral deformities. For information on celluloid and its working, we are indebted to Dr. E. M. Flagg, of New York.

Attaching artificial teeth to bases.—The method first practised in securing teeth to the base was by rivets through the tooth. This was first applied to human, animal, and ivory teeth, but subsequently to those of porcelain, single and in sections or blocks. The imperfection of this method was soon shown by the loosening of the teeth from friction of the plate and rivet; to correct this fault many ingenious devices were attempted, each one approaching the end desired, until after repeated experiments the result was a complete revolution in tooth fabrication, and the present plan of fixing a platinum pin in the substance before baking was evolved. (This plan is wholly of American origin.) To these pins were soldered pieces of "backing" or plate, and this was again soldered to the base-plate if of metal; if vulcanite or celluloid,

the pins were bent, split, or headed, and served directly for the attachment without further preparation.

Securing dentures in the mouth.—In securing artificial dentures in the mouth the methods of ligatures, clasps, pivots, and springs have already been mentioned. In 1835 Dr. C. A. Harris, of Baltimore, designed what he called an "air-chamber," being simply a depression in the surface of the plate projecting downward from the palatine arch. This has been subjected to many modifications, in position in the plate, shape, manner of construction, etc.; but the principle involved has remained the same. Its application and utility have been universally recognized, and it forms one of the greatest advances in prosthetic dentistry. Until quite recently it was thought useful only for dentures in the upper jaw, but now its adaptation to lower plates, in a modified form, is spoken of with much confidence.

The attachment of one or more teeth to the natural organs without clasp or plate is a modern device, and has been very successfully practised. It consists in the selection of plain plate-teeth, with color, shape, and size adapted to the locality; a backing fitted to the pins and soldered, with a wire attached thereto, and extending beyond the lateral sides; the free ends of this line are adjusted to holes drilled in the palatine or proximal surfaces of the adjoining teeth, and there secured by packing gold-foil or amalgam around the wire and thoroughly filling the holes made for its retention. The advantage of this, where it can be done without injury to the natural teeth, is freedom from plate or other annoyances in the mouth, and its firmness and durability.

The mechanical devices and various labor-saving appliances and materials of American origin which have contributed to the advancement of dentistry are numerous and important. For impressions there are preparations of wax, plaster, gutta-percha, and several compositions. For casts and dies are flasks, antagonizing casts, and articulators; also furnaces and muffles, vulcanizers, celluloid apparatus, lathes, grinding-wheels, scrapers, files, disks, and burr-wheels, as well as an almost endless variety of wheels, cones, cylinders, and disks of felt and other substances, for polishing and finishing cases of every variety of shape and material. For use in the office, and to aid in the operative department, for drying the mouth and cavities and protecting the operation from moisture, are napkins, paper, saliva-pumps and ejectors, duct-compressors, tongue-holders, air-syringes, rubber tubes, and Barnum's rubber-dam, the latter one of the most valuable inventions given to the profession. Cutting and drilling instruments, almost unlimited in shape and design, including corundum-wheels and disks of numberless sizes and various thickness, with Green's, Morrison's, Beer's, Bonwill's, Elliott's, and S. S. White's engine; also water and electrical motors; Foote's, Taylor's, Hodge's, Salmon's, Snow and Lewis', Baxter's, Banister's, Green's, Gaylord's, Buckingham's, and Pomroy's automatic mallets; Bonwill's electric mallet; hand-mallets of wood, rubber, steel, lead, and ivory; operating-chairs, possessing every conceivable movement, with the possibility of adaptation to patients of any size and in any position.

The operative and mechanical departments of dentistry, though still regarded by the majority of practitioners as industries not sufficiently dissimilar in their processes to prevent the pursuit of both by the same person, must, as competition necessitates and stimulates proficiency, gradually gravitate into the hands of artisans practising exclusively one or the other as a specialty. The laboratory-work essential to the construction of artificial dentures necessarily interferes with that delicacy of touch which is so indispensable to the skilful treatment of the natural teeth; and in like manner do the repeated and exacting demands of an operative practice intrude upon the work in the laboratory.

Porcelain teeth.—As an outgrowth from mechanical dentistry a new industry has arisen in the manufacture of porcelain teeth. These, in size, shape, and color, so nearly resemble the natural ones that when selected and arranged with artistic skill they are not easily detected. Though of French origin, their perfection is due entirely to the efforts of the American manufacturer. To Dr. A. A. Plantou and Mr. Charles W. Peale, of Philadelphia, must be awarded the credit of manufacturing, in 1819 and 1820, the first porcelain teeth made in this country; but Samuel W. Stockton, of Philadelphia, and James Alcock, of New York, in 1835 began their production upon a more extended scale and for the purpose of supplying the profession at large, and thus initiated an industry which has attained remarkable proportions. The present degree of proficiency in moulding and enamelling the teeth was not attained until some years later, nor was the color so lifelike or the shades so varied. These improvements in the fabrication of porcelain teeth, which have so admirably displayed the possibilities of the manufacturer, in the transparency of the tooth, the granulated appearance and flesh-like tint of the gum, and the almost unlimited variety of shades, were due to the persistent and untiring efforts of Dr. Elias Wildman, of Philadelphia, who began his experiments in 1837. The employment of purple of Cassius, or oxide of gold, now exclusively used in the production of gum-color, was also attained wholly through his labors. In 1844 Samuel S. White, a nephew of Samuel W. Stockton, began the production of these teeth in Philadelphia; and this was the initiatory step in an enterprise which has since become the largest of its kind in the world. Numerous improvements are accredited to Mr. White, the most important of which are various modifications in the forms of the platinum pins and a studied effort to recognize and imitate the anatomical and physiological differences in natural teeth. An artificial tooth must possess certain characteristics respecting size, shape, and color; it must on its external surface resemble the external covering of the natural tooth; it must possess toughness, which permits the use of the hammer in riveting without fracture and the use of the blowpipe in soldering without liability to crack. If the tooth were a homogeneous mass, vitrification necessary to imitate the enamel surface would render it brittle. A nice adjustment of materials is necessary that beauty shall not be sacrificed to strength. The clear cutting edge of enamel projecting over the point, with the yellow or brown at the base, must be so nicely blended with the colors of the body of the tooth that the line of union cannot be determined. These and many other indispensable results have been secured by patient research, experiment, and artistic skill.

The principal materials entering into the composition of mineral teeth are feldspar, silex, kaolin, with various fluxes, characterized as glasses. The general tone or tint of these materials is white or light yellow, so that coloring forms an important adjunct in the process. The substances used are titanium for yellow, platinum sponge for gray, oxide of cobalt for bright blue, and gold oxide for red. These, with their varying combinations, are used to color the body, point, and surface enamels. There are over forty shades in the bodies used, and a greater number in the point and outside enamels. Starting with the lightest shade of body, known as "a," forty different grades may be produced by using a different point-enamel, and on each of these again a modified effect by the employment of surface enamels; so that with a single body of any given color may be produced 64,000 modifications; and as this is only one of the forty different bodies, a mathematical effort would determine the number of shades of which they are capable. For the production of these colors a muffle glowing with an incandescent heat is essential.

An establishment in Philadelphia produces over

400,000 teeth per month, or little less than 5,000,000 per year—about one-half of the whole number used in the world.

Origin of dentistry in the United States.—From the most reliable information attainable, we learn that Mr. John Woofendale, of England, was the first dentist in the United States. He practised in New York and Philadelphia from 1766 to 1768, at which time he returned to England. His successor was Mr. Joseph Le Maire, of France, who came with the French army during the period of the Revolutionary struggle; he was soon followed by one Whitelock in 1784. Mr. Isaac Greenwood was the first dentist established in Boston, and his son, John Greenwood, who was the first native American dentist, commenced practice in New York in 1788, and soon after constructed for Gen. Washington an entire denture, which for neatness of execution was said to have been unequalled. The teeth were carved from ivory, and secured in the mouth with spiral springs. From this time until 1820 accessions from Europe, and adoption of the profession by native Americans, increased the number of practitioners in the United States to more than 100. In the next decade they numbered 300, and in ten years more they exceeded 1200. The census of 1860 gave the United States 5000; in 1873 there were 10,000; and in 1882 not less than 15,000.

With this great increase in the number of practitioners the progress of dentistry as a science has been conspicuous. From comparatively elementary operations it has extended to a thorough and scientific treatment of the oral cavity. The desire on the part of the more liberally educated men in the profession that their specialty should attain and maintain a commanding position has created an interest in the education of students, and a corresponding desire for a more extended and liberal curriculum in the colleges. There are also those who believe that a thorough medical education, preparatory to studying the manipulative and artistic branch of dentistry, would make more efficient and useful practitioners, enabling the operator to treat an oral disease of any complexity without danger of meeting with disaster from the absence of surgical knowledge and skill; in fact, that dentistry should be practised as a specialty of medicine, the practitioner understanding and fully appreciating the influence morbid systemic conditions exert upon the teeth, and to what extent certain lesions of the mouth and teeth exalt or modify constitutional disturbances.

The progress so readily recognized has been stimulated not a little by the publication of journals, formation of societies and associations, and the organization of colleges. Dental legislation, the establishment of State boards of examiners, and the organization of a national association of college faculties will also doubtless exert an influence in behalf of dental education.

Dental journals.—An important event in the history of dental surgery in the United States was the establishment of the *American Journal and Library of Dental Science* in Baltimore in 1839. Members of the profession widely separated, and almost wholly unknown to each other, found through this journal a medium of communication. Following its publication, and up to the present time, there have been about forty periodicals established ostensibly in the interests of dentistry. While many of these had an ephemeral existence, others have rendered a worthy service to the profession. Among the latter are the *Dental Cosmos*, the *Dental Register of the West*, *Missouri Dental Journal*, and others in New England and the South.

Dental societies.—Little more than forty years ago no organization of dentists had been effected; now every State has its State Dental Society and many minor organizations within its limits, while of national organizations there are three; the American Dental Association, being a delegated body, is the most important.

Dental colleges.—The origin of institutions for teach-

ing dentistry was the result of the necessity for a radical change in the method of imparting instruction. The schools now granting dental degrees number twenty; the older and more important ones are the Baltimore College of Dental Surgery, chartered in 1839; the Ohio Dental College, chartered in 1845; the Philadelphia (afterwards the Pennsylvania) College of Dental Surgery, chartered in 1850; the Philadelphia Dental College in 1863; and the New York College of Dentistry in 1865. (C. N. P.)

DENVER, the capital of the State of Colorado and county-seat of Arapahoe co., is situated on the South Platte River, 15 miles E. of the foot of the Rocky Mountains, 39° 47' N. lat. and 105° W. long. It is the metropolis of a very large region of country, made productive since 1860 by the discovery of precious metals and by the use of the prairie ranges for the herding of cattle. In 1858 a settlement called Aurania was made on the west side of Cherry Creek, Colorado being then a county of Kansas Territory. The following year Denver (named after Gen. James W. Denver, then governor of Kansas Territory) was laid out on the east side of the creek, and shortly after the two settlements were united. During the early years of Colorado Territory the seat of government was changed several times, but Denver was finally decided upon. In 1876, when the Territory was admitted into the Union, Denver was made the temporary capital; and in election of November, 1881, the city was chosen as the permanent seat of government. In the meantime Denver had shown unprecedented growth of population. In 1860 the region of which the city has become the trade centre was marked on the map as the Great American Desert, Denver being then but a frontier camp. In 1870 the population, by census, was 4800. During the decade from 1870 to 1880 the resources of the Territory developed rapidly, and a good agricultural product was added to the yield of mineral and livestock. In 1877 the valuable deposits of mineral at Leadville were discovered, and Denver, as the commercial centre whence the mountain camps drew their supplies, grew from a frontier town into a city; so that, in 1880, the census showed a population of 35,630. Estimating by the increased business, school population, and other elements, the population was placed in 1884 at 60,000. The growth of the city has been assisted by judicious exhibitions of the products of the State, the first of importance being at the World's Exposition at Paris in 1871. This was followed by a tasteful and attractive display at the Centennial Exhibition at Philadelphia in 1876. Finally a highly successful exhibition was held in Denver itself in 1882, which was attended by thousands of visitors from all parts of the United States, and even from foreign countries.

Denver to-day presents the appearance of a well-established, prosperous city. The site is nearly level, sloping slightly towards the Rocky Mountains, whose snow-clad peaks are in full view on the west. By means of irrigating ditches along the streets a fine growth of shade-trees has been secured, which, in summer, give the city a park-like appearance. The elevation of 5370 feet (over one mile above sea-level) makes the atmosphere rare, dry, and clear, there being on an average less than six days each year without sunshine. The large buildings of the city are of recent construction, the finest having been erected since 1880. The Tabor Grand Opera-House, one of the finest theatres in the United States, was built in 1881, by H. A. W. Tabor, who became a millionaire through successful mining. The Tabor Block was also built by him. Of the large hotels, the Windsor was constructed by the Denver Mansion company (limited), composed of English capitalists, who have invested very largely in land, buildings, and irrigating ditches. These buildings, and other large blocks, were erected during the two years from 1880 to 1882, and these years are notable in the city's history because of

incessant building operations, winter as well as summer.

The public buildings of Denver were not begun until 1882. The court-house, built of Colorado stone, was completed in January, 1883. The city hall, also of Colorado stone, was completed the same year. A State capitol, on ground donated to the State, has been begun, as also the buildings of the National Government, for which Congress appropriated \$300,000. A branch mint of the United States is located here, which in 1883 manufactured gold bars valued at \$1,374,685.

Denver has a Chamber of Commerce, composed of merchants, manufacturers, mining-stock-brokers, and other business men. Its transactions for 1883 exceeded \$31,000,000, showing an increase of \$8,000,000 in two years. There are 6 national banks, and several private banks. The interests of the city have been mainly commercial, as this is the trading centre for the State and adjacent regions. In 1882 Denver was made by Congress a port of delivery for foreign goods, and already it has considerable direct importation. Manufactures have also been established, and in 1883 employed 5091 hands. The value of their products was \$10,472,200, while the value of the plants was \$4,502,600. There are two smelting-establishments, iron-works, agricultural-implement-factories, gunpowder-works, flour-mills, and breweries, while other works for the manufacture of cement, glass, chemicals—all depending on easily available resources—are being introduced. The city is the junction of a number of important systems of railway. Of these four go to the East—the Union Pacific, to Omaha; the Burlington and Missouri River, to Omaha and Chicago; the Kansas Pacific, to Kansas City; the Atchison, Topeka, and Santa Fé, via Pueblo, over the Denver and Rio Grande and the Denver and New Orleans to Kansas City. Other broad-gauge lines are the Denver Pacific and the Colorado Central to Cheyenne, and the Denver and Boulder Valley to Boulder. By way of Cheyenne Denver has lines of broad-gauge railways through the North-west. To the mountains there are three narrow-gauge roads—the Denver and Rio Grande, the South Park, and the narrow-gauge branch of the Colorado Central. Of the railways now in course of construction the most important is the Denver and New Orleans, which, already completed to Colorado Springs and Pueblo, is to run into New Mexico and Texas, where, on the Canadian river, it will join the Fort Worth and Denver City, thus becoming a through line to the cotton country and to the Gulf, giving Denver direct access to Southern products, and bringing the city a thousand miles nearer to tidewater. The Denver City Railway has 15 miles of track, 210 horses, and 38 cars in use now, and constantly increasing to meet the demand of travel.

The educational facilities of Denver are ample. There are 16 public schools, including a high-school. The value of public school property is \$547,328, with a bonded indebtedness of \$228,000. The seating capacity is 5607; enrolment of pupils, 6601; number of teachers, 110; average yearly cost of tuition, \$2.09. The University of Denver, having a complete faculty and a medical department, is under Methodist auspices; Jarvis Hall and Wolfe Hall are Episcopal academies; Brinker Institute is an independent academy; and St. Mary's is Roman Catholic. Denver is the residence of three bishops, of the Roman Catholic, Protestant Episcopal, and Methodist Episcopal churches respectively. There are more than 30 churches, all the leading denominations being represented, and many of them having fine structures. There are 5 daily and 15 weekly newspapers.

Denver occupies a surface of about four miles square, and including its suburbs is six miles square. The area within corporate limits is 13½ square miles. The rapidity of its growth is shown by the following statement of the value of the public and private buildings erected each year since 1878:

Cost of buildings erected in 1879	.. . .	\$2,068,894
" " 1880	.. . .	3,917,362
" " 1881	.. . .	4,739,000
" " 1882	.. . .	4,039,554
" " 1883	.. . .	2,257,695

Total cost of buildings \$16,662,505

The assessed valuation of taxable property in 1883 was \$30,597,855. The death-rate during 1883 was 17.98. This included consumptives who came in the last stages of that disease. Deducting these, the rate was 15.76. The sewers of Denver are constructed on the separate system, with glazed stoneware pipe, deep enough to drain cellars, carefully ventilated, and supplied with flushing apparatus. The city has gas-and water-works. In 1883 pure water was obtained here from an artesian well, and there are now 65 such wells in various parts of the city, furnishing an abundant supply. The country near the city has been made very productive by a canal, constructed with English capital, extending a distance of over a hundred miles, and irrigating a vast tract of prairie adjacent to the city limits. The Denver City ditch is also an extensive irrigating canal, the water for these canals, as well as for the water-works supply, being drawn from the Platte river.

DE PEYSTER. Members of this family have been prominent in New York City since 1640. JOHANNES DE PEYSTER, the first of the name in America, was a member of a Huguenot family, and came from Holland to New Amsterdam about 1640. He held several city offices from 1655 to 1677 under both Dutch and English rule, and acquired great wealth. His eldest son, Abraham (1657–1728), was mayor of New York City and judge of the supreme court of the province. In 1700 he became president of the council and acting governor of the colony, and in 1706 treasurer of New York and New Jersey, which position he held till his death, in 1721. The eldest son, Abraham II., noted for his wealth, benevolence, and personal influence, succeeded him as treasurer, and retained the position till his death, in 1767. When the Revolutionary War broke out the family adhered to the king's cause, and three grandsons of Abraham II. became officers in the loyal or Tory regiments. Frederick, the youngest of these, was a captain at the age of eighteen, and was wounded in 1780 in the campaign in the Carolinas. His son, Frederick II. (1796–1882), graduated at Columbia College, studied law, and was for many years a master in chancery. He was also in early life active in connection with the State militia, and was an aide to Gov. De Witt Clinton. In later life he was a member and officer of many charitable, religious, and benevolent societies. For sixty years he was prominently connected with the New York Historical Society, and published several addresses on historical and antiquarian subjects. His son, JOHN WATTS DE PEYSTER, LL.D., was born at New York, March 9, 1821. In 1851 he visited Europe and investigated the military systems of the Continent. He embodied in several reports many valuable suggestions, which resulted in improvements of the militia system of the State of New York and in the establishment of the paid fire department of the city of New York. He has devoted much attention to the early history of the Dutch in America, and is one of the best military writers in this country. He published in 1855 a *Life of the Swedish Field-marshal Torstensen*, for which he received three medals from the king of Sweden. He has also published *The Dutch at the North Pole and the Dutch in Maine* (1857), *Early Settlement of Acadia by the Dutch* (1858), *The Dutch Battle of the Baltic* (1858), *History of Carausius* (1858), *Ancient, Mediæval, and Modern Netherlands* (1859), *Life of Lieutenant-General Menno, Baron Cohorn* (1860), *Winter Campaigns the Test of Generalship* (1862), *Practical Strategy* (1863), *Secession in Switzerland and the United States Compared* (1864), *Decisive Conflicts of the Late Civil War* (1868).

The History of the Third Corps, Army of the Potomac (1868), *Local Memorials relating to the De Peyster and Watts Families* (1881), *Mary, Queen of Scots, a Study* (1882). Besides these separate publications, Gen. De Peyster has contributed frequently to military and other periodicals, and was editor of the *Feuilleton* (1854-58). He is noted for his thoroughness of research in the subjects he has chosen, his sound judgment, and extensive knowledge of military affairs. His three sons—J. Watts, Jr., Frederic, Jr., and Johnston Livingston—were officers in the Union army during the Civil War, and the youngest, then a lieutenant on Gen. Weitzel's staff, received the brevet of lieutenant-colonel for hoisting the first United States flag over Richmond upon its evacuation by the Confederate troops, April 3, 1865.

DEPPING, GEORGES BERNARD (1784-1853), a French geographer and historian, was born at Münster, in Westphalia, May 11, 1784. In 1803 he removed to Paris, and was soon busily employed in teaching German and writing for the press. In 1827 he was naturalized as a French citizen. He died at Paris, Sept. 6, 1853. His earliest work of importance was *Histoire générale de l'Espagne* (2 vols., 1811). About the same time he made a collection of the best old Spanish romances. Afterwards he prepared some works for the young, designed to impart geographical knowledge in a pleasant guise. The success of these led to his preparing more ambitious descriptions of Switzerland, Greece, France, and England, which passed through several editions and were translated into other languages. Having formed acquaintance with Baggesen and Oehlenschläger, he began to study the history of the north of Europe, and some works which were the fruits of this study were crowned by the academy. His principal works are *Histoire des expéditions maritimes des Normands et leur établissement en France* (1826; 2d ed. 1844); *Histoire du commerce entre l'Europe et le Levant* (2 vols., 1830); *Les Juifs dans le moyen-âge* (1834); *Histoire de la Normandie* from 1066 to 1204 (2 vols., 1835). He also edited *Reglements sur les arts et métiers de Paris au treizième siècle* (1837), and *Correspondance administrative sous le règne de Louis XIV.* (4 vols., 1850-55). He published in German an autobiographic sketch under the title, *Erinnerungen aus dem Leben eines Deutschen in Paris* (Leipsic, 1832), and some minor historical works.

DERBY, EDWARD HENRY SMITH STANLEY, 15TH EARL OF, an English statesman, son of the 14th Earl of Derby, was born at Knowsley Park, in Lancashire, July 21, 1826. His mother was Emma Caroline, a daughter of Edward Bootle-Wilbraham, the first Lord Skelmersdale. He was educated at Rugby and graduated in 1848 from Trinity College, Cambridge, with high honors in classics. From his father, "the Rupert of debate" and the most finished parliamentary orator of his time, he inherited what may be called the profession of politics. In 1848 he failed of an election as representative for Lancashire; but during his absence (1848-50) on a tour in America he was returned to Parliament for Lynn-Regis, which borough he represented without a break for nineteen years, until in 1869 his father died, and the son (previously known as Lord Stanley) succeeded to the earldom. He at once took a marked position as one of the strongest men among the moderate conservatives of the House of Commons. While on a journey in India, in 1852, he was made under secretary of state for foreign affairs in his father's administration, and in 1853 brought forward a plan for reform in Indian affairs, substantially the same that was adopted in 1858. In 1855 he declined a cabinet office under Palmerston, but in 1858 entered his father's second administration as colonial secretary, and soon after was made president of the board of control and commissioner for India. He was secretary of state for India, 1858-59, and managed the transfer of British India from the East India Company's control to the crown officers. As secretary of state for foreign affairs (1866-68 and 1874-78) he won the reputation of

a safe and industrious man, without any of his father's brilliancy and dash, but with admirable capacity for the details of that difficult position. Derby's mind is of the judicial quality, with no partisan bias, with no fire, with no faculty for constructive statesmanship. He is a pre-eminently plain and safe man, of phlegmatic and slow temperament, almost a non-combatant in Parliament—in short, the very reverse of what his brilliant father was. His retirement in 1878 from Beaconsfield's cabinet was caused by differences with his fellow-ministers regarding the occupation of Cyprus. In 1870 he married the Lady Mary, dowager-marchioness of Salisbury, and daughter of the fifth Earl De La Warr. While in the lower house he served on many important commissions. In 1874 he was chosen Lord-Rector of the Edinburgh University. In 1879 he announced the severance of his connection with the Conservative party. He afterwards became colonial secretary under Mr. Gladstone.

DERBY, a family prominent in the commercial affairs of Massachusetts for three generations.

DERBY, ELIAS HASKET, I. (1739-1799), a merchant of Salem, Mass., was born there Aug. 16, 1739. He was descended from Roger Derby (1643-1698), who was born at Topsham, England, and, being a Friend, emigrated to America to enjoy religious freedom. Capt. Richard (1712-1783), grandson of Roger, was a successful merchant, a member of the general court of Massachusetts and of the council from 1774 to 1777. Elias, the second son of Capt. Richard, in early life kept his father's accounts and conducted correspondence. At the commencement of the Revolution he had several vessels engaged in the West India trade. As the war destroyed American commerce, he united with his townsmen in fitting out privateers to prey upon British traders. No less than 158 were sent out, mounting more than 2000 cannon, and 445 vessels were captured from the enemy. The rate of insurance on English vessels rose to 23 per cent., and the British were compelled to employ their navy in convoying merchant-vessels. Perceiving the necessity of attaining the utmost speed, Mr. Derby studied naval architecture, and suggested many improvements in the models. His vessels were superior in size and speed to any previously launched in America. In 1775 his younger brother, John, by the swiftness of his ship carried to England the first news of the battle of Lexington, and at the close of the war brought home from France the first news of peace. Just after the battle of Lexington, and at other critical times in the Revolutionary War, Elias showed his patriotism by advancing to the Government large supplies. After the war, returning to peaceful pursuits, Elias showed spirit in opening up new channels for American commerce. In June, 1784, he despatched a vessel to St. Petersburg, and in November another to the Cape of Good Hope. Capt. Ingersoll, in command of the latter, refused to take a cargo of slaves from the Guinea coast, although the slave-trade was then allowed by law, but sailed in ballast to the West Indies. In Dec., 1785, Mr. Derby sent the first vessel from New England to India and China. In 1790, when his vessels brought 700,000 pounds of tea to America, just after a heavy duty had been imposed, he protested against being compelled to pay immediately, and was allowed time. In his correspondence with the Government he suggested the great importance of a system of drawbacks to a commercial people. The commerce of Salem, which had remained stationary from 1771 to 1791, greatly revived under the stimulus of the India trade, and in the last fourteen years of Mr. Derby's life his vessels numbered 37, making in that time 125 voyages, including 45 to the East Indies. Of these vessels but one was lost, and his good fortune may be partly attributed to his prudent order that none of his ships should come on the New England coast between November and March. In 1798 he liberally helped the Government in forming a navy. He died at Salem, Mass., Sept. 8, 1799.

DERBY, ELIAS HASKET, II. (1766-1826), son of the preceding, a merchant of Salem, Mass., was born there Jan. 10, 1766. At the close of the Revolutionary War he left college, visited England and France, and, learning something of the East India trade, induced his father to embark in it, and in 1785 went himself to the Isle of France, where he spent a year; then went to India, where he remained for three years. Returning in 1789, he brought the first cargo of Bombay cotton to America. He then devoted himself to commercial pursuits until the war of 1812, when he set up the first broadcloth loom in Massachusetts. In furtherance of the woollen manufacture he gathered a flock of 1100 merino sheep in Spain, and landed two-thirds of them in New York. A few merinos had been brought to the United States in 1802 by Gen. David Humphreys, American minister to Spain, but the practical introduction belongs to Mr. Derby. He was for several years a brigadier-general in the State militia, and was generally referred to by this title. He died at Londonderry, N. H., Sept. 16, 1826.

DERBY, ELIAS HASKET, III. (1803-1880), an American lawyer and author, was born at Salem, Mass., Sept. 24, 1803. He was a son of Gen. E. H. Derby, and graduated at Harvard College in 1824. Having studied law with Daniel Webster, he was admitted to the bar in 1827. He practised in Boston, and became eminent in his profession, especially in railroad cases. He was active in promoting the commercial interests of Boston, and was president of the Old Colony Railroad. During the Civil War he labored zealously to secure the construction of iron-clad vessels. He contributed frequently to the newspapers of Boston under the signature of "Massachusetts," treating of both national and local topics. He died at Boston, March 31, 1880. He published several articles in the *Atlantic Monthly*, *Edinburgh Review*, and other periodicals. He was also the author of *Two Months Abroad* (1844), *The Catholic*, *The Overland Route to the Pacific*, and many reports on *The Fisheries*, *The British Provinces*, and other subjects.

DERBY, GEORGE H. (1824-1861), an American soldier and humorist, was born in Norfolk co., Mass., in 1824. He was a descendant of Elias H. Derby, I., merchant of Salem. He graduated at West Point in 1846, and served in the Mexican War, being severely wounded at Cerro Gordo. He was afterwards employed in various surveys, explorations, and public works. While stationed in California he wrote a number of humorous sketches under the name of "John Phoenix," which obtained great popularity and led to many imitations. His sketches were collected and published in 1860 under the title *Phoenixiana*. In 1859, while employed by the Government in erecting lighthouses on the coast of Florida, he was sunstruck. A softening of the brain ensued, and he died insane at New York, May 15, 1861. After his death several of his sketches were published as *The Squibb Papers* (1861).

DESCANT, IN MUSIC. Descant was an early attempt to add to some existing melody a second part or subsidiary melody, to be sung simultaneously. The art of descant came into existence about the year 1095, or later, and gradually led to that of counterpoint in many parts, and in many forms. It is said that two musicians, amusing themselves by singing against one another, found that occasionally good effects resulted, and that on singing at the same time a slow church tune and a ribald song the contrasted motions and the various intervals gave a singular sort of pleasure alternating with displeasure, which was of course due to the incidental consonances and dissonances that resulted. They found at last certain tunes sung in certain ways united better than others and formed agreeable duets. One can understand that attempts would be made to reduce such combinations to writing, to form a basis for future experiments, or to preserve them for future use. But the difficulty of writing such singular combinations of melodies must have

been exceedingly great, for the notation was not so perfect as it is now; the science of harmony had not progressed beyond the use of octaves, fifths, and fourths (the most perfect concords), and, as the tunes were often greatly dissimilar, it was necessary to make elaborate calculations respecting speed and rhythm, in order that the melodies might be made to move together as required. That such extremely difficult operations were attempted at this early period may be seen by consulting the complex diagram prepared by Thomas Morley in his *Plaine and Easie Introduction to Practical Musicke* (London, 1597). These combinations of rhythms were enormously difficult to express in writing, and are almost incapable of performance by executants of the present day.

The modern art of music appears as if born of two opposite principles. First, of harmony, which began with using the most perfect intervals, as regards consonance, and caused the added part to conform in its motions to the principal part (in a way similar to that adopted by certain singers now, who "make a second," by singing uniformly a third or a sixth below the principal tune). The early attempts of harmonists were variously called *diaphonia*, *cantilena*, or *organum*. The opposing principle was that of independent song, with its rhythm and series of sounds preserved intact, whatever were the motions of the associated melody. By degrees more dissonant intervals were introduced into harmony, and also contrary motion, which was no doubt due to the good effect noticeable in descant; and in descants the proportions of notes, as regards length, were simplified into halves, quarters, eighths, etc., in simple geometrical proportions, as they are at the present day. Although in modern music two or three rhythmic formations are simultaneously performed, these are so planned that the principal accents of each are synchronous. In the ball-room scene in Mozart's *Don Giovanni* one orchestra plays a Minuet in three-quarter time, a second plays a Gavotte in two-quarter time, and a third a Valse in three-eighth time, to provide music for the three sets of dancers; but the conductor has no difficulty in making the required beats with one baton, since the different speeds are regulated in such a way that the principal accents coalesce.

Descant was originally an extemporaneous performance, with or without words, which employed "divisions," like those found in Händel's choruses, where sixty or more notes are sung to one syllable. But, although for the most part descant was unwritten, many rules had to be obeyed. The principal melody of the music was originally sung by men in the church. Later, the "plain song" was given to the bass part, and was then called "ground." Favorite "grounds" were called after the writers' names, as "Purcell's Ground," "Farinelli's Ground," etc. When instruments were used, a second copy of the ground was given to a viol player, who, at each repetition of its few simple notes, made different extemporaneous variations upon it. Thus a certain "unity and variety" was secured for instrumental music. Certain passages from Shakespeare's plays, which refer to such operations, not only illustrate them, but also Shakespeare's meaning, singularly well:—

"Ah! what a world of *descant* makes my soul
Upon this voluntary *ground* of love."

"For *burden-wise* I'll hum on Tarquin still,
While thou on Tereus *descantest* better still."

"And stand between two churchmen, good my lord,
For on that *ground* I'll make a holy *descant*."

(S. A. P.)

DESERTION. The act of abandoning, or forsaking, in a general sense. Legally, it is an offence consisting in the abandonment of the public service in the army or navy without permission; or, the act of a husband or wife in leaving his or her consort with the

deliberate intention of causing a permanent separation, and without just cause.

1. *As a military or naval offence.*—By act of Congress, dated March 16, 1802, it is enacted that if any non-commissioned officer, musician, or private shall desert the service of the United States, he shall, in addition to the penalties prescribed in the articles of war, be liable to serve for such period as shall, with the time he may have served before his desertion, amount to the full term of his enlistment; and by the articles of war it is provided that desertion shall be punished at the discretion of a court-martial. The provision in the rules for government of the navy are substantially the same, and include those who solicit others to desert as well as actual deserters. The time after which absence becomes desertion is considered as being ten days, before the expiration of which the absentee is considered as a straggler and may return without penalty, unless wrongful intention be proved.

2. *As an offence against the marital relation,* desertion in most States constitutes a ground of divorce, though they all differ as to the period of time which must elapse before the action may be brought by the party deserted. For the varieties of State law on this subject, see DIVORCE.

A seaman who, after engaging for a voyage, deserts before its completion, is liable for damages, according to the nature of his shipping articles, and also forfeits his wages previously earned, unless he be able to prove cruel and inhuman treatment on the part of the captain. 2 Rob. Adm. R. 232.

DESIGN, SCHOOLS OF. The development of Schools of Design in England, which followed the International Exhibition of 1851, when English manufacturers first became convinced that in the arts of industrial design they had fallen behind their neighbors on the Continent, was not without its effect in the United States, in stimulating the study of drawing in its relation to industries. Prior to that time nearly all of the schools where drawing was taught gave attention chiefly to the Fine or pictorial arts; and in colleges, seminaries, and other private schools, drawing was at best an elective study, the art being treated as an accomplishment only, and one of little practical value. The few schools of design, proper, were small in size, and, being poorly supported, accomplished very little in the way of educating either industrial draughtsmen and designers or teachers of the art. In 1870 a movement was made in Massachusetts to have drawing taught in the public schools, not as an accomplishment, but with direct relation to its usefulness to workmen in various trades and professions. The fruits of that movement were just beginning to be made known when the Centennial Exhibition was opened at Philadelphia in 1876. Americans then had brought home to them the lesson learned by England in 1851, that a manufacturing nation, to keep its place in competition with others, or to advance in rank, must provide education in drawing for its workmen. There are two branches of the art of design—one dealing chiefly with form as limited by mechanical necessities and utility, the other chiefly with ornamentation and surface decoration. The one may be wholly or in greater part mechanical, the other is for the greater part a free-hand accomplishment. Although there were few industrial drawing-schools or schools of design in the United States prior to 1876, some instruction was afforded by various schools in the elements of these two branches of design. Thus, in mechanics' institutes, geometry and mechanical and architectural drawing were taught, generally to night classes, and very imperfectly; and in the academies of the fine arts in the larger cities opportunities were afforded the students for self-instruction in free-hand drawing, though not with the definite purpose of making them industrial draughtsmen. Design is so closely related to invention that it would scarcely have been possible for Americans to have won the distinction

they have attained as inventors if they had not also acquired some skill as designers. The Centennial Exhibition showed that they had in fact developed a high degree of skill in mechanical drawing and in that branch of design which treats chiefly of form as related to the uses to which it is to be put. The necessities of the growing nation, sparsely settled over a broad expanse of territory, impelled the construction of tools combining lightness, strength, and adaptability, qualities of the highest value in industrial design. Thus, without any attempt being made by mechanics to give an art value as such to their productions, the makers of tools and machinery, by giving close attention to the mechanical requirements they had to meet, fulfilled a primary law of industrial design, and produced forms that compared favorably, from an art point of view, with similar productions from nations where academic art education had been much more highly developed than in the United States. But the moment one turned from exhibits of tools and machinery to exhibits where skill in free-hand design, color combination, and ornamentation is of more importance than accuracy in instrumental drawing, it was seen that the United States was far behind England and France and Germany, and indeed most of the smaller nations of Europe, in this branch of the art of design. In textile fabrics of all kinds, paper-hangings, oil-cloths, pottery, glass, and merely ornamental metal work, the American products were generally either mere imitations or very inferior attempts at original design. It was this discovery that greatly stimulated the organization of schools of design in manufacturing cities, and the enlargement and more liberal endowment of those already in existence, as well as the founding of museums of industrial art, where artisans might see the best results of human handicraft.

Although there is a broad line of distinction between pictorial art and industrial art, even where the former is used for surface ornamentation, it is not easy to separate the art-schools of the country into two classes, one training artists only, and the other artisans and designers. The training afforded by the higher art schools fits the pupils to become designers by a little special study, and the elementary training in all the schools is, or should be, the same. It is necessary, therefore, in describing the schools of design of the United States, to mention institutions which do not aim to produce industrial draughtsmen and designers, but have been established primarily for the education of artists. The earliest institutions of this kind in the country were the Pennsylvania Academy of the Fine Arts, Philadelphia (1806); the Public Library and Department of Fine Arts, Boston (1807); the New York Academy of Fine Arts (1808); and the National Academy of Design, New York (1820). These institutions were established with the sole purpose of educating public taste by art exhibitions, and to afford pupils opportunities to practise drawing from the cast and from life. Instruction, as carried on in modern art schools, was not attempted. In 1824 the Franklin Institute of Philadelphia was established. It was a mechanics' institute, and one of its purposes was the maintenance of schools for the education of young men in mechanical and architectural drawing. It was the earliest of a number of mechanics' institutes established in the larger cities with similar aims and having similar schools. The instruction was generally given to night classes, and was chiefly elementary. But schools of this kind represented for nearly fifty years almost the only means afforded in the United States for education in Industrial drawing. The earliest institution established for the express purpose of teaching the arts of design was the Philadelphia School of Design for Women (1847). It was soon followed by the Schools of Art and Design of the Maryland Institute (1848). Their history apparently shows that the manufactures of the country were not at that time, nor for some years afterwards, far enough advanced to require such

schools. They struggled along, accomplishing but little until recent years, when both schools were re-organized and shared with newer institutions the impulse given to industrial training by experiments in Massachusetts, and by the lessons of the Centennial Exhibition. It will be observed that up to this time Philadelphia had taken the lead in the three branches of art education—the fine arts, instrumental drawing, and designing. Within the last ten years Boston and Massachusetts have become more prominent in this regard; and although the schools of Philadelphia have been improved and increased in number as a direct result of the Centennial Exhibition, industrial education has probably at this day reached a higher development in Boston than in any other American city. In 1857 there were only eight institutions in the country prominently engaged in the work of art education, pictorial and industrial, the Boston Art Club (1855), and the Cooper Institute, New York (1855-7), being additional to the six previously mentioned. There were, however, in all the larger cities institutes and associations of mechanics where instrumental drawing was taught, Philadelphia alone having four such organizations. But at that time the public school system itself was imperfectly developed, and many of the mechanics' institutes undertook to teach reading, writing, and arithmetic in night classes, to supplement the work of the public schools. When the demand for such instruction fell off, or was supplied by public night-schools, opportunity was afforded to teach drawing at night in the rooms of these associations, the pupils having already acquired a common school education.

In 1861 the Massachusetts Institute of Technology was established. Its course of instruction adopted some years afterwards included a more thorough education in industrial art than had then been attempted in the United States, and was the starting-point of the newer class of schools of design. In 1870, in answer to petitions of manufacturers setting forth the disadvantages under which they had to compete with foreign manufacturers, for want of workmen skilled "in drawing and other arts of design," the legislature of Massachusetts passed an act providing that "any city or town may, and every city and town having more than 10,000 inhabitants shall, annually make provision for giving free instruction in industrial or mechanical drawing to persons over fifteen years of age." In 1874 twenty of the twenty-three cities and large towns of the State had complied with the law, in form at least, although there was a great want of qualified teachers of drawing—a fact which of itself most plainly shows that the art had been hitherto greatly neglected. Boston, which acted as the pioneer city in the introduction of the new public school study, engaged as director of art instruction Mr. Walter Smith, at that time head-master of the school of art in Leeds, England, who had (in his own language) "studied this matter for the last twenty-five years with the incentive of love and the opportunity given by having nothing else to do." In 1873 a State Normal Art School was established in Boston under Mr. Smith's direction, the purpose being to qualify the teachers in the public schools to act as instructors in elementary drawing; and it is largely through his exertions and skill as an instructor that the art education of the public schools of Massachusetts and of other States has been developed. New York followed the example of Massachusetts in 1875 by providing for instruction in drawing in the public schools. The foundation had thus been laid for a great development of schools of design and drawing when the Centennial Exhibition awakened widespread interest in the subject by exposing the need of such education. Among the direct results of that exhibition was the founding of the Pennsylvania Museum and School of Industrial Art, Philadelphia, which collected, chiefly from the exhibits of foreign countries; one of the finest museums of industrial art works in the country, now displayed in Memorial Hall (the art

gallery of the Exhibition), on the Centennial Exhibition grounds, Philadelphia. It has since established a school of industrial art, which, not having had permanent quarters, is as yet too small to make proper use of the rich museum with which it is endowed. A great impetus was also given by the exhibition to existing art-institutions in Philadelphia. The schools of the Academy of the Fine Arts were reorganized with instructors in all branches of art; the School of Design for Women removed to new and larger quarters, and was greatly improved; the Spring Garden Institute revived its old classes in mechanical drawing, opened a new school in free-hand-drawing and design for both day and night classes, and established mechanical handiwork classes, where the principles of design were practically applied; the Franklin Institute enlarged its facilities for teaching drawing; and the West Philadelphia Institute re-established its drawing classes. In other cities similar activity was displayed. Boston, with its public school children trained in elementary drawing, had no difficulty in finding pupils for its art schools, and established new schools. Cincinnati organized important schools of decorative art which have rivalled those of Boston in providing teachers for other cities; Baltimore reorganized the schools of the Maryland Institute and put them in the front rank of schools of design; and New York established new schools connected with the Metropolitan Museum of Art, and also substituted instruction in drawing for instruction in other studies in some of its mechanics' institutes.

In 1857, as has been shown, there were only eight prominent art institutions in the country affording instruction which might be of benefit to designers and draughtsmen in industrial works. The report of the United States Bureau of Education for 1874 gives a list of twenty-six art-schools, ten being for the special education of artists and three others voluntary associations of artists for mutual practice and help. The report for 1880 gives a list of thirty-eight similar institutions, an increase of twelve. Eight of the new schools were established in the years 1876 and 1877, and of these the avowed purpose of six was to give instruction in design and industrial art. But this list is very imperfect. It is known that at this time (1884) there are in the United States at least eighty-three art schools, including seventeen universities with departments of the fine arts, where the study of drawing is a part of the regular course. There are twelve schools of pictorial art and fifty-four schools, nearly all of recent organization, established as industrial art-schools or schools of design. Mechanical drawing is also taught in many industrial schools as a basis for training in handiwork. They are in this respect schools of design, and should be classed as such, though their main purpose is mechanical training. Such institutions are the Institute of Technology, of Boston, Mass.; the Mechanics' School of the State College of Maine; the department of mechanic arts belonging to the Purdue University, Indiana; the Manual Training School of St. Louis, Mo.; and the mechanical handiwork school of the Spring Garden Institute, Philadelphia. There are also many colleges, seminaries, and universities where drawing from copies was formerly taught merely as an accomplishment, which have recently adopted the modern system and teach drawing with special reference to its educational influence upon eye and hand and memory. Drawing is also taught in the public schools of many cities; Philadelphia has adopted the Boston plan of training its teachers to teach elementary drawing to all the pupils, and thus to qualify them to enter the higher schools established by private bounty.

Information respecting the art-schools of the United States cannot well be tabulated so as to give a true conception of their history and present standing, because many of those which bear early dates of incorporation have only recently opened drawing-schools or

have so changed their character as to make the date of their organization as applied to existing schools misleading. A brief account is here given of the facilities afforded for art instruction in the principal cities of the Union.

New York.—In New York instruction in pictorial art is given at the National Academy of Design and by the Art Students' League, the latter a new organization, founded in 1875 and incorporated in 1878, which has a large staff of teachers. Industrial drawing and the arts of design are taught at the Cooper Institute, which had over 2000 pupils in 1881-2; by the General Society of Mechanics and Tradesmen of the City of New York, 300 pupils; by the New York Turnverein, 750 pupils; and in the technical schools of the Metropolitan Museum of Art with about 300 pupils. In 1883 the last-named schools were reorganized with 100 pupils, but with ample accommodations for 1000. Drawing is also taught in the public schools of New York, and there are many societies of artists which maintain schools, as well as organizations, like the Society of Decorative Art established primarily for the sale of the works of members, but which give instruction to pupils in various branches of decorative art.

Philadelphia.—In Philadelphia instruction in the fine arts is provided at the Academy of the Fine Arts, which in recent years has occupied a new building and greatly enlarged its facilities for giving such instruction. The School of Design for Women, 293 pupils; the Spring Garden Institute, 653 pupils; the Franklin Institute, 200 pupils; and the Pennsylvania Museum and School of Industrial Art, 79 pupils, give instruction chiefly in industrial drawing; and all except the first have night-classes. The Pennsylvania Museum was founded in 1876 and has a valuable museum of objects of art. The other institutions are much older, but have been greatly improved and developed recently. There are also decorative art clubs and artists' associations similar to those of New York. Drawing is taught in the public schools. In Girard College and the House of Refuge mechanical handiwork schools have recently been organized, in which drawing is a primary study.

Brooklyn, N. Y.—The Brooklyn Art Association for a time maintained drawing-schools, but discontinued them in 1881. In 1883 it took charge of schools which had been established by the Art Guild in 1880. The Ladies' Art Association of New York maintains a Brooklyn branch which had 124 pupils in 1883. The Brooklyn Institute has an evening school with 50 pupils, and Packer Collegiate Institute has classes in drawing.

Chicago.—Chicago has an Academy of Design which still maintains classes in pictorial and industrial art, though its building was destroyed in the fire of 1870. The Art Institute, formerly the Academy of Fine Arts, organized in 1879, has a school of 300 pupils, including night-classes. The Chicago Society of Decorative Art, organized in 1877, gives instruction in industrial art, including embroidery and wood-carving, and there are two artists' associations with classes for self-help. A manual training-school where industrial drawing is taught was established in 1883.

Boston.—Boston has taken the lead among American cities in the development of industrial drawing. The Massachusetts Institute of Technology requires the pupils in all departments to learn mechanical and free-hand drawing during the first year, and in most of the departments this study is carried through the whole of the four years' course. There are special classes in architectural drawing and the mechanic arts, and a free school in drawing and architecture, meeting at night, is supported by the institute. The State Normal Art School of Massachusetts is a training-school for teachers of industrial drawing, and was founded in 1870. In 1881 there were 222 pupils in the day-school and 72 in the night-classes. The latter have since been discontinued. The Museum of Fine Arts also maintains

an art-school. The Young Men's Christian Association maintains night-classes in drawing, and the Boston School of Sculpture gives instruction in modelling to a few pupils. There are also many clubs and societies of artists for self-help, and a society of decorative art which maintains a school.

St. Louis.—The St. Louis School and Museum of the Fine Arts, forming the art department of Washington University, was organized in 1879, and in 1883 had about 300 pupils. Instruction in drawing is also given to pupils in other departments of the university. There are several artists' societies and sketch clubs.

Baltimore.—Baltimore has an old institute (the Maryland Institute), established for the promotion of mechanic arts, which was thoroughly reorganized in 1879, and now maintains both day and night-classes in drawing and painting, chiefly industrial. In 1883-84 there were 177 pupils in the day-classes and 497 in the night-classes. There is also a Decorative Art Society, for the sale of works of art, which maintains classes in drawing, design, and china-painting.

Cincinnati.—The Ohio Mechanics' Institute, established in 1856, maintains free schools, with 280 pupils, confining its instruction at present to drawing applied to the industrial arts, though the design is to supplement instruction in drawing with practical lessons in a school of technology. The University of Cincinnati had an art department with 411 pupils in 1883, but in January, 1884, it was transferred to the Cincinnati Art Museum Association, which is richly endowed.

San Francisco.—San Francisco has an art association, organized in 1871, which maintains classes in pictorial drawing, and also a Decorative Art Society, with 89 pupils.

New Orleans.—The Southern Art Union and Woman's Industrial Association of New Orleans, organized in 1880, is similar in organization and aims to the Decorative Art Societies in other cities, having a salesroom for the sale of works of art, but it also maintains day and evening classes in drawing and the decorative arts.

Cleveland, Ohio.—The Cleveland Academy of Art, organized in 1881, opened day and evening classes in 1883. The Western Reserve School of Design for Women, organized in 1882, had 60 pupils in 1884.

Pittsburg, Pa.—Pittsburg has had a School of Design for Women since 1865, which gives instruction to women and also to boys under the age of fifteen.

Buffalo, N. Y.—Buffalo has a Decorative Art Society, with schools for women and children.

Of the cities, having less than 150,000 inhabitants, the following are known to have schools of design and drawing: Charleston, S. C., the Carolina Art Association having organized a school in 1882; Columbia, Mo., where the Missouri University requires a study of art as a condition of graduation; Columbus, Ohio, an art-school founded in 1875, and having, in 1881-2, over 200 pupils; Denver, Col., a College of Fine Arts attached to the University of Denver, with 60 pupils; Elgin, Ill.; Fordham, N. Y.; Hartford, Conn., a School of Design, founded in 1872, which has loaned its casts, etc., to the Society of Decorative Art organized in 1877, which maintains classes in industrial art; Indianapolis, Ind.; Jacksonville, Ill.; Le Roy, N. Y., the Art College of Ingham University; Louisville, Ky., the Polytechnic Society, with art classes in drawing and painting; Manchester, N. H.; Meadville, Pa.; Milwaukee, Wis.; Newark, N. J., the Essex Art Association, which organized classes in 1884; Norwich, Conn., the art department of the Norwich Free Academy; Peoria, Ill., classes attached to the Ladies' Art Society; Portland, Me., the Portland Art League; Providence, R. I.; Richmond, Va.; Rochester, N. Y.; Springfield, Ill.; Springfield, Mass.; Syracuse, N. Y.; Urbana, Ill.; Washington, D. C.; Wellesley, Mass., the department of art attached to Wellesley College; and Worcester, Mass.; the Worcester County Free Institute of Indus-

trial Science, in the latter place, teaching drawing to the pupils in its technical schools.

Industrial drawing is also taught in the United States Military Academy, West Point, N. Y., in the United States Naval Academy, Annapolis, Md., and in the principal universities, colleges, and preparatory schools of the country, where it is no longer treated as a mere accomplishment but as a necessary part of general education. See *Reports of the Bureau of Education*, 1873-80; *Circulars of Information*, published by the Bureau; *The United States Art Directory and Year Book* (New York, 1882); *Modern Art Education* (Boston, 1875).

DES MOINES, the capital of Iowa, and county-seat of Polk co., is on the Des Moines River, 175 miles W. of Davenport, 138 miles E. of Omaha, and 357 miles W. of Chicago. It is also on the following railroads: the Chicago, Rock Island, and Pacific, the St. Louis, Keokuk, and North-west, the Des Moines and Fort Dodge, and branches of the Chicago, Burlington, and Quincy, and the Chicago and North-west. The entire city comprises an area of eight square miles, nearly equally divided by the Des Moines River, flowing from N. to S.; the "West Side" being again divided by the Raccoon River, which here joins the former. The sections of the city are united by six bridges. The northern section of the West Side is the main business part of the city, though there are many business houses also on the East Side, the ground in each section rising with easy slope from the river, the business portion being on an average 15 feet above the river. In the West Side are the county court-house, the principal hotels, railroad depots, and banks, as well as the post-office, a handsome marble structure, erected in 1870, which furnishes accommodations also for the United States courts and other offices of the Federal Government. Farther back from the river are many fine private residences, and in the extreme north-western part of the city is a park of 40 acres. There is also a large park on the Raccoon River, owned by a private association, in which agricultural fairs are held. On the East Side is the State Capitol, erected on an elevated site, and surrounded by a park of 10 acres. The State Arsenal is a large building, which contains equipments for the militia and many memorials of the civil war. The State library contains 30,000 volumes, and there is another public library with about 6000 volumes. In the West Side there are 5 public school-houses, 1 of which is a high-school, 2 are grammar-schools, and 2 are primary-schools. These furnish instruction to about 3000 pupils, and 600 more are taught in private schools. The University of Des Moines, a Baptist institution, chartered in 1865, has a commodious brick building, 80 by 250 feet, in a conspicuous position. Des Moines has 15 churches, belonging to the Methodist, Presbyterian, Congregational, Lutheran, Baptist, Christian, Roman Catholic, Episcopalian, and Universalist denominations. There are published here 2 daily, 10 weekly, and 3 monthly periodicals. There are 2 national banks and 4 other banks, a life-insurance and 2 fire-insurance companies. The industries of the city comprise iron-foundries, machine-shops, scale-works, agricultural-implement-works, woollen-mills, an oil-mill, and a paper-mill. For these industries the rivers furnish abundant water-power. The city is lighted with gas, and furnished with water by the Holly system from the Raccoon River. In the vicinity are found bituminous coal, potters' clay, fire-clay, lime, etc. The site was laid out in 1846, and a town was incorporated in 1851 under the name Fort Des Moines. In 1855 the State legislature resolved to remove the capital to this location, and in 1857 the transfer was effected and the city obtained a new charter under its present name. It has grown steadily in numbers and importance. Population in 1860, 3965; in 1870, 12,035; and in 1880, 22,048.

DETERMINISM, a word now generally used to

designate that system of thinking which, upon whatever grounds, denies the freedom of the human will; maintaining, variously, that such apparent freedom is only concealed necessity. Any statement or defence of this scheme of opinion is, of course, in its last ground, philosophic, yet it will be conducive to clearness of view to distinguish, first, *Religious* determinism, depending on dogmatic grounds, and second, *Psychologic* determinism, in its various modes of statement. The first will occupy us but briefly, and then we will notice the chief variations of the other.

Religious determinism, first fully formulated by Augustine in opposition to the Pelagian heresy, reproduced in subsequent writers and intensified by writers of the older school of Calvinism, holds that in consequence of the fall of man, and the inherited sinful propensity arising therefrom, the human will has become enslaved; that man is in a condition utterly helpless, and can only be roused therefrom by an act of grace, which is of itself entirely deterministic, and entirely unconditioned by anything that, except by courtesy, could be called human freedom. This view is fortified by texts from the Christian Scriptures.

The dogmatic grounds for opposing it consist in the asseveration with equal earnestness that the Christian Church and the Christian Scriptures everywhere take for granted human responsibility and guilt, and offer the gospel of Christ to be freely accepted or rejected. Nay, it is asserted that the heathen, to whom the knowledge of the gospel offer has not come, are still responsible and will be judged by a law of their own.

Whenever this question is argued by religionists, except as a question of exegesis (into which we do not propose at all to enter), it is always and inevitably also argued as a question of psychology, and ultimately of philosophy. Indeed, the doctrine of *grace* is strictly philosophic, and consists in holding that the various influences brought to bear upon human nature that can be followed by the intellect (Providential), and the subtler influences working beneath consciousness (mystical) are ruled by the category of final cause, itself a part of a universal design in which the individual intelligence is a constituent element. The denial of *grace* resolves itself into pure indifferentism (one of the shallowest tentatives of human thinking), which will be noticed below. Such doctrine of *grace* may be made to consist either with the admission or denial of human freedom, though perhaps only in the former case does it deserve the name.

Let us then, as a question of psychology and philosophy, note the possible modes in which human freedom may be denied, and what are the positive schemes which make such a denial imperative. There are really only two such philosophies—(1) Materialistic and (2) Idealistic Necessitarianism.

Determinism everywhere opposes itself, and victoriously, to its favorite adversary, pure indifferentism. This latter scheme represents the human will as always *in æquilibrio*, that it looks at, sifts, and accepts or rejects all motives, is indifferent to them all, can at any time make a new beginning. Such seems to have been the thesis of Pelagius. Something like it seems to have been defended by Duns Scotus. It is defended by the Anglican Bishop King (*De origine Mali*), and expressions implying it are not infrequently to be found in writers of lesser note. According to the psychology implied in this scheme the human *will* seems to be thought as something apart from, superadded to, or enclosed within human *nature*, is regarded as an abstract entity, or as pure Ego; and therefore is indifferent, or may be indifferent, or at least was once indifferent. But determinists may and do always urge in opposition to this, that we know nothing of any such *will*, that we have no evidence of the existence of any such will, that we only know the Ego as concrete, and therefore as determined; that, indeed, the will is the nature itself, the entire nature, with all its past behind it, and becomes *will* when focussed, and *quoad*

any possible activity (not denying, however, that as movement it is *prius*, and that pure activity is the first element of any concrete). It points, likewise, to the fact that we do not and cannot dissociate will from character; that there is no mere arbitrariness in human choices, that the "titillation of arbitrariness" is itself a motive for choice, that the motives or ends which the will constructs out of the material supplied by its environment, by the essential conditions of its existence, are always ruled by the prevailing traits of the character.

We may say here that the old attempt to represent the human will as an indifferent force-centre, in the concrete ruled inevitably by forces *ab extra* coming in the shape of motives—the stale maxim of which is, or was, that *the will is governed by the strongest motive*—seems to have been pretty much abandoned by able writers of late days in the interests of determinism; it being clearly seen at length, that motives are not *ab extra*, but creations of the will's own, that motives are only the self-mediation, and not the producing cause of free volition. Thus they have as a consequence of such abandonment found a deeper basis for their scheme.

The sort of determinism we have just above alluded to has been upheld by Buckle, J. S. Mill, by Schopenhauer, and other modern writers. It relies upon the testimony the experience of life furnishes as to the reliability of human character, tells us that as a man is at bottom so will he act; that however artificial disguises may make him seem other than he is, the real self will be sure to break through on a sufficient emergency; and that this character is the creation of influences determining it *ab initio* and *ab extra*, that if there are innate determinations, and derived through the principle of heredity, they are still *ab extra*, and part of the dialectic movement of the universe, whether that be thought as materialistic or idealistic.

A critique of such determinism, while acknowledging that man does never act from a groundless freedom of choice, yet maintains that human volitions cannot be explained as the product of such forces *ab extra*; that beside the determinations derived from heredity or environment, whether belonging to the unconscious or the conscious processes, there are unsounded depths in human nature itself, modifying, and bringing forth new and unexpected results; that the human will, *i.e.*, human nature, is not measured by its conscious experience, that there is within it an incalculable possibility of self-movement, therefore that man is subtly related beyond all traceable relations, that his normal dimension is commensurate with the universe, that he reflects within himself the *whole* of it, and thus that he himself is a true universal, and so far an image of the first principle.

We have not the space here to adduce the facts resulting from an analysis of human experience, confirmatory of this view, and will content ourselves by merely stating an argument from analogy.

As science goes more and more to show the unity of the physical universe, and that every concrete thing is a system of relations, from which there is no evidence whatever that anything is excluded, so we may on grounds as valid infer, that man as an intelligent reflecting the laws of the universe, preadapted to them as they to him, must have the same universality, and that his ideal bound is the infinite.

Thus it comes to be held not only that human volitions require this universal ground for that basis, but that character itself is not only a *principle* of determinations of will, but also a *result* of determinations of will; that, in the words of Julius Müller, "its self-determinings condense themselves to determinations of self."

The question might now arise whether this view, which seems to steer between and along a depth profounder than the shallow currents of pure indifferentism, and superficial determinism, on either side, is

not after all only a more recondite form of determinism still. Allowing that the highest possible idea of self-being is one in which there is a relation to the whole universe beside, that there is nothing indifferent to it, and which cannot amplify and enrich it—this same self may be thought as one determination of the universal; thus is in itself determinate essential being—essence—and its self-determination is just the necessary activity and consequence of this determined essence of being; that conscious self-determination, *i.e.*, *will*, is not necessarily therefore *free*, and that self-consciousness may be only a link in the chain of necessity.

It is urged, in opposition to this, that it leaves unexplained indubitable facts of human nature which cannot possibly be brought under any category of necessity; *e.g.*, the sense of responsibility, the judgment and feeling of obligation, self-accusation, and guilt. And, while we cannot here enter into the argument, we may say that no plausible scheme of necessity, purporting or professing to explain these facts, has proved itself satisfying and compelled adherents. Mere mechanical (materialistic) determinism, for some time of late indulged in as a speculation, is giving way before the deeper study of the organism, and of the notion of development, for organism shows us the idea, the *scheme*, which the life-force is actualizing; and all development is synthetic, rather than analytic, making even more of itself by assimilating the food of the universe, yet preserving unimpaired its own unity.

Many writers—among whom may be named Kant, Schelling, Schopenhauer, and Julius Müller, while acknowledging that in the temporal sphere human actions and volitions are, on one side, ruled by the physical *nexus*, and therefore necessary, and on the other by the prevailing bent of the character (for which no origin in time can be posited), therefore also necessary—think to conserve the principle of freedom by speaking of it as a transcendent act. Schopenhauer teaches that by an act which lies before all time, and Julius Müller that by an extra-temporal act (*in forma æternitatis*) every individual has made himself once for all what he is, and that his life, in time, with the whole range of his proceedings, is merely the detailed performance of his pre-existent, or extra-existent, act. And thus we have a strict temporal determinism originating in an eternal act of freedom. Thus the consciousness of freedom is retained throughout the temporal experience; yet all volitions and actions are still thus and thereby inevitably determined. The sense of guilt is the haunting memory of that prior decision, and finds therein its only possible explanation.

The intellectual difficulties of this scheme are immense. It may be questioned, first, whether this so-called extra-temporal state can be concretely thought except as a pre-existent state, and whether we have got beyond the category of time. Be that as it may, we have thrown upon us the task of accounting for this transcendent act of freedom. It must either be thought after the manner of pure indifferentism; or else, this extra-temporal existence, if not absolutely barren, and a nothing in the semblance of a something, must be thought as a state so rudimental that responsibility, and the tremendous consequences hanging upon choice, seem hardly to flow from so inadequate a source. As the choice, so far as is known, seems to have been in every case a wrong choice, this is only another form of presenting the question of the mystery of evil; of locating it for examination in a realm of shadows and unimaginable possibilities, instead of bringing it into the twilight of our actual knowledge. We note it, however, without discussion, as a phase of thought that has not yet vindicated for itself a philosophic basis. We may add, too, that possibly the sense of guilt is of a *posteriori* origin and entirely explicable within the temporal sphere.

There is a modification of determinism which, while denying freedom of choice, yet thinks it has found a way to admit essential liberty—teaching that essential free-will is fettered by the natural restrictions of the individual, yet is sometimes realized, or seemingly realized, and that by a higher or deeper natural process breaking out from the depths and changing the whole life. Thus, sudden conversions. But if this is a *natural* process it is no more, and the essential liberty must be still only a delusion. But, indeed, the facts to be explained do not wear the look of a natural process. They are, for our knowledge, moments in a process of ideal self-government. Such changes in the character, in our experience, come from the illumination of the moral or religious ideal, and the supply of some profounder and more powerful motive-spring. The consciousness that however conditions of nature or of grace may be thought necessary, this is still the soul's own act, is so profound and utter that no scientific or philosophic scheme can ever eradicate it or permanently disguise it. It will ever hold this to be a *prius*, if not a *primum*, of the whole process of thought, which anything else proves its own falsity or insufficiency by contradicting.

It is well known that some determinists, *e. g.*, Buckle, have endeavored to fortify their opinion by appealing to *statistics*, showing that in the aggregate human actions may be very well classified, and in the lump, therefore, predicted; that there will be about so many murders, suicides, and even indifferent or trifling actions, annually, etc. But, in short, the fluctuations in such tables of statistics from movements originating in human free-will, by moral and religious activities, and not by hygienic or other physical ones merely, is enough to show the little worth of this appeal, and that it must not be taken for granted that these fluctuations can be explained from the physical *nexus*.

Again, determinism sometimes appeals to the confessions of certain criminals that they could not have done otherwise than as they did (which, if they are sane, nobody believes but hunters of paradoxes) and that if they had the opportunity they would do the same over again. To counterbalance the weight of such testimony may be set another kind of testimony—of those who have acknowledged their guilt and sought to make what reparation they could, even acknowledging the justness of the punishment they were receiving.

After all, this whole question of freedom and necessity will be decided in and for each intelligent mind by the system of philosophy adopted, according to whether the material or the mental is thought the *prius*, and if the mental, whether life is explained from the standpoint of the logical or the ethical. The position of the advocate of freedom is impregnable, and may be seen to be so. He may be willing to admit that freedom and necessity are but aspects of all concrete existence, and, therefore, in their deepest ground identical; but he is perfectly sure that the so-called necessity is a form of freedom, and not the reverse, and he sees no reason to lower his definition of freedom. There is nothing higher in our thought than the principle of self-determination. We feel that we ourselves are degraded in our own regard if we think of ourselves under any lower category. We feel that our conception of the First Principle is no longer the Highest, or any Absolute, if it is thought as anything other than freedom, pure self-determination. Determinism, as a mode of thinking and feeling, always shuts man in an intellectual dungeon, and inevitably leads to pessimistic views. Wronged human nature revolts and rises towards the optimistic sky only on the wings of freedom.

Yet the truth in determinism should by all means be conserved for the highest ethical interests; and what that is, as the result of the thinking of the present writer, he will state in some sentences as condensed as possible, thus:

1. Our whole essential being is derived, and therefore determined, for us.
2. Our environment, and therefore the whole range of possibilities which we can realize, the material which we may combine, constructing ends or motives, is determined for us.
3. Our idiosyncratic development, through heredity, education, and culture, is determined for us.
4. The matter or content of all our actions, when they pass out of the pure spiritual realm, is determined for us.

It proceeds, according to the laws of the universe, not only outside our own bodies, but in our brains, nervous and muscular systems. Any physical liberty we have is only borrowed; may be lost utterly or granted in its fulness. Freedom, if it exist at all, must belong to the very centre of the spiritual soul. Even the ideal ends we can set ourselves, though innumerable, are not infinite, but limited in number, and therefore determined for us. They have not the exhaustlessness which belongs to absolute freedom; and the relative freedom, if we have it, is fettered by these bonds. What then is left for freedom if all this is abandoned to determinism? Nothing, but that the spiritual soul *can* either yield itself to the eternal, infinite, absolute ideal, however imperfectly or inadequately apprehended; or, abide in some one of the multitudinous lower ones which it can construct out of the material and within the range that is set it; that is, it is *morally* free. That to all appearance men do take one or the other of these alternatives is a proof *a posteriori* of their moral freedom. The last ground of this difference of choice is an insoluble mystery. It is no other than one of the forms of statement of the problem of *evil*. If the form of the universal, instead of the form of isolation, independency, is taken, then the spiritual soul is on the way to *real* freedom, to the removal of all physical limitations, to liberty, to the removal of all contradictions, when freedom is indistinguishable ethically from necessity, yet maintains itself in perennial consciousness as freedom. Here the ethical has merged into the æsthetical. Here beauty reigns. Here the soul can forever enrich itself, and find amplest activity in its expansion to fill the measure to which it can never become perfectly commensurate.

(J. S. K.)

DE TROBRIAND, PHILIP REGIS, a French author and officer in the American army, was born at Tours, France, June 4, 1816. He belongs to a noble French family, and is a baron by inheritance. He graduated at the University of Orleans and studied law. In 1841 he came to New York for the first time, and in 1849 published there the *Revue du Nouveau-monde*. In 1854 he became editor of the *Courier des États-Unis*, the leading journal in the French language in America. In July, 1861, he entered the Union army as colonel of the Fifty-fifth New York volunteers, and in 1862 commanded a brigade in the Third corps. He was promoted to be brigadier-general in Jan., 1864, and soon after was entrusted for a few months with the command of the defences of New York. At a later period of the war he was brevet major-general of volunteers, commanding a division, and after its close was appointed colonel and brevet brigadier-general in the regular army. He was afterwards engaged principally in frontier duty, and in Jan., 1870, organized the successful expedition which put an end to the depredations of the Piegans in Montana. After serving some time in Utah, he was ordered to Louisiana, in Oct., 1874, to command the United States troops concentrated in New Orleans in consequence of political disturbances which had culminated in the overthrow of the State government by an armed organization of citizens. When the next legislature met, in Jan., 1875, some seats were contested with such violence that the military was again appealed to, and Gen. de Trobriand expelled some of the contestants. He retired from active service in 1879. He published in Paris *Les Gentilshommes de l'Ouest* (1841) and *Quatre ans de Campagnes à l'Armée du Poto-mac* (1867).

DETROIT, the chief city of Michigan, is the county-seat of Wayne co., and, until 1847, was the capital of the State. It is situated in 42° 20' N. lat., 82° 58' W. long., on the North-west bank of the Strait (Fr. *Détroit*) or River, connecting Lake St. Clair 7 miles distant N. with Lake Erie 20 miles distant S. At this point the river has a width of $\frac{5}{8}$ mile, an average depth of 30 feet, and a current of 2 $\frac{1}{4}$ miles per hour. Nearly 40,000 vessels, with an aggregate tonnage of 19,000,000, pass here every year. Including the suburbs of Hamtramck and Spring Wells, from which the city is only municipally separated, Detroit stretches along the river for 6 $\frac{1}{2}$ miles, extending back 2 $\frac{3}{4}$ miles. Except for a gentle rise at the bank of the river the site is a level plain, broken on its extreme east and west limits by ravines and ancient water-courses, one of which, known as Bloody Run, was the scene of a massacre of British soldiers in an attack upon the famous Indian chieftain Pontiac, in 1763. Woodward Avenue, running northerly from the river, divides the city almost equally. For the most part the streets intersect each other at right angles, but from the Campus Martius—an open space of 3 acres, $\frac{1}{2}$ mile from the river—and two quadrant parks, known as the Grand Circus $\frac{1}{2}$ mile beyond, both of which are cut by Woodward Avenue, several diagonal avenues radiate—some of them to the city limits and beyond. These diagonal avenues, together with parallel circular streets conforming to the semi-circumference of the Grand Circus Park, create throughout the city at all intersections with the rectangular plan a somewhat perplexing intricacy of highways, many triangular parks, plots, and buildings. The principal avenues are from 100 to 200 feet wide, bordered by one and even two rows of elm or maple trees, and by broad plats of grass extending from the houses to the roadway. Nearly all of the residence streets are lined with trees, and in many quarters this natural beauty is enhanced by the absence of fences. The population of the city in 1880 was 116,342; including the manufacturing suburbs of Spring Wells and Hamtramck, 128,742, which in 1884 was estimated at 150,000. The population in 1810 was 770; in 1850, 21,019; 1860, 45,619; 1870, 79,599. In 1880 there were 17,292 of German birth, 10,754 Canadian, 6775 Irish. There were 20,493 dwellings, and 5.68 persons to a dwelling—the lowest number in any city of the United States having more than 100,000 inhabitants. The government of the city consists of a mayor elected every 2 years; a city council of 12 members, elected on a general ticket for terms of 4 years; and a common council of 26 members, 2 from each ward. Connected with the police department are 8 stations—the central situated in East Park—and 175 men. The annual expenses are \$180,000. In the fire department there are 11 steam-fire engines, and 2 reserve, 3 chemical engines, 3 hook and ladder, 1 protection wagon, 1 fire escape, 129 alarm-boxes, 130 miles of wire, 893 street hydrants, 190 reservoirs, 65 horses, and 170 men. The annual expense is \$142,538 (1884). Water is supplied to the city from Lake St. Clair by 3 pumping-engines and 242 miles of pipe, whose daily capacity is 72,000,000 gallons. In 1884 the daily consumption was 20,000,000 gallons, or 150 gallons to each inhabitant. The works are valued at \$3,315,989. The schools have 12 grades with 14,385 sittings; a total enrollment of 300 teachers, and 18,971 pupils in attendance. The school census shows a population of 43,728 between the ages of five and twenty years. There is an average attendance of 400 at the night schools in winter; and connected with the department is a special school for vagrant, truant, and disorderly pupils. The annual expenditures (1884) are \$256,013. The public library, consisting of 50,605 volumes, had, in 1884, an annual circulation of 102,610 volumes, and 31,428 volumes were consulted in the library building, erected for the purpose on the park bounded by Gratiot Avenue, Farmer and Farrar

streets. The annual expenditures (1884) are \$20,137, \$6000 of which were derived from fines in the central station court. Between \$15,000 and \$20,000 are annually expended for the support of the poor. Belle Isle Park, an island of 650 acres and situated in the middle of the river 2 miles above the centre of the city, was bought in 1880 at a cost of \$200,000 for purposes of a public park. It is more than a mile long and nearly half a mile wide, covered with a thick growth of native forest timber. Under the direction of Frederick Law Olmsted, architect of New York Central and Brooklyn Prospect parks, this has been transformed into a natural park, with water-ways for drainage and boating, and characterized by forest scenery, open parade-grounds, bathing facilities, drives, avenues, meadows, and woodland paths. The house of correction with 600 inmates—a few of them United States prisoners for life—is devoted, for the benefit of the city, to the manufacture of chairs. It has turned over to the city treasury as high as \$50,000 annual profits. All these departments are governed by boards or commissions, whose members are, with two or three exceptions, appointed by the mayor and confirmed by the common council. The police commissioners are appointed by the governor of Michigan, the board of education is elected by the people on a general ticket, the commissioners of the public library are appointed by the board of education. In addition to the departments mentioned there is a board of public works, which, in 1884, had 100 miles of sewers and 97 miles of paved streets in charge, building inspectors, and a board of public health. The number of deaths in 1883 was 2884. The judiciary of the city consists of a police court, recorder's court, superior court, and circuit court of three judges. The United States District Court for the eastern district of Michigan is also held in Detroit.

The city is lighted by 20 electric lights and 3600 gas and naphtha lamps. In 1883, 7,046,192 letters, 1,142,408 drop letters, and 2,332,973 postal cards were delivered in the mails. There are 90 churches, 17 of which are Catholic, 2 Jewish, the rest Protestant. The Fort Street Presbyterian Church, the Central Methodist, and the Church of our Father (Universalist), both facing the Grand Circus Park, St. Joseph's (R. C.), on Orleans Street, St. Paul's (P. E.), on Congress Street, St. John's (P. E.), on Woodward Avenue, are distinguished for architectural attractions. The principal public building is the City Hall, on the west side of the Campus Martius. It is built of gray sandstone—three stories and a basement—in the Italian renaissance style with mansard roof surmounted by a cupola, the summit of which is 180 feet from the ground. It was finished in 1871 at a cost of \$700,000. Four colossal statues of Cadillac, Lasalle, Hennepin, and Richard—the pioneers of the Lake region—adorn the roof. In front is a large grass-plat furnished with trees and fountains, and two British cannon captured in 1812 at the naval battle won by Commodore Perry on Lake Erie. On the east side of the Campus Martius is the market building, erected in 1881 at a cost of \$75,000. The upper stories are occupied for city courts and offices. Between these two buildings is the soldiers' monument, designed and executed at Munich by Randolph Rogers, and erected at a cost of \$70,000 by the people of Michigan to the memory of the soldiers who fell in the civil war of 1861–65. It consists of a granite base and shaft surmounted by a colossal female warrior in bronze with shield and sword, and surrounded by symbolical bronze human figures representing the navy and the cavalry, infantry, and artillery service. On the sides are medallions in relief of Grant, Sherman, Lincoln, and Farragut. The United States Government building on Griswold Street is (1884) in process of demolition preparatory to the erection of a new one. Another fine building is the station of the Michigan Central Railroad, on the corner of Jefferson Avenue and Third Street. It is 280 ft. long by 182 ft.

wide; the front and side walls are low; the roof is broken into numerous gables, all subordinated to a tower at the corner 157 ft. high. It is built of pressed brick and terra-cotta, adorned with blue and red slate, and cost \$175,000. Immediately south the freight building of this road extends along the river in for a quarter of a mile, the iron roof consisting of a single arch. Four grain-elevators along the river front have a united capacity of 2,375,000 bushels.

The principal benevolent institutions are the Detroit Industrial School, for the instruction of poor children; Harper Hospital (Prot.), with accommodation for 200 patients; Home of the Friendless (Prot.); House of Providence, Infant Asylum, and Lying-in Hospital (Cath.); Little Sisters of the Poor (Cath.); Retreat Insane Asylum (Cath.); Protestant Orphan Asylum; St. Vincent's (Cath.) Orphan Asylum; St. Luke's (Epis.) Hospital; St. Mary's (Cath.) Hospital, accommodating 150 patients; Thompson Home for Old Ladies (Prot.); United States Marine Hospital; Women's Hospital and Foundlings' Home (Prot.); House of the Good Shepherd (Cath.). The three principal cemeteries are Elmwood (Prot.) on Elmwood Avenue; Mt. Elliot (Cath.) just east of Elmwood; Woodmere (Prot.) 5 miles W. of the City Hall. There are also 1 Lutheran and 4 Jewish cemeteries. Detroit has 4 theatres and about 50 public halls; 26 miles of street railways, employing 300 men and 750 horses; 7 daily newspapers (2 German) and 40 other newspaper and other publications; 45 telephone stations with 1500 subscribers, connected with all the principal towns and cities within a radius of 100 miles. At Grosse Pointe on Lake St. Clair 8 miles N., and Grosse Isle 12 miles S. on the river, are many summer residences of the citizens. The river is the favorite resort during the hot months. Scores of steamboats ply to the towns on the Detroit and St. Clair rivers, at the mouth of which latter, and near the ship-canal of St. Clair Flats, are hotels, private houses, and fishing-club houses built over the water. Ferry-boats to Windsor, Ontario, opposite Detroit, and to Belle Isle Park, are during the hot months the daily resort of thousands, who, on payment of a few cents, may remain on the boats, without landing, all day and evening for the enjoyment of the cool breezes always to be found on the river. Detroit is connected with Chicago and Buffalo by the Michigan Central, the Wabash, the Grand Trunk, and the Lake Shore and Michigan Southern Railroads and their branches; with Mackinac by the Michigan Central Railroad; with the Grand Rapids and Indiana Railroad at Howard City by the Detroit, Lansing, and Northern; with St. Louis by the Wabash Railroad; with Toledo by the Michigan Central and the Lake Shore; with Bay City by a branch of the Michigan Central, and with Port Huron by the Grand Trunk; with Ludington on Lake Michigan by the Flint and Pere Marquette; with Grand Rapids by the Grand River Division of the Michigan Central; and with Grand Haven on Lake Michigan by the Detroit and Milwaukee Railroad.

The assessed valuation of the city was in 1883 \$105,910,925, of which \$78,982,170 was real estate and \$26,928,755 personal property. There was a tax levy of 10.88 mills on the dollar, from which \$1,113,222 were collected. The total receipts were \$2,473,960; the expenditures \$1,611,008. The total bonded debt, Jan. 1, 1884, was \$1,056,500, for the redemption of which there were \$941,322 in the sinking fund, leaving a net debt of only \$115,178.

There are (1884) 5 national and 8 savings or other corporate banks, with an aggregate capital of \$4,100,000; deposits, \$21,745,000; loans and discounts, \$18,113,000. The weekly clearing-house figures for 1883 range from \$2,175,722 to \$3,461,688.

The average annual entries and clearances at the custom-house are about 12,000 vessels and 2,000,000 tonnage. The value of imports in 1883 was \$1,914,453; duties on imports and other receipts \$21,917. The

arrivals included 334,943 immigrants, and 176,308 animals for breeding. The total value of exports was \$3,131,490.

The amount of capital invested in manufactures is \$22,000,000; the annual value of the product, \$50,000,000; wages paid, \$10,000,000. Among the more important industries are boots and shoes, with \$500,000 capital; cars, \$500,000; clothing, \$1,300,000; flour and feed, \$550,000; hats and caps, \$350,000; iron, steel, and castings, \$1,800,000; leather, \$750,000; machinery, \$1,950,000; meat-packing, \$1,650,000; safes, \$300,000; stoves, \$900,000; seeds, \$762,000; tobacco and cigars, \$1,500,000; malt liquors, \$400,000. The amount of lumber manufactured was 125,000,000 feet. There are also large manufactories of iron, steel, copper, tobacco, stoves, cars, pins, etc., just outside of the city limits, owned and operated by Detroit citizens. Receipts of wheat have varied from 6,857,866 bu. in 1883 to 12,045,020 bu. in 1879; shipments from 6,260,480 bu. in 1883 to 10,964,183 in 1878. Receipts of corn have varied from 1,823,087 bu. in 1883 to 265,551 bu. in 1879; shipments from 1,572,627 bu. in 1883 to 60,629 bu. in 1879. Receipts of oats have ranged from 1,553,249 bu. in 1883 to 411,381 bu. in 1879; shipments from 670,882 bu. in 1883 to 62,891 bu. in 1880. Receipts of beans from 5,771,143 bu. in 1883 to 2,981,792 bu. in 1878; shipments from 5,255,291 bu. in 1883 to 978,952 in 1878. Receipts of barley, 765,531 bu. in 1883. The total capital invested in the wholesale business and manufacturing establishments of the city is \$60,000,000; annual sales about \$90,000,000. The retail and commission houses sell \$40,000,000, making a total of \$130,000,000.

The site of Detroit was first visited by civilized man in 1610, ten years before the landing of the Pilgrims at Plymouth. In 1705 there were 2000 souls in the Indian villages on its site. It was founded in 1701 by La Mothe Cadillac under the government of France; was transferred to England in 1763; was occupied by British troops during the revolutionary war; and was transferred to the United States by treaty in 1783, but not taken possession of until 1796. When the Territory of Michigan was organized in 1805, Detroit was made the seat of government. It was surrendered by Gen. Hull to the British in 1812, and retaken by the United States in 1813. It was twice besieged by Indians, eleven months by Pontiac in 1763, once captured in war, and once in 1805 burned to the ground. The present city was laid out in 1807; incorporated as a village in 1815, and as a city in 1824. When Michigan was admitted as a State in 1837, Detroit continued until 1847 to be the capital. It suffered from destructive fires in 1836, 1840, 1848, and 1849. (E. G. H.)

DETTINGEN, a village of Bavaria, in the circle of Lower Franconia, on the right bank of the river Mayn, the scene of a battle fought June 27, 1743, between the allied Austrians and English, commanded by George II., king of England and elector of Hanover, and the French forces under the marshal Duc de Noailles. The war is known as that of the Austrian Succession, incident to the death of Charles VI., the father of Maria Theresa. On the 29th of April, 1743, King George II. prorogued the British Parliament and went over to Hanover, taking with him his second son, the duke of Cumberland, and his secretary of state, Lord Carteret. In his youth the king had fought in person in the battle of Oudenarde, and had conceived a hearty and constant hatred to the French, which he was eager to gratify again in the field. In contrast to this activity, the young French king, Louis XV., was indolent and luxurious, taking little personal interest in the conduct of his armies, which supported the election of the elector of Bavaria to the imperial throne. The imperial forces had suffered greatly; they had ceased to threaten Hanover, and after marching to the relief of Prague had wintered in Northern Bavaria. To aid them a large French army now took the field, and all the troops were placed under the command of the marshal de Noailles.

They marched full of hope and ardor, superior in numbers and equipment, to give the finishing-stroke to the allies and their cause. To meet them, the British forces proceeded early in February from Flanders into Germany, under the earl of Stair. They were joined by an Austrian force under D'Ahrenberg and 16,000 Hanoverian soldiers in the pay of the English government. The military conduct of Lord Stair, which has been lauded by the French, has been severely censured by English writers. His movements were very slow, and he did not cross the Rhine until the middle of May. At Höchst he awaited the arrival of another Hanoverian contingent, 6000 strong, who were paid by the electorate of Hanover. Thus the allied army, composed of English, Austrians, Hanoverians, Hessians, and a few troops from the Low Countries, numbered about 37,000. Lord Stair might have gained great prestige by capturing the emperor at Frankfort, whither he had fled, but Frankfort was a free city and its neutrality was respected. The international condition of affairs was curious. Although French and English armies were arrayed against each other in the field, the two countries still maintained the semblance of peace; the British ambassador was still in Paris, and the French at the English court.

The army of De Noailles was 60,000 strong, homogeneous and thoroughly supplied. It crossed the Rhine and approached the Mayn by the southern bank, as the allies did by the northern. Lord Stair, more confused as he approached the scene of action, hastily called in all his detachments sent out to observe the enemy, and advanced up the northern bank of the Mayn, that he might draw his supplies, of which he was in great need, from Franconia. The principal magazine was at Hanau. On the 16th of June he reached Aschaffenburg on the river and 23 miles from Frankfort. He was closely followed by the French army, detachments of which were posted along the river-banks, and was thus cut off from his magazine at Hanau and the hope of supplies from Franconia. It was at this juncture that King George came from Hanover with his son. The situation was critical in the extreme; he found the army lacking food and forage, cooped up in a narrow valley between Aschaffenburg and Dettingen, literally surrounded by a very superior French force. All ways of escape were blocked—above Aschaffenburg, below Dettingen, and along the banks of the river between the two. The most feasible plan was to break through the toils by countermarching down the stream in hope of reaching Hanau. This counsel was adopted, and the retreat from Aschaffenburg commenced. To meet and crush them, De Noailles, advancing his main body to Seligenstadt, threw two bridges over the river, and sent his nephew, Lieut.-Gen. the duc de Grammont, across with 23,000 men to secure the defile in front of Dettingen through which the allies must pass in carrying out their hazardous design. The village is divided by a small stream which empties into the Mayn and forms a ravine. Six French batteries were posted on the river-bank to play upon the flank and rear of the allies in passing through this ravine.

Before the dawn of the 27th of June the allied forces began their march, formed in two close columns. King George was at first with the rear column, which was considered the post of danger, as Aschaffenburg was, upon its evacuation, at once occupied by 12,000 French troops. But the troops of De Grammont were soon descried in front, and the king hurried thither to form the line of battle. Nothing could have saved the allies but the blunder of the French commander, who, impregnably posted in the village, had been ordered to wait and not attack the enemy until he should enter the ravine.

De Noailles having given these orders, and having everything arranged for the speedy destruction of the allies, left the front and recrossed the Mayn to hurry forward some tardy detachments. No sooner had he gone than De Grammont, with a rashness that was to prove fatal, crossed the ravine which protected his po-

sition and was designed to be the fatal trap for the allies, with considerable delay in getting his cavalry over, and gave battle to the enemy on equal terms. His whole command followed, and the encounter was waged with a rather more than even chance of success to the allies. King George was mounted upon a fiery horse, which ran away and carried him almost into the French lines. Fortunately stopped in this headlong career, the king put himself at the head of the advanced English regiment; he shouted, "Now, boys, for the honor of England, fire; behave well, and the French will soon run;" and after a volley led them to the charge. The repeated charges of the French cavalry could not break the English line: the French batteries along the bank were obliged to cease firing because their own troops were endangered. The Austrian troops under Neuperg bravely seconded the English, and when the astonished De Noailles returned he found his troops disheartened and disorganized and the allies on an irresistible advance. He could do nothing but order a retreat, which soon became a disastrous rout; the bridges were soon choked by the fugitives; many threw themselves into the river to escape by swimming; numbers fled to the mountains. The allied batteries played upon the flying masses. Victory had been snatched from the jaws of defeat. The fighting lasted until four o'clock; the king dined on the field, and did not leave it until ten. The allied army pursued its march unmolested to Hanau. The French losses amounted to about 6000, with an unusual proportion of officers, who had fallen in an attempt to stay the pursuit. The loss of the allies was about 3000, but they left their wounded upon the field, commending them—the French writers say "shamefully"—to the generosity of the French.

It will be observed that notwithstanding the superior numbers of the French in the entire field, in the actual engagement on the restricted ground the allies were in somewhat greater force. Dettingen is notable as the last battle in which an English king has commanded in the field. (H. C.)

DEVASTAVIT, in law, a wasting or mismanagement of the estate and effects of a person deceased by the executor or administrator into whose hands the same have been committed. The term is also used to indicate an entry or suggestion of waste filed by a plaintiff in a suit against an executor or administrator.

Devastavits may arise in several ways: (1) By direct abuse, as where an executor or administrator sells, embezzles, or converts to his own use the goods entrusted to him; (2) by mal-administration, as where such a one pays a claim not actually due or does not distribute the assets in the order fixed by the law; (3) by neglect, as where he fails to sell goods at a proper time, or to collect a doubtful debt which by the exercise of due diligence might have been gotten in.

The law requires from an executor or administrator in the foregoing cases the exercise of honesty, care, and forethought; and if he be lacking in these respects he will be adjudged guilty of a *devastavit*. In such case said party will be held personally liable to make up the loss out of his own estate. (L. L., JR.)

DEVENS, CHARLES, an American general and jurist, was born at Charlestown, Mass., April 4, 1820. He graduated at Harvard College in 1838, and was admitted to the bar in 1841. He practised law in Franklin co., Mass., until 1849, and was a member of the State senate during the years 1848 and 1849. From 1849 to 1853 he held the office of United States Marshal for Massachusetts, after which he resumed the practice of law in Worcester. On the outbreak of the civil war he was commissioned as a major, but was soon made colonel of the Fifteenth regiment Massachusetts Infantry. In the unfortunate affair at Ball's Bluff this regiment won distinguished honor. Col. Devens was appointed a brigadier-general in April, 1862, and commanded a brigade during the Peninsular campaign. In 1863 he had command of the First division of the Eleventh corps, and in 1864 he commanded

a division in the Eighteenth corps and afterwards a division in the Twenty-fourth army corps, which division was the first to enter Richmond when it was evacuated in April, 1865. Gen. Devens was three times wounded, slightly at Ball's Bluff, and severely at Fair Oaks and Chancellorsville. He participated in most of the battles of the Army of the Potomac, and at the request of Gen. Grant was breveted major-general for gallantry and meritorious conduct at the taking of Richmond. While at the front in 1862 he was nominated for governor of Massachusetts by what was termed the People's party, but was defeated by Gov. Andrew. After the surrender of Lee in 1865 Gen. Devens was ordered to a command in South Carolina, where he remained until 1866, when he was mustered out of service. Gen. Devens resumed the practice of law in Massachusetts, but in 1867 was appointed one of the justices of the Superior Court of that State, and in 1873 was made one of the justices of the Supreme Court of Massachusetts. In March, 1877, he was selected by President Hayes as attorney-general of the United States, and served as such until the close of that administration. In April, 1883, he was reappointed one of the justices of the Supreme Court of that State, which office he now holds. Except his judicial opinions and those given as attorney-general, his only publications have been occasional addresses, among which are an oration at Bunker Hill on the centennial anniversary of the battle, and one upon Gen. G. G. Meade, delivered before the Society of the Army of the Potomac.

DE VERE, SIR AUBREY (1788-1846), an Irish poet, was born at Curragh Chase, county Limerick, in 1788. The family was founded by Vere Hunt, an English soldier of noble descent, who went from Essex to Ireland in Cromwell's army, and afterwards settled there. A descendant, also named Vere Hunt, was made a baronet in 1784. His son, Aubrey, on succeeding to the title in 1818, dropped the name Hunt and assumed the name and arms of De Vere. At an early age he had married Mary Rice, sister of Lord Montague. He wrote little till he reached his thirtieth year, when he produced in succession two dramatic poems, *Julian, the Apostate*, and *The Duke of Mercia*. He was a friend and admirer of Wordsworth, and dedicated to him *A Song of Faith; Devout Exercises and Sonnets* (1842). This was followed by *The Waldenses* (1842), and *The Search After Proserpine* (1843). De Vere especially cultivated the sonnet, studying Petrarch and Filicaja. He was of a deeply religious nature and firmly attached to the Church of England, but favored the introduction of religious equality in Ireland. In the last year of his life he composed his longest dramatic poem, *Mary Tudor*, which was published after his death. He died in 1846.

DE VERE, AUBREY THOMAS, an Irish poet, third son of the preceding, was born at Curragh Chase, county Limerick, Jan. 10, 1814. He was educated at Trinity College, Dublin, but did not graduate. At an early age he wrote poetry which closely resembled his father's in thought and style. When famine fell on Ireland with all its horrors De Vere devoted himself to active charitable work, and his sad experience at that time led him to publish a pamphlet on *English Misrule and Irish Misdeeds* (1848). He was also led to engage in religious studies which resulted in his conversion to the Roman Catholic Church in 1851. He then began again to write poetry, partly to illustrate Irish history and partly to contribute to the aid of religion. In 1854 he was made honorary professor of political and social science in the Catholic University of Dublin. He afterwards took part in the agitation for the disestablishment of the Church of Ireland. Among his publications are *Picturesque Sketches of Greece and Turkey* (1850); *Poems, Miscellaneous and Sacred* (1856); *May Carols* (1857); *The Sisters, Innisfail, and Other Poems* (1861); *The Infant Bridal* (1864); *Irish Odes* (1869); *Legends of St. Patrick* (1872); *Alexander the Great*

(1874); *St. Thomas of Canterbury* (1876); *Legends of the Saxon Saints* (1879); *The Foray of Queen Meave* (1882).

DE VERE, MAXIMILIAN SCHELE, LL.D., an American philologist, was born in Sweden, Nov. 1, 1820. His ancestors, the Barons von Schele, owned estates in Pomerania, and his father entered the Prussian military service and rose to high rank. The son was mainly educated in Germany, studied law at Berlin and Bonn, became referendarius in the Prussian department of justice, and entered the diplomatic service. He had also served the customary year in the army and was appointed lieutenant in the Landwehr. At the age of twenty-two he came to America and spent a year travelling through the United States, part of time in the far West. He was then invited to settle in Cambridge, Mass., and being generously assisted by Longfellow and others, became a teacher of modern languages in Boston, but was soon called to a professorship in the University of Virginia, entering upon his duties there in November, 1844. He has since completely identified himself with his adopted country, and during the civil war remained in performance of his duties at the university. His literary career began with the publication of a work on Anglo-Saxon left in manuscript by President Jefferson, the founder of the university. Then follows his *Comparative Philology* (1865), *Studies in English* (1866), *Americanisms* (1871), and *Leaves from the Book of Nature* (1872), which has been republished in England with illustrations. His *Myths of the Rhine*, illustrated by Doré, appeared in 1874, as an *edition de luxe*. His minor works are the *Romance of American History* (1872), *Modern Magic* (1872), *Wonders of the Deep* (1869). In the *Great Empress* he sketches the life of Agrippina, the mother of Nero (1880). Besides contributing to leading magazines he translated several works, among which those of Spielhagen have been received with special favor. He has lectured before the Smithsonian Institution, the Peabody Institute, and other audiences. He has published school grammars of French and Spanish. He was one of the founders of the American Philological Association, and is a member of many learned societies at home and abroad.

DEWEES, WILLIAM POTTS (1768-1841), an American physician, was born at Pottsgrove, Pa., May 5, 1768. On his father's side he was of Swedish descent. He studied medicine with Dr. William Smith, and after attending lectures at the University of Pennsylvania, but without obtaining a degree, began to practise at Abington, Pa., in 1789. In December, 1793, he removed to Philadelphia, where, by his talent and diligence, he secured the favor of Dr. Rush. Dewees made obstetrics his specialty, and obtained extensive practice and high reputation. Feeling the necessity of having a degree in order to secure professional honors, he applied to the university and obtained it in 1806. In 1810 he was a prominent though unsuccessful competitor with T. C. James for the newly founded professorship of obstetrics in the University of Pennsylvania, the first of the kind in this country. In 1812, partly on account of ill-health, he gave up his profession and devoted himself for five years to farming at Phillipsburg. Having returned to Philadelphia in 1817 he became connected with the Medical Institute of Philadelphia, founded by Dr. Chapman. He was elected in 1825 adjunct professor, and in 1834 professor of obstetrics and diseases of women and children in the University of Pennsylvania. A year later he was obliged to resign on account of ill-health, and went to Cuba and thence to Mobile, where he resided for nearly five years, practising to some extent. Having returned to Philadelphia in 1840, he died there May 20, 1841. He published *Inaugural Essays*, *Medical Essays* (1823); *System of Midwifery* (1824); *Physical and Medical Treatment of Children* (1825); *Diseases of Females* (1826); *Practice of Medicine* (1830). His practical works have passed through several editions. His *Sys-*

tem of Midwifery was the first original American treatise on the subject, and while it was founded mainly on that of Baudelocque, it contained many improvements. Dr. Dewees was a member of the American Philosophical Society, and received many certificates and diplomas from medical institutions at home and abroad.

DEWEY, CHESTER, D.D. (1784–1867), an American Congregationalist preacher and botanist, was born at Sheffield, Mass., Oct. 25, 1784. He graduated at Williams College in 1806, and in 1808 was licensed to preach, but soon after became a tutor in his *alma mater* and in 1810 was made professor of mathematics and natural philosophy in the same. In 1827 he took charge of an academy at Pittsfield, Mass., and was also professor of botany and chemistry in the medical college there. In 1836 he was made principal of the collegiate institute at Rochester, N. Y., and when the University of Rochester was erected, in 1850, he was made professor of chemistry and natural history. He retired from this position in 1860 and died at Rochester Dec. 15, 1867. He was especially eminent as a botanist, and his *History of the Herbaceous Plants of Massachusetts* was published by that State. He also contributed many articles to the *American Journal of Science and Arts*, and to the secular and religious papers.

DEWEY, ORVILLE, D. D., LL.D. (1794–1882), an American Unitarian minister, was born at Sheffield, Mass., March 28, 1794. He graduated at Williams College in 1814 at the head of his class, and became first a teacher, then a clerk, in New York. Afterwards he studied theology at Andover, finishing his course in 1819. He was for some months an agent of the American Education Society, and then took temporary charge of a congregation at Gloucester, Mass. In 1821 he became a Unitarian, and was appointed assistant to Dr. Channing in Boston. On Dec. 17, 1823, he was ordained pastor of a Unitarian church in New Bedford, Mass., and while there frequently contributed to the *Christian Examiner* and the *North American Review*. In 1833, on account of ill-health, he went to Europe, where he spent two years. When he returned he took charge of the Unitarian church of the Messiah in New York, which became large and prosperous under his ministry; but in 1842 he was obliged again to seek relief in travel. Two years later he resumed his charge, but resigned in 1848, and retired to a farm in Sheffield. He afterwards delivered in several places courses of lectures on *The Problem of Human Life and Destiny* and on *The Education of the Human Race*. He also took temporary charge of Unitarian churches in Albany and Washington, and from 1858 to 1862 was pastor of a church in Boston. He then retired to his native place, and, feeling that his work was accomplished, looked forth on the busy world with kindly, unselfish interest. He died in the house in which he was born, in Sheffield, Mass., March 21, 1882.

Dr. Dewey was undoubtedly the greatest Unitarian preacher—equal to Dr. Channing in earnest and effective pulpit oratory, and superior to him in the grasp and profundity of his mental powers. He was unsurpassed in the attention he commanded, in the fervor and depth of the emotions he excited, in the power with which he brought home to the conscience the precepts of moral and religious truth. The uniform ability with which week after week he presented the momentous themes of the pulpit and showed the spiritual laws underlying and pervading human life was remarkable; but this long-continued intensity of the mind proved too much for the body, and obliged him frequently to suspend his labors, and finally to retire from a devoted congregation. Although a firm believer in the Unitarian doctrines, which he embraced early in his ministerial course, he never lost his sympathy with the great body of Christian believers. He was himself an embodiment of the noble character he loved to portray and impress upon his hearers.

His first book, *Letters on Revivals*, was published in

1830, and attracted attention. In 1835 he gathered into a volume *Discourses on Various Subjects*, and in 1836 he published the results of his travels in Europe in *The Old World and the New*. In later years his discourses were collected from time to time, and published in England as well as America under the titles *Human Nature, Human Life, The Nature of Religion, Commerce and Business, The Unitarian Belief*.

DEXTER, HENRY MARTYN, an American Congregationalist minister, editor, and author, was born at Plympton, Mass., Aug. 13, 1821. He is on the father's side of the sixth generation from Thomas Dexter of Lynn, and on the mother's side of the seventh generation from George Morton of Plymouth, the presumed author of *Mourt's Relation*. His father, Rev. Elijah Dexter, prepared him for Brown University, which he entered in 1836, but two years later he removed to Yale College, where he graduated in 1840. After teaching for a year in Dorchester Academy, he studied theology, and graduated at Andover in 1844. He became the first pastor of the Franklin Street Congregational Church in Manchester, N. H., and in 1849 succeeded Rev. Austin Phelps, D. D., in charge of the Berkeley Street Church, Boston. After being for a year the weekly correspondent of the *New York Independent*, he became in 1851 an associate editor, and in 1856 the chief editor, of the *Congregationalist*. In 1866 his church had grown so large that he was compelled to resign his editorial position, but in the following May, when the *Boston Recorder* was merged in the *Congregationalist*, Dr. Dexter resigned his pastoral charge and returned to his editorial labors. He still holds this position, residing in New Bedford, but spending half of each week in Boston. Besides his journalistic work, Dr. Dexter was one of the founders of the *Congregational Quarterly*, and has largely contributed to its pages. He has also contributed to other reviews and magazines, and has published—*Street Thoughts* (1859), *Twelve Discourses* (1860), *Future Punishment* (1865), *Congregationalism* (1865; 5th ed., 1879), *New England Ecclesiastical Councils* (1867), *The Polity of the Pilgrims* (1870), *Pilgrim Memoranda* (1870), *As to Roger Williams and his Banishment from Massachusetts* (1876), *Congregationalism of the Last Two Hundred Years as Seen in its Literature*, with a copious bibliography (N. Y., 1880), *Hand-book of Congregationalism* (1880), *The True Story of John Smyth, the Se-Baptist*, with bibliography of the Baptist controversy (1881). He also edited in 1865 an exact reprint of *Mourt's Relation* and Capt. Benjamin Church's *Philip's War and Eastern Expeditions*. He has received the degree of D. D. from Iowa College and from Yale College. He has long been engaged upon a new history of the Plymouth colony of 1620, founded upon original researches.

DIALECT. In language there is a constant tendency to variation. This tendency manifests itself in very various ways—in the addition of new words and the loss of the old, in the change of form or of meaning of the same word, or in change of form combined with change of meaning. Nor do these processes, singly or in combination, affect always the whole of the word; on the contrary, a very important factor is the alteration of single syllables, especially final syllables and those by which the relations of inflection are denoted.

These tendencies are most clearly seen and best known in the comparison of documents produced at one period in the life of a people with those produced at a much later date, provided this people has not in the mean time changed its own speech for that of any other. Thus a comparison of the Latin with the Italian clearly shows how great the ultimate result of a long-continued succession of individual alterations may come to be, so that one tongue, through a large portion of its original area, has been altogether superseded by another that has grown out of it. Of certain precautions to be observed in making this comparison we shall speak farther on.

But these tendencies to change are never altogether the same over the whole district occupied by a language:

they differ more or less widely in different sections, and thus tend not merely to change, but to differentiation. Where these differences affect any great number of words or forms, especially forms of inflection, the various contemporaneous local forms are called, with reference to each other, "dialects," the whole group of allied languages being termed a "family." Thus, the Latin split up into Italian, French, Spanish, Portuguese, and other less important forms of speech, collectively called the "Romance tongues," so that any one of these, as the Spanish, is properly described as "a dialect of the Romance family of languages."

This is the strictly scientific use of the term, and in this sense every tongue ever spoken, when considered in its relation to some kindred form of speech, may be described as a "dialect;" and, in consequence, the terms "language" and "dialect" are often quite synonymous terms, or at least seem to be such.

The term "dialect" is not, however, used to describe the special speech peculiarities of individuals, although the mutual relations between the forms peculiar to single persons are exactly the same as the mutual relations between those greater sums of difference to which the term is applied. Furthermore, when the region concerned is very limited, a single mountain-valley, for instance, although the term "dialect" is often used, it is more commonly displaced by the less familiar word "patois," which commonly implies that the variation is too unimportant, in some way, to receive special consideration. And yet in some of these cases the sum of differences between a "patois" and its allied forms of speech may be greater than those subsisting between two forms of speech classified as "languages."

These limitations, illogical as they are, bring us to the consideration of the less accurate use of the word "dialect"—a use that is very often found even in books of strict scientific content, and one that rests on a purely political or literary basis. Where a certain form of speech has, from the political circumstances of those that use it, or from its literary content, become a special subject of study, it is commonly spoken of as a "language," and related forms are generally described as its "dialects," unless some of these last have similar claims to special attention. Thus we speak of a "Spanish language," and describe certain provincial forms of speech as "dialects" of this. Yet the Portuguese, which closely resembles the Spanish, is termed a "language," and on very intelligible grounds.

The test of mutual intelligibility between two speakers has been sometimes proposed as a basis of exact definition, but it is valueless, as the degree of intelligibility often depends partly on the speakers and partly on the subject; and the proposed test altogether fails when confronted with the actual use of the word, for a party of three can get along fairly well although one may use the "Swedish language," another the "Danish language," and the third the Icelandic.

To describe, in all its phases, the continually fluctuating use of the two terms is impossible, and no definition will hold good if tested by all the quotable cases where they are found. The difficulty is one common to all cases of evolution; and it will be found that students of biological science, accustomed as they are to the parallel fluctuating use of the terms "family," "species," and "variety," often grasp the relation under discussion more readily than the average student of philosophy or even of philology.

The extent of the territorial range of a dialect depends upon political circumstances, but in primitive times the territory of each community, and in consequence of each dialect, was very limited. Thus, the Attic, the leading literary dialect of Greece, was originally the dialect of Attica alone, or probably of a very small portion of this small state. So also the classical Latin first appears at the city of Rome; and in the case of both languages it is not unlikely that the starting-point was the patois of a single village clustered on a single hilltop.

The vocabulary of such a community, however, by no means suffices for the needs of a great or a cultivated people. As it grows it makes new words; these new words alter the aspect of the sum of analogies, both for external phonetic form and internal content or signification, so that the mechanical deduction of a dialect from any form of speech standing even in the direct line of its ancestry is impossible. In addition to this, it is daily becoming more and more evident that dialects may be mixed, although this is by no means assented to by all good authorities, and the special investigations that may enable the philologist to speak of such mixtures with precision are as yet incomplete.

So, while the student must remember that every language is evolved from some dialect of limited area, he must beware of the conclusion that this evolution is one to be compared with the development of the oak from the seed; that is, one that is necessarily determined by the original content of the parent tongue. No such deduction by fixed processes is to be thought of in connection with languages.

In the case of the origin of most modern literary languages the districts concerned were somewhat more extensive than for the Greek and Latin. They arose at a time when the village community was superseded by a more extensive social organization. They were still, however, "dialects," and nothing else, in the somewhat depreciatory sense of the term. Thus, in the history of the Germanic stock of speech in England there are found, at the outset, at least two important dialects occupying the soil—one the Anglian, in the north; the other the Saxon, in the south. The paucity of documents renders it impossible to decide upon the degree of uniformity with which these were spoken over their whole areas, nor indeed can a full account of the differences between them be given. There were, however, a number of dialects of each, and for a long time the written language in every part of England was, in each case, the more or less faithful phonetic rendering of the speech of the locality where the author lived. The Scottish, mediæval and modern, belongs to the Anglian. Between the two, in mid-England, lay the tract called Mercia. This, too, while it differed materially from the Anglian on the one side and still more from the Saxon on the other, presented a mass of dialects extending as far south as London. Out of the Mercian came the modern English, thus descending, at any rate, from but one of three local forms of speech. How much farther than this we can go, whether the literary English fairly represents only one patois of the Mercian or whether it is the result of the union of many distinct patois, cannot be certainly known. Of course no one needs to be reminded of the borrowed Norman element of the vocabulary. In passing, it may be noted that among the great number of dialects still existing in England the three great ancient divisions, North, Middle, and South, are still represented.

Finally, it should be noted that the limitation of the term "dialect" to *contemporaneous* forms of speech, however useful such restriction may be, may possibly mislead. From the point of view of the student of the dynamics of the growth of speech, the relation between the Sanskrit of the Vedas and the English of Tennyson is exactly the same, except in degree, as that subsisting between the language of Burns and that again of Tennyson. (M. W. E.)

DIAZ, PORFIRIO, a Mexican general and statesman, of humble origin, first became noted during Maximilian's occupancy of Mexico in 1866. At the head of a republican army raised in the northern provinces, he laid siege to Puebla, and after defeating the imperial Gen. Marquez, who was hastening to its relief, took the city by storm, April 5, 1867. He then proceeded to the capital, which made a stubborn resistance, but was obliged to capitulate, June 21, after Gen. Marquez had withdrawn. Having acquired a military reputation, Diaz aspired to the presidency in 1871 as a rival of Juarez. After the death of the latter in July, 1872

Diaz put himself at the head of a military insurrection, but was obliged to submit to Sebastian Lerdo, the chief-justice, who, according to the constitution, had succeeded to the office in the interim. Lerdo was afterwards elected president, Oct. 27, 1872; but before his term of four years expired Diaz was again in rebellion and seized the city of Matamoros. After a number of desperate adventures and hairbreadth escapes he succeeded in driving Lerdo from the country. On May 5, 1877, Diaz was proclaimed president by Congress till Nov. 30, 1880. During his presidency peace was maintained, the tariff revised, smuggling diminished, the finances improved, and several important lines of railway established. Much was done to invite the investment of foreign capital in mines and railroads. When Gen. Grant visited the country Pres. Diaz was assiduous in his attention to the distinguished chieftain. In 1880 an international exhibition was held in the city of Mexico, which gave abundant evidence of the resources and prosperity of the country. On the expiry of his term Diaz transferred his power to his friend, Gen. Manuel Gonzalez, inasmuch as the constitution forbids any person to hold the presidency for two successive terms. In order to carry on the system of internal improvements which he had inaugurated Diaz became the minister of public works, but resigned this position in June, 1881, and became governor of the province of Oaxaca. He has always been popular with the lower classes, and, after attaining the presidency, succeeded by his tact and good fortune in conciliating the aristocratic and conservative portion of the community.

DICEY, EDWARD, an English editor, was born in Leicestershire, May, 1832, and was educated at Trinity Hall, Cambridge, where he graduated B. A. in 1854. He has contributed largely to the *Fortnightly Review*, *St. Paul's*, *Macmillan's Magazine*, and other periodicals, and for several years wrote constantly for the *Daily Telegraph*, for which he has also acted as special correspondent. During his travels in the East he accepted the editorship of the *Daily News*, but after holding it three months resigned and in 1870 became editor of the *Observer*. His published works include *A Memoir of Cavour*; *Rome in 1860*; *The Schleswig-Holstein War* (1864); *Six Months in the Federal States* (1863); *The Battle-Fields of 1866* (1866); *A Month in Russia* (1867); *The Morning Land*, the story of a three months' tour in the East (1870); *England and Egypt* (London, 1881).

DICKINSON, JOHN, LL.D. (1732-1808), an American statesman well known as "The Pennsylvania Farmer," was born at Crosia, Talbot co., Md., Nov. 13, 1732. His father, Samuel Dickinson, had an estate in Kent co., Del., as well as that in Maryland, and was soon after appointed chief-justice of Delaware. He was a member of the Society of Friends. The son, having commenced the study of law at Philadelphia, went to London, where he completed his studies in the Temple. Returning to America after three years' absence he entered on the practice of his profession in Philadelphia, and in 1770 was married to Mary, daughter of Isaac Norris, usually called "the Speaker," as having held that position in the Pennsylvania Assembly for fifteen years. From his father-in-law Dickinson obtained Fair Hill, a handsome country residence on the northern border of Philadelphia. Here he lived in elegant style, refreshing his mind and cultivating his taste with one of the finest libraries in the colonies. In 1763 he was elected to the assembly, where he opposed the petition to Parliament asking that Pennsylvania be changed from a proprietary to a royal province, and demanded that some assurance should first be given that the change would be beneficial. Yet he did not hesitate to rebuke the selfishness of the proprietaries, who vetoed grants for the public service unless their estates should be exempted from taxes. When sent by the assembly as a delegate to the General Congress which met

in New York in October, 1765, he found abundant opportunity for showing his love of constitutional liberty. Fluent in speech and ready in debate, his talents were acknowledged by his associates, and the resolutions adopted by the Congress were drafted by him. In plain yet dignified language they asserted that the American colonists had by their circumstances lost none of the rights and liberties of native-born Englishmen. But the protest was in vain. The British Parliament persisted in its determination to tax the colonies without their consent, and in 1768 he published his famous *Letters to the Inhabitants of the British Colonies, by a Pennsylvania Farmer*. The *Letters* clearly showed that while Parliament had power to regulate trade in the colonies, it had no right to impose duties on them for the purpose of raising a revenue, nor had such an attempt ever been made before. The "Farmer" called upon the people, therefore, to resist the "dangerous innovation" and "to exert themselves in the most firm but the most peaceable manner for obtaining relief." To him is due the famous phrase: "No taxation without representation." Franklin, then in London as the agent of Pennsylvania, published the *Letters* with a preface, as the best presentation of the case of the colonies. They were at a later date translated into French and published in Paris. Their arguments conciliated the wisest statesmen of Great Britain, while their tone and style were highly commended by Voltaire. The immediate effect of the *Letters* in America was to prepare the minds of the people for a firm maintenance of their rights and resistance to the encroachments of the British Parliament. In 1774, when the affairs of the colonies had reached a crisis in Boston, Dickinson endeavored to secure unity in action on the part of Pennsylvania, but, on account of the reluctance of the Quakers and of the friends of the proprietary, was obliged to act very cautiously. More eager patriots in the Philadelphia committee were vexed at the slow movements of the assembly, and wished a convention called to supersede it; while Dickinson's efforts were directed to getting Pennsylvania into line with Massachusetts without any overthrow of the existing government. This was felt to be difficult, and eventually proved impossible. When the assembly met in July, 1774, to elect delegates to the Continental Congress, first suggested by Virginia a year before, it passed over Dickinson and chose the ultra-royalist Galloway. But a few weeks after this first Continental Congress assembled in Carpenters' Hall, Philadelphia, Dickinson was substituted, and thenceforth his influence was seen and felt in all its actions and deliberations. As the drafts of various public documents previously proposed by committees had failed to express the judgment of the Congress, Dickinson was added to the committees and drew up the "Petition to the King," the "Declaration to the Armies," and the "Address to the States." These documents received the highest praise on both sides of the Atlantic. Their vigorous defence of the rights of America convinced all whose minds were open to reason. But the king and his ministers were obstinate, and when the second "petition," which Dickinson had drafted and insisted on sending, was presented by Richard Penn, it was rejected because it came from the Congress. Two days after the delivery of a copy of it to the ministry the king issued a proclamation declaring that open and avowed rebellion existed in the colonies, and calling on all his subjects to assist in bringing to condign punishment the authors of these traitorous designs. The proclamation arrived in Philadelphia, Nov. 1, 1775, and on the 4th the assembly chose nine delegates to Congress. Of these Dickinson, who had been elected almost unanimously to the assembly, was one, and Franklin another. Before the end of the month both were appointed members of a secret committee of correspondence with their friends abroad. Dickinson still continued to be a member of the Pennsylvania assembly, and, though the Quakers

had there a majority, his cautious policy served so well that it was agreed to arm the people, for which purpose 5000 new muskets were ordered and bills of credit were issued amounting to £35,000. When the assembly of New Jersey proposed soon after to make a separate address to the king, Dickinson, as the chief advocate of united action, was sent to urge them to rest on the petition already sent in the name of united America. After the committee to draft the Declaration of Independence was appointed in June, 1776, Dickinson was made a member of the committees to arrange the form of confederation for the colonies and to prepare a plan of treaties with foreign powers. Meantime the proprietary government of Pennsylvania, which he had done so much to uphold, fell irretrievably, unable to endure the first shock of the conflict which had now begun. The plan of confederation proposed by Dickinson was not accepted. Firmly convinced by his knowledge of history that concentration of power was the cause of instability in previous republics, he was anxious to preserve the sovereignty of individual colonies. He allowed the general government no direct authority to raise a revenue, and in other ways restricted too much its necessary powers. Before the Declaration of Independence was formally signed, in August, he had ceased to be a member of Congress. Dickinson had opposed the declaration as being premature until the terms of confederation between the colonies were settled, unanimity assured, and the promise of foreign assistance obtained. But the temper of the American people had been roused beyond such cautious calculations. A few months later, when the seat of war was shifted from New England to the Middle States, he proved his unflinching devotion to his country by entering the army as a private, and, after serving for a time in New Jersey, was made a brigadier-general. His name and character were so well known to the British employed in subduing America that after the battle of Germantown—Oct. 4, 1777—his house was burned and his property laid waste. His family had retired to his paternal estate in Delaware, and his subsequent career shows that he was regarded as equally a citizen of either State. In April, 1779, he was unanimously elected to Congress from Delaware, and had further opportunity of displaying his ability in the field in which he had already achieved fame. He prepared, on behalf of the overburdened Congress, "An Address to the States," designed to rouse the people to renewed exertion at that time of despondency and peril. In 1780 he became a member of the assembly of Delaware, and was soon afterward chosen president of that State. In 1782 he was elected also president of the supreme executive council of Pennsylvania, being the candidate of the party which favored a revision of the State constitution to adapt it to the altered condition of affairs. During his administration he assisted liberally in establishing a college at Carlisle, and in gratitude for his services the institution received the name of Dickinson College. He was made president of the trustees, and continued in that position till his death. From 1785 he resided at Wilmington, Delaware, and in 1786 he was president of a convention of delegates from five States, which met at Annapolis to devise a uniform system of commercial relations between the States. In the next year he was a member of the convention which framed the Constitution of the United States. Representing a small State, yet having close connection with the great State of Pennsylvania, he was peculiarly fitted for adjusting the compromises necessary to secure harmony between the larger and the smaller States. He urged that considerable power should be left to each State, and that in one of the two branches of the national legislature the States should have equal votes without regard to their size or population. These provisions were incorporated, and Delaware was the first to ratify the constitution (Dec. 7, 1787), closely

followed by Pennsylvania (Dec. 12). This result was largely due to the nine letters in which Dickinson, under the signature of "Fabius," set forth the features and advantages of the new bond of union. In 1792, in the convention to revise the constitution of Delaware, he was the most prominent and active member. In 1797 public opinion in America was highly excited against the French republic on account of its repeated violations of the treaty of 1778. Recalled from his retirement by the general alarm at the prospect of another war, Dickinson published a second series of letters under the signature of "Fabius," counselling forbearance towards our ancient ally and testifying sympathy with her struggle for liberty. In 1801 he collected and published his various political writings. He died at Wilmington, Del., Feb. 14, 1808.

John Adams, when attending the first Continental Congress, visited Dickinson at his handsome residence, Fair Hill, and thus describes his personal appearance: "He is a shadow; tall, but slender as a reed; pale as ashes; one would think at first sight he could not live a month, yet upon a more attentive inspection, he looks as if the springs of life were strong enough to last many years." His character and abilities are readily seen in this sketch of his career. He was a man of thought and learning rather than of action; an able reasoner, an agreeable conversationalist, and a devout Christian. Wisely conservative, yet a friend of human rights, he had courage to set forth his views on all public questions that came before him, even at the expense of his own popularity. The American people still owe him a debt of gratitude, and the ideas which he proclaimed have long been imbedded in the national character.

J. P. L.

DICKINSON, JONATHAN (1688-1747), a Presbyterian minister of New Jersey, was born at Hatfield, Mass., April 22, 1688. He graduated at Yale College in 1706, studied theology, and was ordained pastor at Elizabethtown, N. J., Sept. 29, 1709. Here he labored for nearly forty years, taking part also in the various controversies which agitated the Presbyterian Church in that time, especially that concerning the revival under Whitefield. A pamphlet on this subject written by Dickinson, but at first published anonymously, was widely circulated, and commended by the most eminent Presbyterian divines. When the Presbyterian Church was divided in 1741 into the Synods of New York and Philadelphia, the former synod proposed to establish a college in New Jersey, and Mr. Dickinson, as an acknowledged leader in the denomination, was entrusted with the matter. A charter was procured in 1746 from John Hamilton, the acting governor of New Jersey, and the new institution went into operation at Elizabethtown under the name of Nassau Hall. Mr. Dickinson had long been engaged in the work of training young men for the ministry, and his new duties did not vary much from those in which he had been employed. He died of pleurisy at Elizabethtown, N. J., Oct. 7, 1747. He was an able defender of Calvinism, and his publications consisted entirely of sermons and pamphlets, many of them being controversial. A collection of his writings was published at Edinburgh in 1793.

DICKINSON COLLEGE, an institution of learning, at Carlisle, Pa., now under the patronage of the Methodist Episcopal Church, was chartered by the legislature of Pennsylvania, Sept. 8, 1783, and was named in honor of John Dickinson, who was then governor of the State. One week later Gov. Dickinson, who had taken great interest in the project, was elected president of the board of trustees. In order of time it was the second college in Pennsylvania and the eleventh in the United States. As communication between different sections of the country was then difficult, it was intended especially to afford the advantage of liberal education to the persons living west of the Susquehanna.

As was the case with all the early colleges, religious motives were prominent in leading to its organization.

and although it was not limited by its charter to any denomination, the Presbyterians were for half a century most prominent in its management. The first president was Rev. Charles Nisbet, D.D., who was called from Montrose, Scotland, and was inaugurated July 4, 1785. The other professors were Rev. Robert Davidson, D.D., pastor of the Presbyterian Church in Carlisle, and James Ross, whose *Latin Grammar* was a favorite text-book until the middle of this century. Mr. Ross had already begun a preparatory school in 1783, and on this foundation the college rested. Dr. Nisbet was indefatigable in his labors, but was not able to make the institution what he desired. It was crippled by want of means. The aid expected from the State was tardily given, and the chief dependence was on private contributions. Large donations of unimproved land were received, but as a purchaser could rarely be found these did little good. For nearly twenty years the exercises were conducted in a small two-story building with four rooms. The first commencement was held Sept. 27, 1787, when nine young men received "the first degree in arts." The students were first divided into three regular classes in 1796. In 1798 a lot of ground was purchased of the Penn family, and the erection of a new building commenced, but before it was completed it was destroyed by fire, Feb. 3, 1803. This misfortune enured to the benefit of the college, by enlisting the sympathies of prominent men and allaying the bitterness heretofore felt towards it on account of the strong sympathy its officers and students had shown for the Federalists. Pres. Nisbet died Jan. 18, 1804, aged 68. He was a man of great learning, lenient in discipline, but a master of sarcasm, which deterred those inclined to be disorderly. Dr. Robert Davidson, his colleague from the foundation, became acting president for five years, but in 1808 he resigned to devote himself wholly to the pastoral work. In June, 1809, Rev. Jeremiah Atwater, D.D., president of Middleburg College, Vt., was elected to the presidency of Dickinson. In 1811 the versatile and ingenious but eccentric Dr. Thomas Cooper was made professor of chemistry and mineralogy. In 1814 another year was added to the regular course, but on account of the war the senior class was called to the defence of Philadelphia, and the degrees were conferred *in absentia*. In June, 1815, in consequence of difficulties between the faculty and trustees in regard to discipline, President Atwater and some of his colleagues resigned, and soon after the operations of the college were suspended. In 1821 a new policy was inaugurated by the trustees; the land received from the State in 1786 was reconveyed to it for \$6000, and this sum enabled them to pay off the debts, to repair the buildings, and complete West College. Rev. John M. Mason, D.D., was elected president, and with him an able faculty, consisting of Henry Vethake, Rev. Alexander McClelland, D.D., Rev. Joseph Spencer, Rev. Louis Mayer. The classes filled rapidly, but in 1824 Dr. Mason resigned on account of impaired health, and Rev. William Neill, D.D., succeeded him. Troubles again arose between the trustees and professors, and in 1829 the whole faculty resigned. A new faculty was organized in the following year, under the presidency of Rev. Samuel B. How, D.D. Though the institution was practically free of debt, the old trouble, arising from joint administration of discipline, soon again threatened its life.

The Baltimore Conference of the Methodist Episcopal Church was then considering the propriety of establishing a college within its bounds, and began to negotiate with the trustees of Dickinson College. The latter in April, 1833, agreed to transfer the institution to the Baltimore and Philadelphia Conferences, who obligated themselves to support it as a college. This was accomplished in June by the resignation of the majority of the trustees, the vacancies being filled by a committee of the conferences. The good effects of the change were speedily seen. Political and sectarian

controversies which had vexed the former management were henceforth unknown. The grounds were improved and beautified, and an endowment of about \$40,000 was soon raised. Rev. John P. Durbin, D.D., editor of the *Christian Advocate*, and noted for his eloquence, was elected president, and Merritt Caldwell and Robery Emory were made professors. They did not enter on their duties here till September, 1834, by which time important changes in the charter had been obtained from the legislature, making the principal also president of the board of trustees, and giving the final decision in cases of discipline to the faculty, thus removing the stumbling-block which had so often caused trouble. Thus the college entered upon its second half century under new auspices, with new vigor, with an amended charter, and many external improvements.

Among the professors added about this time were William H. Allen, afterwards president of Girard College, and Rev. John McClintock, afterwards widely known as an author of excellent classical text-books, and joint editor of *McClintock and Strong's Religious Cyclopædia*. Dr. Durbin was a man of eminent prudence, tact, and wisdom, who treated the opinions of his associates with the utmost respect, while he impressed them with the excellence of his own plans. In 1845 he resigned and resumed the pastorate in Philadelphia; and his colleague, Rev. Robert Emory, an excellent disciplinarian, succeeded him. Mr. Spencer F. Baird, the eminent naturalist, who has since become secretary of the Smithsonian Institute at Washington, and Dr. George R. Crooks were now added to the faculty. In 1847 Pres. Emory and Prof. Caldwell died, and Professors McClintock and Crooks resigned. Rev. Dr. Jesse T. Peck was then elected president, and other changes were made in the faculty. Dr. Peck, though a dignified and amiable man, was not a college graduate, and did not find his new position congenial. After a trial of three years he resigned, and was succeeded by Rev. Charles Collins, D.D., in 1852. Under the latter the college, by the sale of scholarships at low rates, greatly increased the number of its students, while its reputation was fully maintained by the ability of the professors and their devotion to the interests of education. Dr. Collins, after a highly successful career, resigned in 1860, and removed to Tennessee. Prof. H. M. Johnson, who had first suggested the issue of scholarships, and who was noted as a stimulating teacher of philosophy and literature, now became president. The civil war, however, brought great discouragement by diminishing the number of students and the productiveness of investments in Western real estate. Yet the work was carried on, and every year a class was graduated. In 1863 the borough of Carlisle was occupied for a short time by the Confederate troops, who did no injury to the college then, though a few days later some shells were thrown in the grounds. At the close of the war the prospects of the college seemed to brighten, and in 1866, during the centennial of American Methodism, \$100,000 were added to its endowment. An elective scientific course, including practical laboratory work, was introduced, and has proved highly successful. In April, 1868, Pres. Johnson died after a brief illness, and in September following, Rev. Robert L. Dashiell, D.D., an alumnus of the college, was elected president. After an administration of four years Dr. Dashiell was chosen missionary secretary by the General Conference; Rev. James A. McCauley, D.D., also an alumnus, was then elected president, and still retains the position. The preparatory school, which had been suspended in 1869, was revived in 1877, and is now in successful operation.

In connection with the college there have been two literary societies, the Belles Lettres Society, founded in 1786, and the Union Philosophical Society, founded in 1789. With varying fortunes they have continued to exert influence on the minds and habits of successive classes. They have gradually accumulated libraries,

which now combined include 21,000 volumes, which are open twice a week to the members. The Scientific Society was formed in 1867, and is under the direction of the professor of chemistry. It affords an excellent means of training the members in power of scientific expression, as well as in advancing their knowledge.

In addition to the regular classical course, Dickinson College now furnishes a Biblical elective course for those preparing to enter the Christian ministry; two scientific courses, in one of which the study of Greek is entirely dispensed with, while in the other the full classical course is pursued to the end of the second year. Provision is also made for additional elective studies.

There is also in connection with the college a preparatory school, which has been in operation several years, and has proved an efficient aid to the main institution.

In 1883 the faculty consisted of seven professors, including the president, and there were 111 students in all the courses.

Among the more distinguished persons who have been professors in Dickinson College, but have not been mentioned in this sketch of its history, are Prof. C. D. Cleveland, the author of several *Compendiums of Literature*, John M. Keagy, Rev. Otis H. Tiffany, Alexander J. Schem, Charles F. Himes, Charles J. Little.

Among its distinguished graduates are President James Buchanan, Chief-Justice Roger B. Taney, several senators, judges, and many prominent clergymen.

DICKINSON, ANNA ELIZABETH, an American orator, was born in Philadelphia, Oct. 28, 1842. Her father died when she was only two years old, and the family was left to struggle with poverty. Anna was educated in the Friends' free schools, and showed great avidity for books. She readily accepted any means of making an honest living. In January, 1860, an address at a meeting of the Progressive Friends on "Woman's rights and wrongs" gave her a wide reputation. She was then a school-teacher, but a year later she obtained employment in the United States Mint in Philadelphia. From the outbreak of the Rebellion she frequently spoke on the questions of the day, and in December, 1861, she was dismissed from her position in the Mint for denouncing Gen. McClellan as a traitor. She then devoted herself entirely to political addresses, and rendered great service to the Republican party. She also visited the hospitals of the army and labored in behalf of the freedmen. After the war she continued her political addresses, discussing at first Southern reconstruction, but gradually turned her attention exclusively to woman's work and suffrage. In 1868, with the same object, she published a novel, *What Answer?* Afterwards, as the demand for lyceum oratory declined, she turned her thoughts to the stage, and in 1879 she appeared on the stage in several cities, but without marked success. Her attempt to render the character of Hamlet did not meet popular favor. She has since lived in retirement.

DICKSON, SAMUEL HENRY (1798-1872), an American physician, was born at Charleston, S. C., September, 1798. He graduated at Yale College in 1814, and studied medicine in Charleston and at the University of Pennsylvania. He assisted in establishing a medical college in Charleston in 1824, and became professor of the institutes and practice of medicine. In 1832 he retired, but when the college was reorganized in 1833 he was re-elected. In 1847 he became professor in the University of New York, but returned in 1850 to his professorship in South Carolina. In 1858 he was made professor of the practice of medicine in Jefferson Medical College, Philadelphia, which position he held till his death, March 31, 1872. His first work was *Dengue: its History, Pathology, and Treatment* (Philadelphia, 1826), and he subsequently published several articles on the same subject. Besides contributing to various medical journals, he published *Essays on Pathology and*

Therapeutics, 1845; *Essays on Life, Sleep, Pain, etc.*, 1852; *Elements of Medicine*, 1855. In his *Essays on Slavery* (1845) he maintained the essential inferiority of the negro race. He was not only a thorough scholar, but one of the most graceful and elegant writers on medical subjects.

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See Vol.
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ed.).

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DIEFENBACH, LORENZ, a German philologist, was born at Ostheim, in Hesse, July 29, 1806. He was educated at Giessen, and studied theology and philosophy. In 1823 he removed to Frankfort-on-the-Main, where he studied modern languages and music. For some years he was pastor of a church and librarian at Solms-Laubach, and later lived in other parts of Germany. In 1845 he assisted in forming a German-Catholic congregation at Offenbach, and in 1848 was elected

as delegate from that town to the Parliament at Frankfort. He was also made counsellor to Prince Leiningen, president of the imperial ministry. Having settled in Frankfort on account of his official duties, he lectured in the commercial academy, and displayed great literary activity, publishing several novels as well as scientific, literary, critical, and political articles and books. From 1865 to 1876 he was city librarian; he then removed to Darmstadt, and has since been engaged exclusively in literary work. Among his novels may be mentioned *Ein Pilger und seine Genossen* (1851), *Die Pfarrerskinder* (1867), *Arbeit macht Frei* (1873). His more important works have been on ethnographical and philological subjects, one of the earliest being *Ueber die Romanischen Schriftsprachen* (1837). This was followed by *Celtica* (3 vols., 1839-40), and several dictionaries, among which were supplements to the great work of Ducange on mediæval Latin, *Glossarium Latino-germanicum* (Frankfort, 1857), and *Novum glossarium* (Frankfort, 1867). Among his ethnographical works are *Origines Europææ* (1861), *Vorschule der Völkerkunde* (1864), and *Völkerkunde Osteuropas* (Darmstadt, 1878). Dr. Diefenbach is a member of the Berlin Academy and of several other literary societies.

DIES NON JURIDICUS, in law, a day upon which courts do not transact business and upon which no ordinary legal proceeding can be taken. Sunday is universally considered, both in England and in the United States, as *dies non juridicus*. Its observance as such is supposed to have been common to the Normans and Saxons, and will be found to be mentioned in the very earliest treatises on the common law. Hence the origin of the maxim, "Dies Dominicus non est juridicus." No judgment can therefore be entered in a cause on Sunday, nor can an award be made and published on that day. A return of process, a notice or demand, or levy of execution made on Sunday is void. Service of process in a civil case cannot be effected upon the defendant on Sunday, nor in general can any official charged with civil duties discharge them on that day.

The foundation of the maxim just referred to is based, however, solely upon the ground that it is improper to allow a violation of a period of time peculiarly set apart for repose and divine worship, when the same purpose can be as easily effected at another time. Hence, where there is any pressing necessity, or where the particular act in question tends to facilitate the transaction of business or to establish and maintain peace and order in the community, legal proceedings may be carried on upon Sunday. A verdict may therefore be rendered and received on Sunday, and so of an award where the deliberations of the arbitrators have extended continuously through the preceding night. Ministerial acts may also be lawfully executed on Sunday, for otherwise, peradventure, they can never be executed. An information may therefore be filed on that day or a recognizance taken. An injunction in a pressing case may be issued and served on Sunday. An arrest may also, without doubt, be effected in a criminal case on that day. In New Hampshire it is said that a writ may be issued on Sunday in a civil case, if not done "to the disturbance of others."

In addition to Sundays, the stat. 5 & 6 Edw. VI. § 3, prescribed a number of holidays, which had already prior to that time been observed, as *dies non*. These were the Feast of the Circumcision (Jan. 1), the Epiphany (Jan. 6), the Purification of the Virgin Mary (Feb. 2), the Feast of St. Matthias (Feb. 24), the Annunciation (March 25), the Feasts of St. Mark (April 25) and of St. Philip and St. James (May 1), of the Ascension, of the Nativity, of St. John the Baptist (June 24), of St. Peter (June 29), of St. James (July 25), of St. Bartholomew (Aug. 24), of St. Matthew (Sept. 21), of St. Michael (Sept. 28), of St. Luke (Oct. 18), of St. Simon and St. Jude (Oct. 28), of All Saints (Nov. 1), of St. Andrew (Nov. 30), of St. Thomas (Dec. 21), Christmas Day and the three following days, and Mon-

day and Tuesday in Easter and Whitsun weeks. Good Friday was also generally observed, though not mentioned in the statute.

By stat. 3 & 4 Wm. IV. c. 42, § 43, the *dies non* in England are reduced to Sundays, Easter Monday and Tuesday, Christmas Day and the three following days, and so they stand at the present time. It should be observed that the English courts have always been extremely liberal in admitting the validity of all legal proceedings transacted on *dies non* other than Sunday.

In the United States the courts and court offices are generally closed on the following days besides Sundays: January 1st, or New-Year's Day; February 22d, or Washington's Birthday; May 30th, or Decoration Day; July 4th, or Independence Day; December 25th, or Christmas Day; and also on Good Friday and Thanksgiving Day, which latter usually falls on the last Thursday in November. In some of the States it is particularly provided by statute that those days shall be taken and considered as Sunday, in which case it is to be presumed that they are accounted *dies non* to all intents and purposes. In other States provision is only made that bills or notes maturing on those days shall be considered as due on the day preceding or following. Where this is the case it is presumed that they are not to be accounted as *dies non*, strictly speaking. (L. L., JR.)

DIETERICI, FRIEDRICH, a German Orientalist, was born at Berlin, July 6, 1821, and is the son of the noted statistician, K. F. W. Dieterici. He studied theology at Halle and Berlin, and then devoted himself to the study of Oriental languages under Rödiger and Fleischer. After obtaining, in 1846, permission to teach as professor, he went to London in 1847 and thence to the East, where he spent eighteen months in Cairo under the instruction of a learned sheik. He then visited Upper Egypt and Palestine and returned to Germany by way of Constantinople and Athens. In 1850 he was made professor extraordinary in the University of Berlin, and still holds this position. He published the text of *Alfiyyah*, an original Arabic Grammar, with the commentary of Ibu-Akil, and a translation of the same into German (Leipsic, 1852); a *Chrestomathie Ottomane* (Berlin, 1854), and an edition of the works of the poet Mutanabbi (Berlin, 1858-61). Turning his attention to the Arabic philosophy of the tenth century, he published *Die Propädeutik der Araber* (Berlin, 1865); *Logik und Psychologie* (Leipsic, 1868); *Naturanschauung und Naturphilosophie* (2d ed., Leipsic, 1878); *Der Streit Zwischen Mensch und Thier* (Berlin, 1858; Arabic edition, Leipsic, 1879); *Anthropologie* (Leipsic, 1871); *Die Lehre von der Weltseele* (Leipsic, 1873); *Die Philosophie der Araber* (Leipsic, 1876-79). He has also published an Arabic German dictionary (Leipsic, 1881), and the so-called *Theology of Aristotle* (1882), an Arabic version of a lost Greek work of special importance in the history of philosophy. Among his other works are volumes of travels and an essay on *Der Darwinismus im 10. und 19. Jahrhundert* (Leipsic, 1878).

DIETETICS. No two nations use the same food or prepare it in the same way. In the United States the raw materials of food are abundant, and of great variety, but they are rarely turned to the best account, the waste is great, the cooking often bad, and the diet of a large part of the people is comparatively monotonous. Among farmers, the laboring classes, and those who do not keep servants—where the cooking is done by the wife and daughters of the householder—the faults of cooking are largely due to the desire to save labor. Dr. Derby's remarks on the food of Massachusetts laborers apply to a large part of the country. "Whatever can be made in one day and kept for use in several succeeding days is preferred. The quickest way to cook fresh meat is to put it in the frying-pan. The laborious kneading of fermented bread is dispensed with and its substitutes are prepared by the hasty stirring-in of chemical powders." Dr.

Barnes in a paper on the cause of dyspepsia (or so-called liver complaint) among the rural and laboring population of South Carolina (*Second Report State Board of Health, S. C.*, Charleston, 1881, p. 273) comments on the excessive use of salted and smoked meats and the sameness of the "hog and hominy" diet of the average Southern laborer, and regards the general and almost constant use of fried meats as the cause of much of the sickness met with in rural districts. The supply of vegetables and fruits is more abundant and varied in the United States than it is in Europe, and the use of meat among the middle and lower classes is much more common here than it is abroad. Diseases due to insufficient food are rarely observed by dispensary and hospital physicians in this country.

The United States army ration is now composed as follows: 12 ounces of pork or bacon, or 20 ounces of fresh beef, or 22 ounces of salt beef; 18 ounces of soft bread or flour, or 16 ounces of hard bread, or 20 ounces of corn-meal. To every 100 rations, 15 pounds of beans or peas, or 10 pounds of rice or hominy; 10 pounds of green coffee, or 8 pounds of roasted (or roasted and ground) coffee, or 2 pounds of tea; 15 pounds of sugar, 4 quarts of vinegar, 24 ounces of adamantine or star candles, 4 pounds of soap, 4 pounds of salt, 4 ounces of pepper; and to troops in the field, when necessary, 4 pounds of yeast powder to the 100 rations of flour.

The component parts of the ration are subject to change at the discretion of the President of the United States. Fresh mutton may be issued in lieu of, and at the same rate as, fresh beef, when the cost of the former does not exceed that of the latter. 14 ounces of dried fish, or 18 ounces of pickled or fresh fish, may be issued in lieu of the meat components of a ration. Molasses or syrup may be issued in lieu of sugar, at the rate of 2 gallons for 15 pounds of sugar. When it is impracticable for troops in the field, or those traveling upon cars or transports, to draw or cook beans or rice, equivalents in money value of bread or meat may be issued.

The following issues may be made to troops per 100 rations: in lieu of the usual meat portion of the ration 75 pounds canned fresh beef, or 75 pounds canned corn-beef. In lieu of the dry vegetable portion of the ration 33 one-pound cans baked beans, or 25 pounds cheese.

The navy ration is as follows: 1 pound of salt pork, with $\frac{1}{2}$ pint of beans or peas, or 1 pound of salt beef with $\frac{1}{2}$ pound of flour, and 2 ounces of dried apples, or other dried fruit, or $\frac{3}{4}$ pound of preserved meat, with $\frac{1}{2}$ pound of rice, 2 ounces of butter, and 1 ounce of desiccated "mixed vegetables," or $\frac{3}{4}$ pound of preserved meat, 2 ounces of butter, and 12 ounces of tomatoes, together with 14 ounces of biscuit, $\frac{1}{4}$ ounce of tea, or 1 ounce of coffee or cocoa, and 2 ounces of sugar, and a weekly allowance of $\frac{1}{2}$ pound of pickles, $\frac{1}{2}$ pint of molasses, and $\frac{1}{2}$ pint of vinegar. Fresh or preserved meat may be substituted for salt beef or pork, and vegetables for the other articles usually issued with the salted meats, allowing $1\frac{1}{4}$ pounds of fresh or $\frac{3}{4}$ pound of preserved meat for 1 pound of salted beef or pork; and regulating the quantity of vegetables so as to equal the value of the articles for which they may be substituted.

Should it be necessary to vary the above-described daily allowance, it is lawful to substitute 1 pound of soft bread, or 1 pound of flour, or $\frac{1}{2}$ pound of rice for 14 ounces of biscuit; $\frac{1}{2}$ pound of rice for $\frac{1}{2}$ pint of beans or peas; $\frac{1}{2}$ pint of peas or beans for $\frac{1}{2}$ pound of rice. The weekly quantity is valued at \$2.10.

A valuable work on dietetics by Dr. C. A. Meinert, entitled *Armee- und Volks-ernährung* (2 vols., Berlin, 1880), contains a large and valuable collection of statistical information with regard to the food-supply of various countries, and should be consulted by those who wish to study the details.

DIETRICHSON, LORENTZ SEGELKE, a Norwegian poet and critic, was born Jan. 1, 1834, in Bergen. He was educated at Christiania, and in 1861 became an instructor in the University of Upsala. He has travelled extensively; in 1858 in Sweden; in 1860 in Germany; in 1861 in Finland; in 1862-65 in Germany and Italy; in 1867-68 in Denmark and France; in 1869-70 in Hungary, Turkey, Asia Minor, Greece, and Italy. In 1862 he married J. M. Bonnevie, a Norwegian painter, in Düsseldorf, who by accompanying him on his travels has found abundant opportunity to gather materials for her art, and she has also successfully illustrated some of her husband's books. In 1875 Dietrichson became professor of the history of fine arts in Christiania. His books are written partly in Norwegian, partly in Swedish. In 1862-63 he edited *Nordisk Tidsskrift for Literatur og Kunst*, published in Copenhagen. In 1864 appeared his biography of the Finnish poet, Runeberg, which was followed by *Omrids af den norske Literaturs Historie* (2 vols., 1866-69). His chief work, written in Swedish, is *Det Skönas World* (2 vols., 1867-69). It is a comprehensive treatise on art and its history. His drama *Madonnabilden* was produced on the Stockholm stage in 1870 with great success. Sketches of his extensive travels are found in his *På Studieresor* (2 vols., 1875). Two other dramas from his pen are *En Arbetare* (1872), and *Karl Folkunge* (1874). His latest works are *Kivleslätten* and *Den norske Træskjærererkunst*.

DIGBY, KENELM HENRY (1800-1880), an English author, was born in 1800, being the youngest son of Rev. William Digby, Dean of Clonfert, of the Established Church of Ireland. He was of the same family as Sir Kenelm Digby. He graduated at Trinity College, Cambridge, in 1823, but had already gained reputation by his *Broadstone of Honour, or Rules for the Gentlemen of England* (1822). This work was not only an enthusiastic vindication of the principles and institutions of chivalry, but it showed a strong predilection for the teachings of the Roman Church, which he soon afterwards entered. He then rewrote his work, enlarging it to four volumes, each with a separate title (1828-29). He had closely studied the scholastic theology and the history of the middle ages, and embodied the fruit of his studies in his *Mores Catholici; or Ages of Faith* (1831-42), in which he depicted the victory of the church over the barbarians. After an interval of several years he published *Comptum; or the Meeting of Ways in the Catholic Church* (1848-54). These were his principal works, but in later years he issued *The Lover's Seat* (1856); *Children's Bower* (1858); *Evenings on the Thames* (1860); *The Chapel of St. John* (1861), a memorial of his deceased wife; and *The Epilogue* (1876). He died March 22, 1880. His first work was pronounced by Julius Hare, "That noble manual for gentlemen," but the author's conversion to the Catholic faith restricted his fame and influence. His style is diffuse, and his writings are pervaded with a pleasing melancholy and regard for the past.

DIGGER INDIANS, a name applied to the Pi-Utes, Goshutes, Washoes, Pah-Utes, and other minor tribes, of the Utah branch of the Shoshone family of American Indians. Its application is somewhat indefinite, however, and covers all those Indians of Nevada, Utah, and California, without respect to tribal designation, whose habits render the title of Root-Digger applicable. Many of the minor California tribes are genuine Diggers. They are among the lowest and most degraded of human beings, living in a comparatively mild climate, on nearly barren plains, where little food is to be obtained beyond the roots which they dig from the ground, and the berries, seeds, insects, fish, and small game, sparsely found in their territory. They are a cowardly, dull, poorly developed, half-starved phase of humanity, with filthy and beastly habits. The food is chiefly obtained by the women, the men being utterly indolent. Among their common

articles of food are lizards, snakes, grasshoppers, and ants, which are thrown together into a dish of hot embers, and tossed about till roasted. Rats and rabbits are singed, and then cooked without removing the intestines. In the spring, when reduced to destitution by the winter lack of food, they will eat dead bodies, and even kill their children for food. Their only protection from wintry winds consists of circular heaps of brush, except that occasionally they dwell in caves or in fissures of the rocks, whence they crawl in the spring, often too weak to stand upright.

They know nothing of their past history, have no marriage ceremony, and no trace of religious observance, and are destitute of arts and weapons beyond the bow and arrow. Tattooing is commonly practised. The females wear their hair short, and the males quite long. They burn the bodies of their dead, with all the effects of the deceased, and indulge in wild mourning over the corpse. Their idea of their origin displays a peculiar evolutionary notion. The first Indians were coyotes. These first walked on all-fours, then gained human members, as one finger, toe, eye, ear, etc.; then two of these members; gained the habit of sitting, and so lost their tails; and finally became human beings. They regret the loss of the tail, which they consider an ornamental appendage.

The Diggers roam throughout Nevada, and into Oregon and California. Their degradation is largely a result of their destitution, since other members of the same tribes, who dwell in more fertile regions, are much less debased, and the Bannacks, who are closely related to them, are a proud, brave, and self-respecting tribe. The Pi-Utes, Winnemuccas, and Pah-Utes have made considerable progress of late.

DILKE, SIR CHARLES WENTWORTH, an English statesman and author, was born at Chelsea, Sept. 4, 1843. His grandfather, bearing the same name, was editor and proprietor of the *Athenæum*, and was distinguished as a critic. The grandson was educated at Trinity Hall, Cambridge, where he graduated as senior legalist in January, 1866. In the same year he was admitted to the bar in the Middle Temple, London, and set out on an extensive tour. After travelling alone for some months through Canada and the United States, he met Mr. W. Hepworth Dixon in St. Louis, and in his company crossed the Great Plains and the Rocky Mountains. Leaving Mr. Dixon at Salt Lake City, Mr. Dilke continued his journey to San Francisco. Thence he sailed to Panama, then to New Zealand, Tasmania, and Australia. He carefully examined these colonies both as to their present condition and future prospects, political and commercial. He then passed to Calcutta, visited Upper India, sailed down the Indus, and returned to England by way of Egypt. In 1868 he published the result of his observations in *Greater Britain: a Record of Travel in English-Speaking Countries during 1866-67*. This work attained a remarkable success, passing through four editions in one year in England and being republished by two firms in America, where it had a still larger number of editions. It was not merely a record of what he had seen, but also an attempt to show the effect of climatic conditions on the race and the influence of race upon government. Immediately after its publication the author was elected to Parliament from the new borough of Chelsea as a Radical, being the youngest man who ever represented a metropolitan constituency. He succeeded his father and grandfather in the proprietorship of the *Athenæum*, and is also proprietor of *Notes and Queries*, and principal proprietor of the *Gardener's Chronicle*. In 1871 he openly avowed his preference for a republican form of government over a constitutional monarchy, and in 1874 an effort was made to defeat his re-election at Chelsea on that ground, but he was returned at the head of the poll. In the same year he published anonymously a vigorous satire called *The Fall of Prince*

Florestan of Monaco, which passed through several editions, and was translated into French. In 1875 he edited the writings of his grandfather, with a memoir, under the title *Papers of a Critic*. In the same year he made a second journey round the world, and published in the monthly magazines his observations in China and Japan. In his parliamentary career he has succeeded in introducing several reforms, among which are amendment to the education bill, by which the school-boards are directly elected by the rate-payers; conferring the municipal franchise on women; abolishing the barbarous penalty of drawing and quartering; the amendment of the registration law, and extension of the hours of polling at parliamentary elections in London. In April, 1880, he was again re-elected for Chelsea at the head of the poll, and on the formation of Mr. Gladstone's government was appointed under-secretary of state for foreign affairs.

DILLMANN, CHRISTIAN FRIEDRICH AUGUST, D. D., a German theologian, commentator, and Orientalist, was born at Illingen, in Würtemberg, April 25, 1823. After a preliminary education at Stuttgart and Schöndal, he studied philosophy and theology at Tübingen. In 1844, under the direction of Prof. Ewald, he devoted himself to Oriental languages, and in the next year, while pursuing his studies, had charge of a church at Tersheim. In 1846, having obtained the degrees of M. A. and of Ph. D. from the University of Tübingen, he went to France and England for the purpose of examining Æthiopic manuscripts in the public libraries. While in England he was invited by the authorities of the British Museum and of the Bodleian Library to prepare catalogues of such manuscripts in their possession. The offer was accepted, and the volumes containing the results of his labor appeared at London in 1847 and at Oxford in 1848. Returning to Tübingen, in the latter year, he became a theological repetent, and after the departure of Ewald performed the duties of professor of Old-Testament exegesis. In 1852 he became a privat docent, and the next year professor extraordinarius. In 1854, a similar position having been offered to him at Kiel in Holstein, he removed thither, and in 1859 was made professor of Oriental languages. In 1862 he received the degree of D. D. from the University of Leipsic. In 1864 he was called to Giessen in Hesse as professor of Old-Testament exegesis, and during his residence there was twice rector of the university. In 1869 he succeeded Hengstenberg as professor of Old-Testament exegesis in the University of Berlin. In March, 1877, he was elected a member of the Royal Academy of Science at Berlin. In September, 1881, he was president of the fifth international Orientalist congress, and as such published the proceedings of the congress in two volumes (1881-82). He is the highest authority in the department of Æthiopic (Geez) language and literature. His translation of the *Book of Jubilees, or the Little Genesis*, appeared in Ewald's *Jahrbücher der biblischen Wissenschaft* (1849-51), and his edition of the original Æthiopic text was published at Leipsic in 1859. He had already edited the famous *Book of Enoch* (Leipsic, 1851), and added a German commentary, with a translation, in 1853. In the latter year he published in Ewald's *Jahrbücher* a translation from the Æthiopic of the Christian *Book of Adam*. His greatest undertaking in this department is his edition of the entire Old Testament in Æthiopic, *Biblia Veteris Testamenti Æthiopica* (Leipsic, vol. i., 1853; vol. ii., 1861-72). To facilitate the studies of others he has prepared an Æthiopic grammar, *Grammatik der Æthiopischen Sprache* (1857); a lexicon, *Lexicon Linguae Æthiopicae cum indice Latino* (1865); and a chrestomathy, *Chrestomathia Æthiopica, edita et glossario explanata* (1866). His most recent publications in this department are the *Ascensio Isaiae* in Æthiopic and Latin (Leipsic, 1877), and a catalogue of the Æthiopic manuscripts in the Royal Library at Berlin (1878). Of his theological

works the most important are those on the *Origin of the Old-Testament Religion* (*Ueber den Ursprung der alttestamentlichen Religion* (Giessen, 1865) and *The Prophets of the Old Covenant in their Political Activity* (*Ueber die Propheten des Alten Bundes nach ihren politischen Wirksamkeit* (Giessen, 1868). He has also published several commentaries, the first being a new edition of Hirzel's *Commentary on Job* (1869), and the next a revision of Knobel's *Commentary on Genesis* (1875). His later exegetical works are original commentaries on *Exodus and Leviticus* (Leipsic, 1880) and on *Genesis* (1882). Valuable articles from his pen have appeared in the *Jahrbücher für deutsche Theologie*, in Herzog's *Real-Encyclopædie*, in Schenkel's *Bibel-lexikon*, and in the publications of the Royal Academy of Berlin. Prof. Dillmann is the most distinguished disciple of Prof. Ewald, and has followed his master in his treatment of the Old-Testament literature and history. While firmly maintaining that those ancient writings must be submitted to all the tests and requirements of modern criticism, he has strongly expressed his dissent from the results arrived at by Kuenen, Wellhausen, and Prof. W. Robertson Smith.

DILLON, JOHN, an Irish politician, is the son of John Blake Dillon, an Irish revolutionist of 1848, and was born in 1851. He was educated at the Catholic University, Dublin, studied medicine, and was licensed as a surgeon, but was prevented by ill health from practising his profession. In 1879 he accompanied Mr. Charles S. Parnell to the United States for the purpose of explaining the principles of the Land-League and arousing sympathy for the Irish peasantry, who were suffering from famine. Elected member of parliament for Tipperary, in 1880, he won considerable distinction by his fearless defence of the claims of his country. He was then indicted with others for seditious conspiracy, but on the trial the jury disagreed. In 1881 he was arrested under the coercion act, placed in Kilmainham jail, denied bail or trial, and kept in durance until 1882, when he and others similarly imprisoned were unconditionally released. Mr. Gladstone paid a high tribute to Mr. Dillon's patriotism and purity of motive, but the latter indignantly spurned the eulogy, fearing that the real purpose of the premier was to asperse the motives of his colleagues. (M. F. S.)

DIMAN, JEREMIAH LEWIS, D. D. (1831-81), an American Congregationalist minister and educator, was born at Bristol, R. I., May 1, 1831. His father, Gov. Byron Diman, was well versed in history, and in early life the son showed similar tastes, contributing to the village journal articles on local history. He graduated at Brown University in 1851, and, after spending two years at Andover Theological Seminary, went to Germany, where he pursued various studies at Halle, Munich, Heidelberg, and Berlin. Returning, in the spring of 1856, he graduated at Andover, and in the autumn of that year was ordained pastor of the First Congregational Church at Fall River, Mass. In February, 1860, he removed to Brookline, Mass., and, after four years of pastoral labor there, was called to be professor of history and political economy in Brown University. In this department he was highly successful, being not only a careful investigator and an original thinker, but inspiring his pupils with his own enthusiasm. Having enjoyed while abroad familiar intercourse with Baron Bunsen, he fully accepted Bunsen's view, that "all history is instinct with a divine presence," and held that Jonathan Edwards, in his *History of Redemption*, had marked the true path of the deepest historical investigation. Besides his labors in Brown University he delivered several courses of lectures in other places, the chief of which were those on *The Thirty Years' War* before the Johns Hopkins University in 1879, and the Lowell lectures in the same year on *The Theistic Argument*. He died at Providence, R. I., Feb. 3, 1881. His

work on *The Theistic Argument* is a valuable contribution to philosophy. A memorial volume of Dr. Diman has also been published under the title *Orations and Essays, with selected Parish Sermons* (1882).

DINDORF, WILHELM (1802-1883), a German philologist, was born at Leipsic, Jan. 21, 1802. His father, Gottlieb Immanuel Dindorf (1755-1812), was a professor of Hebrew and Oriental languages. The son was educated at the University of Leipsic, and began his literary career in 1819 by assisting in an edition of Aristophanes. In 1828 he was made professor of literary history in his *alma mater*, but in 1833 he resigned and went to Paris, where he joined his younger brother Ludwig (born Jan. 3, 1805, died Sept. 6, 1871) and K. B. Hase (1780-1864) in preparing a new edition of Stephanus's great work, *Thesaurus Linguae Graecae* (1829-63). He also edited many Greek classics for Didot's *Bibliothèque*, and for the Oxford and Leipsic series. His principal works are *Demosthenes* (9 vols., Oxford, 1846-51); *Poetae Scenici Graeci* (1830; 5th ed., Leipsic, 1867); his Commentary on the Greek tragic poets and on Aristophanes (7 vols., Oxford, 1836-42). Unfortunate financial speculations in 1879 compelled him to sell his library and unfitted him for further work. He died at Leipsic, Aug. 7, 1883. His brother Ludwig, above mentioned, published editions of Xenophon, Diodorus Siculus, Polybius, Dion Cassius, and other historians.

DINGELSTEDT, FRANZ VON (1814-1881), a German poet and novelist, was born at Halsdorf in Hesse, June 30, 1814. He studied philology and theology in the University of Marburg, 1831-35, and became professor at Cassel in 1836. Here he gave offence by his liberal opinions. He published in 1841 a collection of poems entitled *Lieder eines Kosmopolitischen Nachwächters*, which are remarkable for fine irony, poetical fancies, and exquisite humor. He became, in 1843, keeper of the royal library of Württemberg at Stuttgart, and in 1850 intendant of the royal theatre at Munich. He was appointed director of the imperial opera-house in Vienna in 1867, and director of the great *Burgtheater* in Vienna in 1871. He received the title of baron from the emperor of Austria in 1876. He died at Vienna, May 15, 1881. Among his works are *Wanderbuch* (2 vols., 1839-43); a novel entitled *Unter der Erde* (1840); *Licht und Schatten in der Liebe* (1838); *Heptameron* (1841); *Gedichte* (1845); *Das Haus des Barneveldt*, a tragedy (1850); and *Nacht und Morgen* (1851). In 1840 he married Jenny Lutzer, a popular singer. He translated into German Shakespeare's *Tempest*, *As You Like It*, and *Twelfth Night*, and several historical plays.

DINWIDDIE, ROBERT (1690-1770), lieutenant-governor of Virginia, was born in Scotland in 1690. He became clerk to a collector of customs in the West Indies, and having exposed frauds committed by his employer, was rewarded by being appointed lieutenant-governor of Virginia in 1752. On assuming this position he divided the militia of the colony into four districts, assigning Major George Washington to the command of one of them. Having learned that the French were establishing military posts south of Lake Erie, he sent Major Washington to order their commandant to leave the British territory. The chief effect of this mission was to hasten the approaching conflict. Dinwiddie urged the assembly of Virginia to appropriate money for the public defence, and called upon the other governors to unite in efforts against the French encroachments. After much delay the Virginia Assembly voted £10,000 to be spent under the supervision of commissioners, and the other colonies did little or nothing. Dinwiddie increased the number of troops and promoted Washington to be lieutenant-colonel, nominally second, but really first, in command. The attempt to establish a fort on the Ohio River was unsuccessful, and Dinwiddie, having by urgent entreaties obtained more supplies, resolved to place the new forces under royal officers, allowing no native-born

officer to take higher rank than captain. Washington forthwith resigned, but when Gen. Braddock arrived in 1754 consented to act as a volunteer aide-de-camp with his former rank. After Braddock's defeat the defence of the colony devolved upon Washington, who was frequently annoyed by Dinwiddie's ill-judged efforts at vigorous operations against the enemy. The governor also had frequent disputes with the Assembly, and was charged with avarice, embezzlement, and exaction of illegal fees. In 1758 he returned to England with great wealth. He died at Clifton, England, Aug. 7, 1770.

DIOCESE (*διοίκησις*), a term in general signifying administration, was applied, in the civil administration of the Roman empire, at first to a single province and later to an aggregation of provinces, and in the Catholic Church to the jurisdiction of a Bishop. In the reign of Constantine the empire was remodelled and divided into 117 provinces. For purposes of administration these provinces were grouped into 13 aggregates, to each of which the name diocese was applied. In the East lay the Oriental diocese (containing 15 provinces), Egypt (with 6), the Asiatic (with 10), the Pontic (with 11), and Thrace (with 6 provinces); these dioceses again being grouped under the control of the *Præfectus Prætorio Orientis*. To the westward, under the *Præfectus Prætorio* of Illyricum, were the diocese of Macedonia (containing 6 provinces), and the frontier diocese of Dacia (with 5). The three dioceses of Italy (with 17 provinces), Illyricum (with 6), and Africa (with 6), were under *Præfectus-Prætorio* of Italy. In the West, under the *Præfectus-Prætorio Galliarum*, were the 3 dioceses of Hispania (with 7 provinces), Gallia (with 17), and Britannia (with 5). In this way the 117 provinces of the Roman Empire were grouped into 13 dioceses, and these again placed under the jurisdiction of 4 *Præfecti-Prætorio*.

In accordance with the civil arrangement of the empire, the Christian Church perfected her organization. Every city where there was a civil magistracy seated became also the seat of a bishop; and as the metropolis of a province exercised jurisdiction over all its cities, so the bishop seated in the metropolis possessed a supervision over the bishop of the provincial cities and was thence designated as a metropolitan or archbishop.

The supervision of the bishop extended to the civil whole region lying round the city over which the magistracy exercised jurisdiction, called the *προάστειον* or *παροιμία*, the Parish. The relation of this outlying region to the government of the city bishop varied in different parts of the empire. In the Oriental diocese, Syria and Asia Minor, in the country districts, especially in those localities where lay numerous villages, bishops were consecrated in subordination to the city bishop, and called *χωρεπίσκοποι*, country bishops. This system fell gradually into desuetude, and an attempt in the ninth century under the renewed empire of Charlemagne to establish it in the West was unsuccessful. Among the tribes of Arabia the bishop was itinerant, *περιουδότης*, while in the neighborhood of the greater cities, as Alexandria, and always in the West, the administration was exercised directly by the city bishop through presbyters appointed for the purpose either permanently or for a time, and so called Cardinal, as at Rome.

In further conformity to the civil system, the different metropolitans of a civil diocese were grouped together under the care of an Exarch or Patriarch, *πατριάρχης*, an ecclesiastical *Præfectus-Prætorio*, who was usually the bishop of the civil capital of the diocese. But in this, as in some other respects, the conformity was not complete; Jerusalem being also erected into a patriarchate. So that the metropolitans of the Catholic Church within the empire were under the supervision of the five patriarchs (in the order of their precedence) of Rome, Constantinople, Alexandria, Antioch, and Jerusalem.

A few provinces were exempt from the authority of the patriarch, and to these the title autocephalous (*αὐτοκέφαλοι*) was applied. These included the Island of Cyprus and such Christian countries as Armenia not under the control of the empire. The same name was also given to the bishops of 41 cities in the empire exempted from the control of the metropolitans, and immediately under the authority of the patriarch, while in the civil diocese of Africa the primate or metropolitan of the provinces of Numidia and Mauritania was the bishop senior in consecration and not, according to the otherwise universal rule, the bishop of the metropolis of the province.

According to the canonical rule a diocese might have but one bishop and each bishop was limited to his own diocese. Occasionally an exception was made, as when a vacant diocese was committed to the care of a neighboring bishop or the metropolitan. The large profit accruing from this practice led to a flagrant abuse in the Middle Ages when the jurisdiction and revenues of two or more sees were accumulated upon one person with provision for life; a less objectionable practice existed in the "commendæ militares," when a portion of the revenues of the diocese was assigned to a great lay-noble in return for his protection. The canon law provided that in the diocese of another a bishop might perform the divine offices and use his episcopal habit, without leave, but exercise no jurisdiction; and should consent to exercise such jurisdiction be granted, yet it would be valid only with such as might willingly submit themselves to his authority.

It is to be observed that the view here presented of the organization of the church on the analogy of the empire is combated by a large school of Anglican writers, as Bishop Beveridge, and by the greater part of the Roman authorities, who carry back the metropolitans and patriarchs to apostolic authority, while others of that communion complete the analogy by placing one patriarch, as emperor, above the others, yet differ as to his apostolic or later foundation.

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DIPHTHERIA. Recent investigations cast light

on the etiology or causation of the disease, and, as closely connected with this, the nature of the affection. The clinical facts which are well established, and which must here be considered, are as follows: First, in many cases the disease seems to originate entirely within the person of the patient, no exposure to contagion or epidemic influence being perceptible; second, in other cases the disease seems to be locally epidemic—for example, a single house will have an outbreak of diphtheria which may be of a very fatal nature and be confined absolutely to the one house; thirdly, the disease may occur as a widespread epidemic; and fourthly, diphtheria in some cases seems to be eminently contagious, and in other cases it fails to spread from person to person. There has long been, in the medical profession, a controversy concerning the relation of the two diseases known as pseudo-membranous croup and diphtheria, some physicians believing that the two affections are entirely distinct, and others that they are closely connected or even the same disease. It seems indis-

putable that a case may begin as one of croup or simple inflammation of the larynx and trachea, and gradually take on the features of diphtheria until it ends with all the well-known evidences of blood-poisoning; whilst in other instances the type of a simple inflammation is maintained throughout the attack, although a membrane is formed in the larynx or trachea which cannot be distinguished microscopically or in any other way from the membrane so prominent in cases of diphtheria, and death results.

Very abundantly, in the membrane of diphtheria, there is to be found a peculiar fungal organism known as the *micrococcus*. It occurs usually in irregular masses composed of innumerable exceedingly minute cells, but sometimes these cells are scattered, and sometimes they are collected into round balls, and in other cases they are in irregular masses known as *zoogloea*. The nature of these organisms and their relation to disease have been the subject of much controversy.

In an investigation lasting for some years made under the auspices of the National Board of Health, Drs. H. C. Wood and H. F. Formad have studied the subject very thoroughly, and have arrived at conclusions which seem positive. They find, in the first place, that the formation of the membrane in the throat, which has been supposed to be characteristic of diphtheria, is simply the result of a high degree of inflammation, and may be produced by the application of any caustic or irritant capable of producing inflammation of sufficient intensity. The membrane is not, therefore, peculiar to the disease, but may be formed in the throat of any individual who is suffering from a severe inflammation, the result of exposure to cold or other causes. They have also found that the micrococci or fungal organisms exist in the membrane which is produced by cold, although when this inflammatory membrane is first formed the organisms are very few in number, but later they become more abundant.

In regard to cases of diphtheria, they determined that the organisms are always abundant in the membranes about the throat, and that in malignant cases the same organisms are to be found in the blood and in the internal organs, especially in the spleen, the marrow of the bones, and the kidneys. In the kidneys they exist in such masses as to completely occlude some of the blood-vessels, and no doubt cause the peculiar inflammation of the organ so characteristic of the disorder. These organisms do not always exist in the blood of patients suffering from so-called diphtheria, but are always found in the throat; and the question naturally arises, Are they the cause of the disorder, or do they simply flourish in the throat because they find suitable nourishment and surrounding circumstances?

In order to determine this, experiments were made by inoculating the lower animals with the membrane taken from the throat of a diphtheritic patient, and it was found that when the case was malignant a disease was produced in the animals in all respects similar to human diphtheria. The disease was always primarily local. As an example, in the case of a pig which ate some of the membrane death resulted from diphtheria of the stomach, the mucous membrane of the lower œsophagus and of the stomach being covered with a dense membrane full of micrococci. It was also found possible to pass the disease from animal to animal. Experiments were then undertaken by rubbing up the membrane with water and filtering out the solid particles, when it was found that the poison of the disease was the solid portion of the membrane, and was insoluble in water. It was also found that boiling the membrane for longer than fifteen minutes destroyed its noxious powers.

The micrococcus was then cultivated in various kinds of soups, entirely away from the animal body, according to the method of Sternberg, Koch, and others. It was found that the cultivated micrococcus was not prone to develop the disease, but in a number of instances, by the third or fourth generation of the cultivated plant,

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ed.).

diphtheria was produced in the lower animals. It was further discovered that when the micrococcus was taken from a case of malignant diphtheria its power of developing and growing was excessive, and was maintained for nine or ten generations, whereas when it was taken from a case of simple sore throat the power of growth was very slight; and finally, that the power of growth and development of the plant was always in direct proportion to the malignancy of the disorder.

It is evident that the micrococcus is either the immediate cause of the disorder, or else that it bears the same relation to the poison of diphtheria that the yeast-plant does to alcohol, producing the poison of diphtheria out of the fluids and tissues of the body at whose expense it grows. Under these circumstances a study of the life-history of the micrococcus becomes very important. It was cultivated in all kinds of liquids under very various circumstances, but our authors failed to develop from it any other form of plant, except that in certain cases of rats poisoned with the micrococcus, bacilli appeared in the blood, and it is possible, though scarcely probable, that the micrococcus altered its form. The mode of growth of the micrococcus inside of the body was distinctly made out. It usually first develops in the membrane, and forces its way into the submucous layer, and from thence into the blood; whether it ever primarily exists in the blood, so that the disease is constitutional before it is local, or not, is uncertain; but it is perfectly sure that in the great majority of cases the disease is primarily local.

In the blood, the micrococcus was found to especially attack the white blood-corpuscle. A few of the organisms would be noted inside of these corpuscles in a condition of vibratile movement. They would rapidly increase in number, and peculiar vacuoles would appear in the white blood-corpuscles. Whenever these vacuoles can be seen in the blood of a patient affected with this disease the prognosis is exceedingly grave, as in nearly every instance witnessed death followed. As the micrococcus multiplied in the blood-corpuscle, they finally filled it entirely, until at last the corpuscle or leucocyte is changed into a round ball composed simply of a mass of micrococci grouped together. It is in this way the micrococci balls are formed which have been so long known as existing in the throat. A little later the corpuscle bursts; the internal mass of micrococci escapes, leaving an outer thin membranous collapsed portion; the extruded mass continues to grow, and forms the irregular so-called zoogloea masses of micrococci. The micrococcus which has thus been studied does not differ in any appreciable way from the micrococcus which is found in the mouths of all healthy persons, except in its tendency to grow; and it will be remembered that an unbroken series in growth-power can be found between the micrococcus of the healthy mouth and the micrococcus of the most malignant diphtheria, the power of developing being always in direct proportion to the malignancy of the disease.

It has been shown by Pasteur, Koch, and other French and German investigators, in regard to certain other diseases, that fungal organisms which produce them are capable of passing into an inert condition, and in this inert state or condition they fail to develop in culture-fluids, and that the malignant power of the organism is always in direct proportion to its ability to grow in a culture-fluid where it gets little or no oxygen. It would seem, therefore, that the same fact is true of the organism that produces diphtheria. Its infective power is in direct proportion to its power of developing. These facts being established, the explanation of the clinical facts spoken of at the beginning of this article is very evident. A child gets a severe cold, and has as a consequence a catarrhal sore throat; the micrococci are present in this child's mouth in an inert condition, and by the abundance of food they find in the catarrhal exudation they are stimulated to growth: if, now, the vitality of the child be low, the conflict, which follows between the ever-increasing vitality of the micrococcus

and that of the child, ends in the micrococcus getting a lodgment in the mucous membrane, and finally forcing its way into the blood; and that which was at first a simple case of sore throat or croup is converted into one of general blood-poisoning—i. e., diphtheria.

In the early stages of such a case, or when the micrococcus has not gained great vitality, the contagion is very feeble, but when the micrococcus has assumed its malignant powers, any of it, escaping with the breath from the mouth, coming in contact with the throat of another child or a wound in the finger of a doctor, finds lodgment, commences to grow, and gives origin to a new case of diphtheritic infection. It can be understood, therefore, why the contagiousness of diphtheria varies so infinitely. Again, a house will have some foul water-closet or similar local condition which favors the development of the micrococcus outside of the human body, and finally the whole air of that house becomes loaded with the poison, although the house is not able to infect the whole neighborhood. If, however, people pass from this house into other houses which contain suitable lodging-places for the plant, the epidemic may spread, and that which was purely a local may finally become a general epidemic. In the case of Luddington, in Michigan, the whole subsoil of the town was composed of rotting sawdust, and apparently the micrococcus found suitable conditions for its growth everywhere, so that a general epidemic was produced which attacked almost every child in the affected area. The micrococcus of diphtheria is not distinguishable from that which is found in various other diseases. The sore throat of advanced scarlet fever is exactly similar in its structural change, and in the organisms which it contains, with that of diphtheria, and it is not therefore surprising to find in malignant scarlet fever, after the lapse of some days, the blood presenting exactly the same lesions or changes that are found in the blood of diphtheria, and the kidneys and marrow of bones and other organs loaded with micrococci as in malignant diphtheria.

Drs. H. C. Wood and H. F. Formad have also found an abundance of micrococci present in the blood of women suffering from puerperal infection, and in the blood of patients suffering from erysipelas, malignant measles, and in some cases of septic diseases. These micrococci are at present indistinguishable from those of diphtheria, which in turn are indistinguishable from the *Micrococcus septicus* of Koch, the plant which is supposed to be the poison of septicæmia. Whether future researches will show the micrococcus of diphtheria to be peculiar or not is of course uncertain, but at present it does not seem probable; and it must, therefore, be considered that the blood-changes which occur in diphtheria, and occur also in advanced scarlet fever, measles, erysipelas, etc., are simply the result of septicæmia, and that diphtheria is not in itself a specific disease, but that it is simply a sore throat plus septicæmia, it being understood that a sore throat may commence as a catarrh, or may be a septic sore throat from the beginning, the result of a poison coming from without the body.

The important practical deductions from these facts are: the great importance of attending to the simplest sore throat in children of low vitality; the importance of local treatment in cases of diphtheria for the purpose of checking inflammation, and also of killing organisms that develop in the throat; and finally, the maintenance of strict isolation in cases of diphtheria, and the prevention of the development of local foci of the disease in houses. (H. C. W., JR.)

DIRECTORY, a book containing an alphabetical list of the principal inhabitants of a city, town, State, etc., with their places of abode, business, etc. In all populous urban communities a directory has become an indispensable adjunct to business, and it is of necessity published yearly. Every city and town of any pretensions in the United States has its directory, but in a decreasing number of the smaller towns they are issued less often than once a year. Before published books

came into use for this purpose other devices were used. Thus, in ancient Rome a class of nomenclators existed, whose business it was to know every citizen by sight, and the quarter of the city to which he belonged. We hear of these only with reference to their services in election times, when they accompanied the candidates through the streets, but there is a probability that knowledge so extensive, and acquired with so much difficulty by its possessors, was not allowed to remain useless in the intervals between elections.

Somewhat similar to these were the "caddies" of Edinburgh. They are described by Topham (1776) as "a society of men who constantly attended the Cross in High Street, and whose office it is to do anything that anybody can want, and discharge any kind of business. On this account it is necessary for them to make themselves acquainted with the residence and occupation of all the inhabitants; and they are of great utility, as without them it would be very difficult to find anybody, on account of the great height of the houses and the number of families in every building. The society is under particular regulations, and it requires some interest to become a member of it." Capt. Birt (1754) speaks of the "caddies" as "useful blackguards, who attend the coffee-houses and public places to go of errands. These boys know everybody we know who is of any note."

The necessity for such a class was probably greater in Edinburgh than in other cities. But everywhere the need for it must have been felt whenever a city outgrew the bounds of a large, mutually acquainted neighborhood. The next step was the establishment of intelligence-offices, at which written records were kept of the name and address of every citizen. It is from these offices that our modern directories originated. While a printed directory had been in use in London, England, in 1677, it was not until 1785 that a similar work made its appearance in America. In the latter year a directory was published in the city of Philadelphia—then the capital and chief city of the country—by Francis White, a broker and keeper of an intelligence-office. It made a volume of 83 pages, contained the names of about 3570 householders, and sold at half a dollar. It must have been remunerative, for a rival directory was published the same year by Capt. John Macpherson, who printed the occupation of his subscribers only, and specified the houses at which he was refused information. In these directories, as the houses were not numbered, residences are designated with reference to the nearest intersections of streets. But in 1790, Clement Biddle, while taking the census as U. S. marshal, procured the numbering of the houses, and also collected the names for a third directory, which he published in 1791. From this date a city directory has been published every year, with eight sporadic exceptions, and in eight years two were published. The directories of 1795 and 1801 have the names arranged, not alphabetically, but according to localities, with an alphabetical index at the end. Between 1823 and 1837 ten were published by R. Desilver. From 1837 till 1867, A. McElroy published every year except 1838. Since 1867, James Gopsill has been the publisher.

In 1796 a directory was published in New York by David Franks, a conveyancer and accountant, who had an office at No. 66 Broadway. In 1784 the want of such a guide was greatly felt, owing to the disarrangement of residences caused by the exodus of the "Loyalists" from the city and the return of many of the partisans of the British, to say nothing of the sudden development of New York. The first attempt at a directory was made by Cornelius Bradford, the keeper of the Merchants' Coffee-house, then the resort of the business community. On March 11 of that year he posted a notice in his coffee-house which read as follows: "For the accommodation of the public, to prevent the many disappointments that daily happen to returned citizens and others inquiring for their friends, connections, or those

they may have business with, I have opened a book as a 'City Register,' alphabetically arranged, at the bar of the coffee-house, where any gentleman now resident in the city, either as a housekeeper or lodger, or those who may hereafter arrive, may insert their names and places of residence. The said register will always lay open at the bar of the coffee-house, by which means the disappointments so frequently happening to those who inquire or are inquired after will be prevented.—N. B. The constant opportunity the subscriber has of knowing how numerous these disappointments are has, for the convenience of the public, suggested to him the above-mentioned plan. CORNELIUS BRADFORD." It was the great success with which this plan of the keeper of the coffee-house met that induced Mr. Franks to undertake the publication of a printed directory. His book contained 821 names, and he boasted subsequently that the names of only four men of business had been omitted from its pages. He found a printer in Shepard Kollock, who had an office at Wall and Water Streets. In addition to the names of the inhabitants of New York, the book contained an almanac, tables of the different coins then in circulation in the United States, the names of the members of Congress, the departments of the United States for administering public accounts, the names of the members of the State senate and assembly, the names of the judges, aldermen, and other civil officers, the public State offices and by whom kept, counsellors-at-law, ministers of the gospel, physicians and surgeons, the president and directors of the Bank of New York (the only institution of the kind then in existence in the city), the names of the professors of Columbia College, the rates of postage, and the arrival and departure of the local mails. Mr. Franks reissued his directory the following year, but in 1788 New York was for the first and only time since then without a directory. Hodge, Allan, and Campbell were his successors, and they conducted the publication until 1792, when William Duncan undertook it. Four years later, David Longworth, the publisher of Washington Irving's works, assumed the responsibility, and the directory remained in his family until the death of his son Thomas in 1842. Then John Doggett, Jr., Thomas Longworth's legal representative, continued the publication until 1851, when, upon his death, H. Wilson and John F. Trow purchased the work and continued to issue it until The Trow City Directory Company was formed in 1871, by which corporation the book has since been published.

In 1804 the first directory of Boston was published in that city. In 1796 a directory of the city of Brooklyn, containing 126 names, was printed with the New York book. The residents were described as living "on the main road," "on the new ferry road," "at Sand's dock," and "near the Methodist church," Brooklyn in those days not having been laid out in streets.

The names in the early directories, while they were grouped alphabetically, were not so arranged in regard to each other. Before the publication of directories in the city of New York information concerning the residents was to be had principally from the tax-lists. As far back as 1697 there was a list of the members of the Dutch Reformed Church, originally made by Dominie Selyus, which included their residences. The census of New York, taken about 1710, gives the names arranged by wards.

The makers of directories have always experienced difficulty in obtaining the names of a certain class of people, who for one reason or another have objected to their names being included in the list of the residents of a city. In the beginning of the century one publisher wrote, "We would suppose that, each person being anxious to see his name in print, less trouble would be experienced in collecting them." The desire to appear in print is perhaps no inducement at the present day, while the wish to avoid jury duty and the payment of taxes, the jury- and the tax-lists being fre-

quently augmented by the use of the directory, is to many persons a potent reason why their names should be withheld.

The canvassing for and the compiling and printing of a directory are most difficult and complicated undertakings. In New York City an office staff is always maintained by the publishers of the directory, and the work of preparing for the coming book is ever in progress. But the actual canvass for the names occupies only about six weeks' time. The book is published about June 25, and the canvassing begins on May 2, after the annual "moving day." About one hundred and thirty men are employed to make the canvass. Before it is begun the men receive a regular course of instruction in classes as to their duties, and when they are ready to go out upon the work they are given slips of paper about two inches wide and seven inches long on which to write the names. Only one name is written on each slip. The city is divided into not less than five hundred districts, and each canvasser has to cover about four districts. The men are in the first place sent to the outlying parts of the city, so that by the time the business centres are reached they have become thoroughly acquainted with their work, and are consequently not so liable to make errors. On an average each man turns in 160 names a day. Clerks in the office compare the names on the slips with the old directory, and where changes are found they are noted on the slip, and another canvasser is sent out to verify the work of the first one. A canvasser may return a slip like this: "Smith, John, painter, 2002 Forsyth st.," while last year's directory may show that James Smith, a paperhanger, lived at the address given. There is sufficient similarity here to suggest an error, and to avoid the blunder both names are written on a slip. The whole district having been examined in this way, the "discrepancy" slips are given to another canvasser to verify and correct. In this way comparatively few blunders escape detection. When the work of the canvassers is finished the slips which they have brought to the office are assorted alphabetically and pasted on long sheets of paper, which are sent to the printers. The proof-reading of the work is also done with much care. There are first proofs, revises, and re-revises. The printing of the edition then follows, and when the binder has done his work the volume, which this year (1882) numbers 1802 pages and contains 289,724 names, is distributed to subscribers. The same system, with variations of greater or less importance, is followed in all other cities, local considerations sometimes modifying the scheme. The preparation of the Chicago city directory occupies 120 canvassers three weeks. In St. Louis the work is in some respects simplified, in others rendered more difficult, by the fact that May 1 is not a general moving-day. Though it is sometimes alleged that the compilers of directories are apt to flatter local pride by the undue expansion of their lists, experience has shown that the directory canvass is more close and trustworthy than that made by the census agents of the municipal, State, or General Government, omissions or errors being instantly exposed under the operation of an interested and public check system; and the statistics of a city directory may be accepted in the great majority of cases as affording an accurate picture of its growth and condition. Thus, the figures of the Chicago directory for 1880, at first regarded as excessive, were proved even less than the actual population by the subsequent enumeration. The average ratio of population varies with the closeness of the enumeration, some directories excluding laborers and artisans in tenements and such classes, but it may be stated generally as ranging between three and a half to one, and four and a half to one.

Besides the ordinary local directories there are commercial directories of the Union or of a State; trade directories, including all the important dealers in a certain line of business, as druggists or dealers in hardware; elite directories, giving the names and residences

of the well-to-do alone, and excluding merchants and business-men generally; and in fact all that array of books to be looked for in a highly-organized society of enterprising and labor-saving members. The utility of the modern directory can best be realized by reflecting upon the difficulty with which the functions of urban existence, the postal and telegraph system, the delivery of express parcels and baggage, would be carried on did none of these useful publications exist. A striking instance of the utility of such works even outside of their own direct sphere is afforded at the post-offices in the great cities, where files of directories are kept to be consulted in the case of letters imperfectly addressed or bearing the name of another place than that for which they were in reality intended, many thousands of letters thus reaching their destinations with but a trifling delay. (E. P. B.)

DISCIPLES OF CHRIST, popularly known as "Campbellites," or "Campbellite Baptists," though these designations are disowned by them; it being a religious principle with them to wear only such names as all Christians can wear, thus avoiding an obstacle to that union of Christians which they so earnestly advocate. They prefer to be known simply as "Christians," or "Disciples of Christ;" and in their church capacity—being congregational in government, and having no ecclesiastical organization other than that which belongs to each individual church—as "churches of Christ."

1. *History*.—As a distinct people, the Disciples came into public notice about 1830 under the leadership of Alexander Campbell; hence the popular name "Campbellites." But before that there had been outcroppings in Great Britain and Ireland, as well as in the United States, of the sentiments which finally found advocacy in the writings and addresses of Alexander Campbell and others associated with him. There is, indeed, not one feature of the doctrine or practice of the Disciples that was not taught in the writings of eminent men, and set forth in the orthodox symbols of former times. Their distinctive views, in fragmentary portions, had been advocated by many religious teachers. The first volume of Dr. R. Richardson's *Memoirs of A. Campbell* gives interesting sketches of various progressive movements, especially in Scotland, some of which had a marked influence in shaping the religious principles of Mr. Campbell. In the city of New York, as early as 1811, Mr. Henry Errett published a book entitled *The Constitution of the Apostolic Churches*, in which most of the principles now taught by the Disciples were clearly set forth. In 1818, as one of the bishops of a Church of Christ in New York city, Mr. Errett prepared a circular setting forth the faith and practice of that church, which was sent out with a request for answers from churches of similar faith and order. Answers came from eighteen churches in England, Ireland, and Scotland, three in the United States, and one in Upper Canada. These, together with the circular and an introduction and appendix from the pen of Henry Errett, were published in a small volume. Several letters came to hand after the volume was published; so that in all about thirty churches were known to have an existence at that time, mainly alike in doctrine and in order, though previously there had been no communication between any of them, nor were they under the guidance of any leading mind. These churches were essentially orthodox in faith. They had their rise in no dissent from the doctrine of the Trinity, or of the Atonement, but in their opposition to the assertion of human authority in matters of faith; to corruptions in ritual and government, which they regarded as the commandments and traditions of men; and to systems of speculative theology which, as they thought, had supplanted the simple gospel of the New Testament.

The reformatory movement of Thomas Campbell, Alexander Campbell, and others, sprang from no direct acquaintance or connection with these churches.

Some of the initial steps in the reformatory movement of the Campbells and their early associates are noticed in the article ALEXANDER CAMPBELL. Thomas Campbell, a native of Ireland, and a minister in that branch of the Seceders known as Anti-Burghers, came to the United States in 1807, and settled in Washington co., Pa. Deeply impressed with the mischiefs of sectarianism, he devoted himself to the task of recovering Christians out of sectarian strifes and uniting them in fellowship simply as Christians. This involved the abandonment of party names, human creeds, and ecclesiastical organizations; the acceptance of the Bible as an all-sufficient rule of faith and practice, and an agreement on the part of Christians to walk together in that on which they are agreed, and to bear with each other where they fail of agreement—studying the Holy Scriptures with a view to reach a final agreement in all that relates to faith or duty. In 1809 his son Alexander followed him to this country and joined him in this effort. They soon formed a Christian association, into which all were received who sympathized with its object, and began to leaven the public mind by tracts, lectures, sermons, etc., hoping to bring Christians of all denominations to see the evils of sectarianism.

But the free investigation led most of the members of this association to the conclusion that infant membership in the church, and sprinkling as baptism, were unauthorized by the word of God. This led to their separation from all pedobaptists by their adoption of immersion, as the only form of baptism, and the formation, in 1812, of a church of immersed believers. This church soon united with the Redstone Baptist Association, but with a written stipulation that “no standard of doctrine or bond of church union, other than the Holy Scriptures, should be required.” The leading ministers in that Baptist association were Antinomians. Alexander Campbell was much their superior in scriptural knowledge, classical learning, and oratorical power. He took at once a leading position, and attracted general attention by the freshness and power of his sermons, which were sometimes startling in the boldness and novelty of their utterances, and always remarkable for their clearness of scripture exposition. While he was regarded with suspicion by many of the Baptist preachers, many others were brought into sympathy with his views, and Bible reading, investigation, and discussion became the order of the day. In 1823 Alexander Campbell began the publication of a monthly magazine, called *The Christian Baptist*, in which he and his co-workers set forth what they regarded as the true features of Primitive Christianity, in contrast with modern ecclesiasticism; and also what they held to be necessary to a restoration of the gospel and the Church of the New Testament. A widespread opposition being awakened among the Baptists—especially when, after 1827, Alexander Campbell and Walter Scott openly proclaimed the immersion of the penitent believer to be “for the remission of sins”—a separation gradually resulted, especially in Virginia and Kentucky, though many of the Baptists took their stand with the Reformers. Their numbers were largely increased in 1831 by a union with another body of immersed believers, known as “Christians,” who, under the guidance of Barton W. Stone and others, were pleading for the union of Christians on the Bible alone, and had become numerous in Kentucky and some other Western States. Friendly conferences between the leading men of both parties led to a common agreement to be silent on all questions of speculative theology, and to adhere closely to the language of the Bible on all controverted questions. From that time their progress has been rapid; their plea for Christian union brought in multitudes from the various Protestant denominations, and their plain and powerful preaching “turned many to righteousness.”

II. Distinctive Teaching.—The Disciples hold that the Christian religion, as set forth in the New Testament, is the perfection of divine wisdom and philanthropy, to which, as announcing the conditions of salvation, and as instituting terms of Christian fellowship, nothing should be added, and from which nothing should be subtracted. This religion was gradually corrupted in a variety of ways—these corruptions culminating in a great apostasy from the simplicity, spirituality, unity, and true catholicity that marked the churches of the apostolic age. The attempts of Protestantism to recover the gospel and the church out of these corruptions have been but partially successful, resulting thus far in numerous jarring sects. These sectarian divisions hinder the development of a pure Christianity. The Disciples now urge that loyalty to Jesus, the Christ, demands the abandonment of party names, party creeds, and party usages, and the restoration, in letter and in spirit, of the gospel and the church of the apostolic age. As a basis for such restoration, they submit the following to the consideration of Protestant Christendom:

1. The Old and New Testaments the only authoritative revelation of spiritual truth and source of Christian faith.

2. That the New Testament, as embodying what God has spoken by his Son, contains all that is binding on us as of divine authority; and, studied in the light of Old-Testament revelations, is a complete guide in all that pertains to salvation, duty, and destiny.

3. That the first complete proclamation of the gospel, and the planting of the first church of Christ, are recorded in Acts of the Apostles; so that from this, as a central point, we are to study the Old Testament as preparing the way for Christ; the four Gospels as furnishing a knowledge of Jesus and the means of faith in him as a divine Saviour; the Acts as showing how to preach Christ and how to obey the gospel—how sinners were turned to Christ, brought to rejoice in salvation and gathered into the church of Christ; the Epistles as teaching Christians and churches how to live; and the Apocalypse as unfolding the vicissitudes of the cause of Christ in this world, and to the eternal triumph of truth and righteousness.

4. That in the light of the Scriptures, thus studied, it is evident (1) that the faith of the heart in Jesus as the divine Lord and Saviour (accompanied, of course, with genuine repentance) is the sole condition of acceptance to baptism, and entrance, through baptism, into Christian fellowship; (2) that obedience to Christ in all things is the sole condition of continuance in that fellowship. In other words, faith in Christ and Christian character are the only conditions of fellowship.

5. As essential to the union of Christians, the Disciples insist on (1) the only book that all Christians agree in—the Bible. (2) The only leader and sovereign they all agree in, and whose name is the only name they will agree to wear—Christ Jesus. (3) The only faith they all regard as essential to salvation—faith in Jesus, the Christ, the Son of God. (4) The only baptism they all agree in—the immersion of the believer into the name of the Father, and of the Son, and of the Holy Spirit. (5) The only test of fellowship they all agree in—obedience to Christ. (6) The only church they all agree in—the church of God, built upon the foundation of apostles and prophets, Jesus Christ himself being the chief corner-stone.

The Disciples are essentially trinitarian in faith, but reject all creed formulations, and insist on a rigid adherence to the language of revelation concerning Father, Son, and Holy Spirit, repudiating all speculations on a subject of which we know only what is revealed. They rejoice in Christ crucified as a sin-offering, as the sinner's only hope; but they refuse to adopt any *theory* of the atonement. They regard the

Holy Spirit as the revealer and demonstrator of spiritual truth, and as the divine guest of every purified heart; but the work of the Spirit must be tested by the word of God, and the facts of the Spirit's presence in the heart must be proved by the fruits of righteousness. To the believing penitent they regard baptism as conveying the divine assurance of the forgiveness of sins, and repentance, confession, and prayer as the conditions of pardon to the erring Christian.

In church government they are congregational. They have associations—district, State, and national—for missionary and other benevolent purposes; but these meddle not with questions of doctrine or of church government.

While they recognize all Christians as anointed priests of God, and make no distinction of clergy and laity, they appoint bishops to rule and teach, deacons to minister in financial affairs and works of mercy, and evangelists to go forth as missionaries to preach the gospel, plant churches and care for them.

III. *Their Achievements and Present Condition.*—A mere handful in 1830, the Disciples had according to the returns made in 1880—not in all cases accurate, but not far from the truth—a membership of 592,016, and their annual increase for several years past has been about 40,000. They have 5175 churches and 3787 ministers. They are enthusiastic in Sunday-school work, but it is not possible to give accurate Sunday-school statistics. In the British provinces they number about 5000; in Great Britain and Ireland about 4000; in Australia and New Zealand over 3000. They have 2 universities, 20 colleges, 8 collegiate institutes, 2 orphan schools. They publish in this country 12 weekly papers, 6 monthlies, 1 quarterly; also, 8 Sunday-school weeklies and 4 monthly Sunday-school magazines; also Lesson Leaves and Bible Lessons for Sunday-school teachers and pupils.

For missionary work, in addition to district and State organizations, they have: 1. The General Christian Missionary Convention, with headquarters at Cincinnati, O., which has in charge the destitute regions of our own country, which is now in the thirty-third year of its existence. 2. The Foreign Christian Missionary Society, with headquarters at Cincinnati, O., now in its seventh year. It has missions in England, France, Denmark, Norway, Turkey, 7 missionaries with their families being employed, who have established 8 churches, with 700 members, and about 800 scholars in Sunday-schools. In 1882 2 missionaries with their families were sent to Central India. 3. The Christian Woman's Board of Missions, with headquarters at Indianapolis, Ind., which employs several missionaries in Jamaica, W. I., and has planted several churches and schools in that island, with a church membership of 760. This board is now engaging in home work in the Western States and Territories. (See *Memoirs of Alexander Campbell, embracing a View of the Origin, Progress, and Principles of the Religious Reformation which he advocated*, by Robert Richardson. 2 vols., Philadelphia, 1868. (L. E.)

DISCLAIMER, in law, an act or declaration by which one denies, disavows, or renounces some claim, interest, or right which he has formerly alleged or which has been imputed or offered to him.

Where an estate is devised to a person or conveyed to him without his knowledge or consent, he is at liberty to *disclaim* all rights therein. Thus, a trustee of real property is said to *disclaim* when he declines to act as such. A tenant is also said to *disclaim* who denies the title of his landlord. The right of a patentee under sec. 4917 of the Revised Statutes of the United States to withdraw a part of his specification in the event of the same being too broad is termed the right of *disclaimer*. This right is allowed in order that patentees may be enabled to protect themselves against the defence being set up, in suits brought by them for infringement of their patents, that the specifications thereof are too broad.

In pleading, a *disclaimer* is a renunciation by the defendant of all right, title, or interest in the subject-matter of litigation. In law, *disclaimers* occur only in real actions, and practically amount to a confession of judgment. In equity, they claim that the defendant should be dismissed with costs because he has no interest or right in the subject. A *disclaimer* in equity must, in general, be accompanied by an answer. This is always the case where the defendant has so connected himself with the matter that justice cannot otherwise be done. (L. L., JR.)

DISCOVERY. (See ANNEXATION.)

DISFRANCHISEMENT, in law, the removal or expulsion of a member of a corporation, so as to deprive him of his corporate rights as such.

The right of disfranchisement vested in corporations is either expressed or implied. It is express when conferred in terms by the charter. In such case it may be exercised for whatever cause and in whatever manner the charter stipulates. The implied right of disfranchisement is that which is inferred from the simple fact of the corporate existence. There is no implied right of disfranchisement from moneyed corporations. The implied right of disfranchisement can only be exercised for certain specified causes. These are—1. Where a member has committed some crime so gross as to unfit him for the society of honest men, and has been duly convicted thereof by a jury. 2. Where a member has committed some act which is contrary to his duty as a corporator and manifestly prejudicial to the interests of the corporation. 3. Where a member has committed an offence of a mixed nature, both contrary to law and contrary to his duty as a corporator.

For any of the above causes a member may be disfranchised by vote of the corporation, but if the second cause be the one specified, only after the due observance of the following regulations: 1. The offender must be notified of the charges made against him, and must be summoned to appear on a particular day and at a particular place to answer them. 2. The place must be such as it is possible for the offender to attend, and the time must be at a sufficient distance from the notice to enable the offender to prepare his defence. 3. The offence must be proved by competent witnesses. 4. The defendant must be permitted a full and fair hearing. 5. He must be expelled either by a vote of the corporate body, or of such part of it as may be by the law of the corporation designated for that purpose. 6. The persons before whom the question is tried must not have any undue bias or prejudice against the defendant.

Where a member of a corporation has been unjustly disfranchised he may have resort to the courts. These will consider—1, whether there has been sufficient cause for disfranchisement; 2, whether the disfranchisement has been effected in a regular and orderly manner. If they are of opinion that there has not been sufficient cause or that the proceedings have been faulty, they will restore the person expelled by a mandamus. In the States of Maryland and Illinois such relief will not, however, it seems, be afforded in the case of incorporated beneficial societies and kindred bodies.

The aid of courts of equity is frequently invoked to assist disfranchised members of corporations, either by means of simple injunctions or through mandatory injunctions. It is the better opinion, however, that their jurisdiction does not extend to such cases. (L. L., JR.)

DISINFECTANTS. There are certain principles which underlie the proper use of disinfectant substances which ought to be clearly understood by every person. There are very few, if any, poisons whose power is not destroyed by dilution, and in the great majority of cases dilution is nature's method of rendering innocuous disease-poisons. Thus in winter small-pox and other contagious diseases are more rife than in summer because during cold weather the

poisons are concentrated in the air of enclosed rooms or houses and adhering to furniture, articles of dress, etc., are carried *en masse* from place to place; whilst in summer, through open doors and windows, the disease-germs are swept out and scattered so widely in the boundless atmospheric ocean as to be lost. Again, most of these disease-poisons are very lowly organized beings, with strong resistive powers. All powerful germ-killers are even more poisonous to man than to the germs, and consequently it is folly to attempt to disinfect any air in which a man is immersed. The man would be killed before the disease-germs would be seriously affected.

The only way of disinfecting the air of a sick-room is by quick *ventilation*, *i. e.*, free dilution of the poison. Saucers of chlorinated lime and other disinfectants are an abomination in a sick-room, doing no good and hiding by their own stench the smell which is the natural warning of danger. They thus directly as well as indirectly produce a false sense of security. No folly can be more ridiculous than the attempt sometimes made in times of epidemic to disinfect the air of a city.

It is, however, possible to destroy germs held in suspension by liquids or adhering into solid masses. The excretions of a man suffering from contagious disease are loaded down with the germs, and therefore all the discharges in the sick-room should be received into vessels containing disinfecting solutions, so as to at once destroy the disease-germs before they stream out into the atmosphere. This precaution will not altogether avail, as many of the organisms are thrown out with the breath, and can only be combated by ventilation and the scrubber's brush. Hence all surfaces in the sick-room should be hard and of such character that they can be frequently washed with an abundance of weak disinfectant solutions, so as to overcome danger by the dilution and destruction of the adherent germs. Carpets, pictures, upholstered furniture, etc., should at once be removed when a contagious disease is to be received into a room.

When it comes to the selection of a disinfectant for practical purposes the object to be attained must always influence the choice. Thus for use about the mouth thymol is the best disinfectant on account of its pleasant taste and odor, but for the treatment of wounds it is unfit, partly on account of its great costliness and partly because it attracts innumerable flies. For ordinary purposes it is not the absolute disinfecting power of a substance which should direct selection, but it is the power compared with the cost. A second very important consideration is the poisonous properties of the agent as regards man.

Disinfectants are well divided into germicides or germ destroyers and chemical substances which simply oxidize and thereby remove the organic matter in which the germs develop. For purifying cesspools, sewage, and other large collections of organic material, agents of the latter class are chiefly used. The most important of these are lime, copperas, and chlorinated lime. Of these lime is the cheapest, and is very efficient when a slow action is alone necessary. In closed receptacles it has the great disadvantage of liberating organic alkaloids and ammoniacal compounds by the removal of their acids, and thereby at first increasing the emanations. In water-closets and similar situations copperas seems to be the most available of the class; it may be used in solution when an immediate action is required, or in coarse powder when a very persistent influence is to be exerted. Chlorinated lime is much used, and is undoubtedly efficient.

For disinfecting the discharges of a person sick with a contagious disease a germicide should always be selected. Carbolic acid and its congener, cresylic acid, are amongst the most important. Even superior to them is a solution of corrosive sublimate. It must be remembered that all of these substances are very

deadly poisons, and if a malodorous principle be added to the mercurial solution as a means of warning, such solution would be as little liable to cause accidents as are the coal-tar acids. The sulphites are certainly efficient germicides, but are not ordinarily as available as those just previously mentioned.

For disinfecting wounds benzoic acid and its preparations, especially the old compound tincture of benzoin, borax, iodoform (when its odor is not objected to), and salicylic acid are among the best drugs. Alcohol in sufficient concentration is an excellent germicide, and hence wounds continually bathed in whiskey are very apt to do well. As a dressing for ordinary small cuts and abrasions the compound tincture of benzoin is superior; a piece of patent lint may be placed over the raw surface, saturated with the tincture, and appropriately secured. When textile fabrics, such as clothing, carpets, etc., are infected, as a means of purification heat affords almost the only security against evil. Recent experiments have shown that exposure even to extreme cold is of little service. *Prolonged* boiling is efficient, although disease-germs will resist for some minutes a temperature of 212° Fahr. even when immersed in water. When dry heat is used the temperature of the air should be not less than 250° Fahr., and an exposure of several hours should be insisted on. (H. C. W.)

DISPENSARY. This word is used to denote an institution supported by private contributors (unless otherwise designated) to supply the poor, free of charge, with medical advice, usually with medicine, and sometimes even with food, the patient continuing to live at home and only coming to an office for advice, or being visited at his home by the physician if too ill to go to the dispensary office. It is used to include also the out-patient department of hospitals, but usually the hospitals have no physicians who visit patients in their homes. As a rule dispensary physicians serve without payment, or are paid an amount so small in proportion to the labor performed that all dispensary work may be said to be gratuitous so far as direct remuneration is concerned.

The first regular dispensary was founded in London in 1770, and called the "General Dispensary," though for more than a century poor persons had received medical treatment on what was practically the dispensary system, both from physicians and apothecaries. For centuries also the monks had distributed medicines as alms at the monasteries, and other benevolent persons had given out medicines to the poor, apparently thinking medical knowledge of less importance than the medicine itself. Before the year 1800 five dispensaries are known to have been opened in England and three in America.

In 1801 Dr. Lettson stated that 50,000 patients were relieved yearly in London; in 1850 almost 150,000 were relieved (in 35 dispensaries). Now the number is believed to have risen to 800,000, if not to 1,000,000, out of a population of about 4,000,000. A similar proportion of free patients to the population is observed in large cities in this country. In Philadelphia in 1877, according to Dr. C. E. Cadwallader, of a population of 817,446, there were 132,549 out-patients, or one in 6.16. In New York at the same time, according to Dr. W. Gill Wylie, of a population of about 1,000,000, there were 307,060 out-patients, or about one in three, besides over 20,000 persons treated in their homes by dispensary physicians. In Boston, out of a population of about 360,000, the number of dispensary patients exceeds probably 80,000.

Dispensaries appear, in fact, to create patients, and it is rare that the number of the latter does not increase year by year, unless some particular effort is made to counteract this tendency. From an address given in 1877, by Sampson Gamgee, Surgeon to the Queen's Hospital at Birmingham, it appears that the ratio of persons relieved by the local medical charities in that city has increased as follows:

Years.	Population.	Persons relieved.	Ratio to population.
1867.....	325,895	66,671	1 in 5
1876.....	371,839	104,648	1 in 3.5

If the number still increases in the same ratio, in 1886 the number of persons relieved in proportion to the population will be as 1 to 2.6.

Thus, dispensaries give medical charity not only to persons who receive charity of other kinds, but also to a large number of persons who supply themselves with all other necessities of life, and who but for the existence of dispensaries would not be expected to ask for charity in any form. Meanwhile the dispensaries are generally overcrowded, and the physicians are often overloaded with work which cannot be thoroughly done. Even in dispensaries used for the purposes of medical education where patients not suitable for medical charity may be wanted for the illustration or study of diseases, the presence of a great mass of patients often makes it difficult to select those that are of value from those who are not. These facts are plain to any one who looks into the matter, and the recognition of them long ago led to the formation of Provident Dispensaries.

Provident Dispensaries.—The first definite proposal to alter the dispensary system appears to have been made by Mr. W. H. Smith, of Southam, Warwickshire, where, in 1823, the first dispensary on the basis of payment by the patient was established, and in the course of the next ten years 16 dispensaries on the same plan had been established. Mr. Smith called them Self-supporting, Charitable and Parochial Dispensaries, the name being intended to show the various sources of income, and though by its contradictory adjectives this name exposed the plan to criticism, yet the movement was an earnest attempt to remove generally recognized evils, and it is a matter of regret that its aims were not generally appreciated.

The Charity Organization Society of London, which was not formed till 1869, has generally received the credit of originating the movement in favor of provident dispensaries. In March, 1870, at a meeting presided over by the late Sir William Ferguson, at which 156 members of the medical profession were present, the following resolutions were passed:

"That this meeting is of opinion, that there exists a great and increasing abuse of out-door relief at the various hospitals and dispensaries of the metropolis, which urgently requires a remedy.

"That, in the opinion of the meeting, the evils inseparable from the system of gratuitous medical relief administered at the out-door department of hospitals, and in free dispensaries, can be in great measure met by the establishment, on a large scale, of Provident Dispensaries, not only in the metropolis, but throughout the kingdom, and by improved administration of poor-law medical relief."

The provident dispensary system, which in this way received its first prominent indorsement, has gradually developed, so that there are now a large number of provident dispensaries scattered throughout England. In London alone, where there is great difficulty in establishing them on account of the many free dispensaries and hospitals, yet about forty are now in existence.

In 1879 the "Metropolitan Provident Dispensary Association" was formed to enable persons of every class who are intermediate between those who can pay the ordinary professional fees, and the paupers, whose medical treatment is provided for under the Poor Law, to become members of local associations, whereby they can obtain advantages similar to those possessed by the rich. The Council of this Society is also the medium of communication with the Metropolitan Provident Dispensaries Joint Stock Company, the object of which is to provide suitable buildings where a self-supporting dispensary can be started, including payment of rent, and to suggest to them such rules for

their government as the experience of other provident dispensaries had found to be most convenient.

Membership in provident dispensaries is obtained by paying a small sum, varying somewhat in each dispensary; single cards about 4*d.* per month (entrance fee about 1*s.*); family cards about 1*s.* (entrance fee about 1*s.* 6*d.*); persons under 16 can only ordinarily become members with their parents or guardians. Ordinary members are not treated until one month after admission. All payments are made in advance. There are fines for arrears; after three months' arrears a person ceases to be a member. Applicants actually ill are generally required to pay an entrance fee of about 5 shillings. Several physicians are chosen to compose the medical staff, and a member can select any one of them to attend him. Each physician receives a proportion of the fees, set aside for the medical officers, corresponding to the number of patients who have chosen him.

Any person or family is eligible for membership, whose whole earnings do not amount to more than 35 or 40 shillings per week, it being supposed that under ordinary circumstances any one earning more than this amount can pay such fees as physicians usually demand of families in moderate circumstances. Originally, also, and still to a certain extent, honorary members have added to their funds without participating in the benefits of the dispensary.

There appears to be but one regularly organized provident dispensary in the United States, at Milwaukee, Wis., and this has not existed long enough to show whether it will be successful or not. The fees, paid weekly, are, for a woman, 5 cents; for a man, 10 cents; for man and wife, 12 cents; for each child, 2 cents; for 4 or more children, 8 cents. It is open to any resident of Milwaukee, over fourteen years of age, whose total income does not exceed six hundred dollars a year. Payments cover all attendance and medicine during illness, except in case of childbirth, for which there is required an additional payment of five dollars for a physician, or two dollars for a midwife. Thirty per cent. of all dues received for the previous quarter are quarterly divided among all the physicians, in proportion to the number of visits paid (except for surgery and midwifery cases), a house visit being counted as two office visits. Surgery and midwifery cases are paid for according to special agreement.

Provident Dispensary System not Self-Protective.—It is plain that the provident dispensary is not really placed on a purely business basis. If it were, no objection could be made to the admission of any one who was willing to subscribe, whether rich or poor.

A well-known English physician, always an able advocate of dispensary reform, writes, "... under the provident system, persons unfitted by social position will by virtue of the payment made claim that as a right to which they are certainly not entitled. . . . It is stated that more than one-third of the population of the town of Northampton were members of the provident dispensary, entitled to attendance. Now considering that these 17,849 persons only contributed £2218 for a year's attendance, and that their illness during this year required 50,769 separate visits either to or from the medical offices, giving an average of 10*d.* per visit, there must, even in this case, which is quoted as a highly successful illustration, be some ground for the objection I have raised against the indiscriminate application of the provident system." It becomes thus evident that the provident dispensary system is open to criticism similar to that brought against free dispensaries, viz., that they provide medical services for a less price than many of the recipients can afford to pay, and thus tend to pauperize them in the same proportion that they undersell to them. Another eminent surgeon has said: "The wages test is unsatisfactory, however, unless the nature of the case is taken into consideration; for it is obvious at once that a man earning forty shilling a week, but laboring

under some very obstinate affection, or one requiring some special means of treatment, is a far more deserving and a far more eligible candidate for dispensary relief than one earning thirty shillings a week whose ailment is of a trivial nature."

In other ways also efforts have been made to limit the use of the free dispensary to the class for which it was intended. Originally contributors to dispensaries were allowed to recommend a certain number of patients, on the supposition that those who supported the institution must know what persons would be most benefited by it. But this privilege has been greatly abused, whether intentionally or through negligence, and the plan has been almost if not wholly given up in the United States and to a certain extent even in England, where it was once almost universal. The number of patients in some dispensaries has been cut down by charging a small fee for admission, or registration, or for medicine. But though this may reduce the number of patients temporarily it cannot bring about a lasting reform, for those who ought not to come to the dispensary think little of paying the shilling, and are not to be deterred by the rule; while to those that are proper applicants it is a great burden.

The simple exclusion of patients found by investigation to be able to pay ordinary medical fees is a first step toward the solution of the difficulty, but it does not affect that great class, by far the most important, so far as their own well-being is concerned, who ought not to accept medical charity, yet are not provident enough to save money to pay for medical treatment, so long as they know how easily it may be obtained gratis.

In this connection it should be kept in mind that as regards the amount of wages earned, provident dispensary patients differ very little from patients at free dispensaries. In 1873 Dr. Ford Anderson found the total wages of one hundred families in a provident dispensary to be £120 2s. 8d.; of one hundred families in a free dispensary £111 12s.

The Proper Function of the Dispensary.—In its early history the free dispensary was a place where the expensive product, medical treatment, was given to persons too poor to purchase it; it acquired a value of another kind, when it became also a place for giving clinical teaching in medicine. Both its charitable and its educational aspects should be considered in studying its effects on society. If the dispensary enables the rich to lighten the burdens of the poor and weak, and helps them to take better care of themselves in future, it is fulfilling its proper function; if, on the other hand, it saps the energies of that portion of the population who need to husband their energies to the utmost—if it constantly invites those people, who are just above depending on their richer neighbors, to become dependent on them; and having drawn in one set, immediately goes to work on the next above—then it is certainly a curse instead of a blessing. Were a number of grocers to send their goods to be distributed to people unable to supply themselves, no doubt the system would develop like the dispensary system. First would come those out of work for sickness or some other accidental cause, unwillingly at the outset, and only because their children were suffering, but with less hesitation later as they found themselves kindly treated. On going to work again they would still find it just as well to deal at the free grocery; and their neighbors too would soon see the advantage of getting their supplies in the same way. And so more and more people would cease to make provision for groceries; would arrange for other expenses; or on the other hand, finding it cost less to live, would underbid their neighbors for work, and be underbid in turn themselves. Groceries free to every comer would be regarded as an absurdity, yet free medicine is as far as the patient is concerned equally absurd.

In seeking for the best dispensary system, attention must be given (1) to the most efficient means of pro-

viding kindly and timely medical treatment for the poor, and (2) proper material for educational purposes.

Dispensary Reform.—Among applicants at dispensaries are found four general classes: (1) those that are suitable recipients of alms and therefore of medical charity; (2) those that can do something for themselves, but must still, to a certain extent, depend on charitable aid; (3) those that could in the long run provide their medical treatment, but have not learned to regard it as a need for which provision should be made; and (4) those that need no aid for ordinary medical expenses, though perhaps they are not able to meet the extraordinary expenses which must be incurred to obtain advice in consultations.

As schools of practical medicine dispensaries are valuable, partly because the diseases which are met with there are of a kind different from those that are usually found in hospitals, yet are quite as important for study, and partly because the number of patients is so large that the cases can be selected. For out-patient departments of hospitals and other dispensaries used for educational purposes applicants should be considered not only with regard to their circumstances, but also with regard to the diseases which they illustrate.

No method of reforming dispensaries which does not recognize this demand will enable them to fulfil their proper function. "At present it is too much the fashion for lay-governors to pass over all matters connected with medical tuition as being merely technical, or as being the business of the doctors, not of themselves. The truth is that the function of hospitals and dispensaries in teaching medicine is a matter of equal, if not greater, importance to the public than their function in relieving a certain proportion of the sick in the community."

By adopting the recommendation of an eminent English surgeon that the educational dispensaries and out-patient departments should only take the place of consulting physicians, these institutions would obtain the cases they most desire without the disadvantage of having to treat a great many patients that they do not want; on the other hand, since the physicians holding appointments in dispensaries of this kind would be eminent physicians and surgeons, and often specialists, poor persons, and persons who, though not poor, are yet not able to pay extraordinary fees, could obtain valuable consultations in obscure or complicated illness. It has been suggested in furtherance of this plan that the educational dispensaries should receive patients only for one visit, with, however, the proviso that any cases may, at the request of the attending physician or surgeon, be kept under treatment and observation.

Supposing, then, that such of the out-patient departments of hospitals and dispensaries as are connected with medical colleges supply all needful extraordinary medical treatment, how shall the patients be distributed for that kind of treatment which corresponds to ordinary medical practice? (1) Those who can pay such fees as physicians ordinarily demand of families in moderate circumstances need not be considered at all. (2) Those who could pay all their medical expenses, if allowed to do so, by paying a little at a time, could either join what might be called medical insurance clubs, or could separately agree with a physician to assume the care of the family by the year for a certain sum. These insurance clubs would be like the provident dispensaries in England, except that the fees would be much higher, so as really to remunerate the physicians and pay other expenses. Of course the fees must vary in different clubs according to the amount of remuneration which the experience and reputation of the physicians connected with it could command.

For the second class mentioned, who must at times receive aid from others, there would have to be dispensaries which would have to be charitable in fact,

and should be so in name. The members would pay a fee which would either not pay the expenses or not pay the physicians, as is really the case in the English provident dispensaries. Such dispensaries might be managed in part by the members, but being charitable institutions the controlling power would have to be vested to a considerable extent in the physicians and contributors, who would then make arrangements to keep acquainted with the circumstances of the members, and discharge them from the dispensary, or persuade them to enter one of the self-supporting insurance clubs, if their circumstances became sufficiently improved. These dispensaries should be used for medical teaching, and would be of special service to medical students.

The proper patients for free dispensaries would be (1) those above mentioned who are acknowledged objects for charity of all kinds; (2) all persons applying in an emergency, who, though they ought to have provided for themselves, have neglected to do so. Such patients should be warned, however, that they would not be received again, and should be shown what steps to take to provide for future emergencies. All the patients above mentioned, including those who can pay ordinary fees but not consulting fees, could, as has been suggested already, be referred to the hospital out-patient department and educational dispensaries whenever, on account of the severity or obscurity of the case, it seemed desirable to do so.

To carry out the plan satisfactorily all the leading dispensaries would have to combine in order (1) to investigate all cases; (2) to decline all able to pay for the disease actually in hand, unless the case was one properly recommended as a case for instruction or consultation; (3) to inform all applicants what their proper course would be for securing good treatment.

The expenses of investigation would at first be considerable, but they would rapidly diminish if some simple system of registration were adopted among the dispensaries, (1) because the place of the individual applicants would become established, and (2) because people would learn from each other the advantages of the insurance arrangements and the difficulty of getting treatment free. (C. P. P.)

DISTRESS, in old English law, denotes a taking of the personal chattel of a wrong-doer into the possession of the party aggrieved as a pledge for the performance of a duty or the satisfaction of a wrong committed. In modern law distress is a summary method whereby a landlord may seize upon and sell the property of his tenant for rent in arrear.

The right of distress was imported by the early settlers of the United States and is still generally recognized. In the New England States it has, however, been superseded by the law of attachment on *mesne process*. In New York the right of distress has been abolished by statute. In North Carolina the courts have declared it to be inconsistent with the spirit of the laws and have, therefore, denied it to be in force. To the same effect are the decisions of the courts of Missouri. In Alabama the right of distress is confined to the city of Mobile. In Mississippi and Wisconsin it has been abolished. In the remaining States it is believed to be still in force, though much modified by statutory provision.

In order to entitle a landlord to distrain for rent, there must be an actual letting and not merely an agreement to let, but the lease may be either by parol or in writing. A distress cannot rightfully be made until the day after that on which the rent falls due. It seems, however, that there is no necessity for making a demand for the rent in arrear prior to issuing the distress as in the case of a re-entry. As a rule all chattels which are on the demised premises at the time of the levy are liable to be distrained. There are certain sorts of chattels which are, however, exempt from distress. By stat. 2 William and Mary, chap. 5, it was provided that if five days should expire after levying the dis-

tress without payment of the rent in arrear or replevying of the goods, then the said goods should be properly appraised and sold after five days' notice, the proceeds to be applied towards payment of the rent in arrear. This statute is regarded as in force in most of the United States. In some, statutory provisions substantially similar have been passed by the legislature. Acts have also been generally passed whereby the landlord is enabled to distrain upon goods clandestinely or fraudulently removed by the tenant from the premises out of which the rent distrained for issues. In case of an illegal distress the proper remedy is an action of replevin. See **REPLEVIN** and **AVOWRY**.

DISTRICT ATTORNEY. A title usual throughout the United States, designating the law officer of either the State or the national Government within a particular district or county, as distinguished from the attorney-general, whose powers are commensurate with the entire domain.

By the provisions of the Revised Statutes of the United States a United States district attorney is appointed by the President for each of the numerous judicial districts (fifty-eight) into which the country is divided, and is commissioned for a term of four years. It is his duty to prosecute in his district all delinquents for crime and offences cognizable under the authority of the United States, and all civil actions in which the United States are concerned, and, unless otherwise instructed by the Secretary of the Treasury, to appear on behalf of the defendants in all suits or proceedings pending in his district against collectors or other officers of the revenue for any act done by them or for the recovery of any money exacted by or paid to such officers and by them paid into the Treasury. He is also to represent the United States in all prize causes wherein they are concerned, and from time to time must make official reports of the manner in which he has discharged his duties.

He is not, however, regarded as having a general authority to commence suit in the name of the United States, except in extraordinary cases where the remedy or lien of the national Government may be lost by delay. In all other cases he awaits the direction of the President, some head of a department, or the solicitor of the Treasury. The United States courts in any district will only recognize the United States as a party plaintiff in the record to a suit when it appears that the action has been instituted by the district attorney.

In the various States the office of district attorney also exists, although the officer is not always so designated. In Arizona, California, Colorado, Dakota, Georgia, Iowa, Louisiana, Massachusetts, Mississippi, Montana, Nebraska, Nevada, New Mexico, New York, Oregon, Pennsylvania, Tennessee, and Wisconsin the term "district attorney" is employed. In Arkansas, Indiana, Michigan, Missouri, Ohio, Utah, Wyoming, and Washington Territories the term "prosecuting attorney" is employed. In Connecticut, Florida, Illinois, Kentucky, Indiana, Vermont, and Virginia these officers are termed "State's" or "commonwealth's attorneys." In Kansas, Maine, and Minnesota they are termed "county attorneys," and in New Hampshire and North Carolina "county solicitors." In Alabama and South Carolina they are known as "circuit solicitors," and in New Jersey as "prosecutors of the pleas." In Delaware and Rhode Island the functions of these officers are discharged by the attorney-general and his assistants. In almost all of the States the office of district attorney is an elective one. In New Jersey, however, he is appointed by the governor, and in New York by the judges of the county courts. In Connecticut the State's attorneys for the whole commonwealth are nominated by the judges of the superior court.

The duties of the district attorneys in the various States are wholly regulated by statute. It is their province to draw up indictments in all criminal cases, to present them to the grand jury, and on the trial to conduct the prosecution. (L. L., JR.)

DISTRICT OF COLUMBIA is the territory of the United States of America which contains the national capital or seat of the general government. The term is also the legal designation of the local government established by act of Congress, and now existing, for municipal purposes, over this territory. In the choice of the name the memory of the great discoverer, Christopher Columbus, was honored.

The District of Columbia is situated on the eastern or left bank of the Potomac River, at and around its junction with a small affluent from the N. E., called the Anacostia or Eastern Branch—about 100 miles, by the channel of the river, from the Chesapeake Bay, and about 200 miles, by the river and bay, from the Atlantic Ocean. It lies between the parallels of $38^{\circ} 47'$ and $39^{\circ} 00'$ N. lat., and between the meridians of $76^{\circ} 54'$ and $77^{\circ} 07'$ W. long. from Greenwich. The centre of the dome of the capitol is in $38^{\circ} 53' 20''$ N. lat. and $77^{\circ} 00' 29''$ W. long. (or, in time, 5h. 8m. 2s.) from Greenwich. The present area of the District is about 70 square miles, including the river and water-courses (the city of Washington occupying about $11\frac{1}{2}$ square miles), bounded on the W. and S. W. by the Potomac River, and surrounded on all other sides by the State of Maryland. The original intention was that the District, or "Federal Territory," as it was for some time called, should include a square of 10 miles to the side (100 square miles), lying on both sides of the Potomac River, in which the future city would be near its centre; but this original project was afterwards somewhat modified.

During the Revolution, Congress had met at various places, as constrained by military exigencies. Soon after the close of the war (1782) rivalry between several of the States sprang up as to a permanent seat for the new government. Although the city of Philadelphia had chiefly enjoyed the temporary advantage of the more frequent presence of Congress, urgent pleas were advanced in favor of sites both farther north and south. During the existence of this sectional strife the Federal Constitution was adopted, which gave Congress the power "to exercise exclusive legislation in all cases whatsoever over such district" (not exceeding 10 miles square) "as might be accepted for the seat of the government." The Federal government under the Constitution was inaugurated at the session of Congress in New York, March 4, 1789.

Meanwhile, by an act of its general assembly, Dec. 23, 1788, the State of Maryland offered to cede to the general government "any district" in that State not exceeding ten miles square—to which offer was afterwards added a grant of \$72,000; and, on Dec. 3, 1789, the general assembly of the commonwealth of Virginia offered a similar cession of "a tract of country," adding afterwards a grant of \$120,000. These moneys were to aid in the purchase of land and in the erection of public buildings. These offers were accepted by Congress, and a final decision of the vexed question as to site was attained by the passage of the act of July 16, 1790, the first section of which declares "that a district or territory not exceeding 10 miles square, to be located as hereafter directed on the river Potomac, at some space between the mouths of the Eastern branch and Conogocheague, be, and the same is hereby, accepted for the permanent seat of the government of the United States." It was also at the same time enacted that the President of the United States be authorized to appoint three commissioners to survey and define "a district of territory" under the limitations mentioned, and that these commissioners should have power to purchase or accept such quantity of land on the eastern side of said river within the said district as the President should deem proper and according to such plans as he should approve, and that they should, prior to the first Monday of December, 1800, provide suitable buildings for the accommodation of Congress, and of the President, and for the public offices of the

government. Also, that prior to the first Monday in December, 1790, all the governmental offices should be removed to the city of Philadelphia, and should remain there until the first Monday in December, 1800, on which day the seat of government of the United States should be transferred to the district and place aforesaid. This act was approved by the President, George Washington, who all along had taken an earnest interest in the subject, and thereafter gave his active personal attention to carrying into effect its minutest requirements.

By virtue of this act, President Washington, on Jan. 22, 1791, appointed Thomas Johnson and Daniel Carroll, of Maryland, and David Stuart, of Virginia, commissioners, and also issued a proclamation, dated Jan. 24, 1791, designating the experimental boundary lines of the district to be accepted, and directing the commissioners that, after they had run the lines, they should survey and define, by proper metes and bounds, the part within the same for immediate location and acceptance. It may be stated here that the Conogocheague, named in this memorable act, is a small creek entering the Potomac River at Williamsport, in Washington co., Md. The boundary lines run by the commissioners were, commencing at Jones' Point at the mouth of Hunting Creek on the Virginia shore south of the city of Alexandria, first in a N. W. direction for 10 miles, then N. E. for 10 miles, then S. E. for 10 miles, thence S. W. for 10 miles to the place of beginning. But, as the original act of July 16, 1790, required the location of the district to be *above* the mouth of the Eastern Branch, and the fourth of the above-named lines was found to run *below* or on the south side of said mouth, an act to amend was passed, March 3, 1791, so as to include part of the lands lying below, also naming the town of Alexandria as to be included, and with the further important proviso that "nothing herein contained shall authorize the erection of the public buildings otherwise than on the Maryland side of the river Potomac."

To give his personal supervision the President soon after this left Philadelphia, and on March 28, 1791, he arrived at Georgetown, and on the next day he rode over the new district in company with the commissioners and the two surveyors, Andrew Ellicott and Major Peter Charles L'Enfant. On the evening of that day (March 29) a meeting was held for the purpose of effecting a friendly understanding between the property-holders in the new district and the United States commissioners, which was perfected by a written agreement signed next day by nineteen of these property-holders, representing interests in Georgetown, and in hamlets called Hamburg or Funkstown near the present Observatory, and Carrollsburg near the present arsenal at Greenleaf's Point. On March 30, 1791, while still at Georgetown, the President issued his proclamation declaring the location of the territory of 10 miles square, in conformity with the amendatory act of Congress of March 3, 1791, and directing the commissioners to have the lines run, defined, and limited, and to make their report thereon, and that this should be the whole territory accepted as the district for the permanent seat of the government—the place of beginning being, as before, at Jones' Point, one of the diagonals of the square being directed due north, and the other diagonal west-east. This is the figure of the present District, with the important exception that all the land on the right bank of the Potomac River, including the county and city of Alexandria, was retroceded to the State of Virginia by act of Congress, July 9, 1846.

On April 15, 1791, the initial or corner-stone of the lines of the Federal territory was planted at Jones' Point, in the presence of the commissioners and the surveyor, Ellicott, with Masonic solemnities. Negotiations with the local property-holders were continued, and on June 29, 1791, a final settlement with them was made, certain lots being reserved by them or exchanged for part

of the new public domain, while others were sold at public auction to defray the costs of the new buildings and other public structures. The plan of the city was prepared, under the direction of the President, by Major L'Enfant, and was carried out by Mr. Andrew Ellicott, the other surveyor employed.

At first the future capital was alluded to as the "Federal City," and it is not until Sept. 9, 1791, that we find in a letter of the commissioners of that date that they "have agreed that the Federal District shall be called the 'Territory of Columbia,' and the Federal city the 'City of Washington.'"

During the year 1800 the public archives were removed from Philadelphia to the new seat of the government, where Congress soon after met (Nov. 21, 1800). On May 3, 1802, the city of Washington was incorporated. Its neighbor, Georgetown, had been an incorporated city from Dec. 25, 1789, having been first laid out for a town in 1751.

These, however, remained distinct corporations until both were abolished by act of Congress, Feb. 21, 1871, as well as the county of Washington, the name until then applied to all the part of the District outside the bounds of these two cities. In the new city, gradually, various buildings were erected for the governmental offices, and on Sept. 18, 1793, the foundation-stone of the north wing of the capitol was laid by George Washington. This was completed in 1800, and the remaining portions—the south wing and the central building—were finally completed in 1827. Part of this was burned (Aug. 24, 1814) by the British troops during the war with Great Britain (1812–1815). For an account of the public buildings, parks, avenues and streets, monuments, and other features of the city, we must refer to the article WASHINGTON (CITY OF), as well as for a detailed account of the governmental departments, schools, colleges, and other public institutions, etc.

In this place we shall only add that on April 16, 1862, slavery was abolished in the District; on Jan. 1, 1863, the Emancipation Proclamation of President Lincoln took effect; and on Jan. 8, 1867, colored men were admitted to vote in the District.

Population.—The following table shows the population of the District at each decennial census, exclusive of that portion of the ten miles square originally belonging to and retroceded to Virginia in 1846:

Census.	White.	Free Colored.	Slave.	Total Pop.
1800.....	5,672	400	2,072	8,144
1810.....	10,345	1,572	3,554	15,471
1820.....	16,058	2,758	4,520	23,336
1830.....	21,152	4,604	4,505	30,261
1840.....	23,926	6,499	3,320	33,745
1850.....	37,941	10,059	3,687	51,687
1860.....	60,764	11,131	3,185	75,080
1870.....	88,296	43,404	.....	131,700
1880.....	118,028	59,596	.....	177,624

In this table, in the column "white," are included, for 1860, 1 Indian; for 1870, 3 Chinese and 15 Indians; and for 1880, 13 Chinese, 4 Japanese, and 5 Indians.

The increase from 1870 to 1880 was 34.8 per cent. Of the total population in 1880 there were 83,578 males, and 94,046 females; native, 160,502 (of these 80,702 born in the District); foreign-born, 17,122. The density of the population to the square mile was 2960.4. There were 34,896 families, averaging 5.1 persons, and 28,687 dwellings, averaging 6.2 persons to each. There were 164 blind, 169 deaf and mute, 860 insane, and 13 idiotic; 184 paupers were supported during the year, and 381 persons were convicted of crimes. There were 1464 persons engaged in agriculture; 15,337 in manufactures and mechanical industries; 39,975 in professional and personal services; and 9848 in trade and transportation. Of the total population, in 1880, there were credited to the city of Washington 147,293; to

the city of Georgetown 12,578; and to the remainder of the District, including 4 villages, 17,753.

The number of farms within the District in 1880 was 435; the area of improved land was 12,632 acres; value of farms, including land, buildings, and fences, \$3,632,403. Estimated value of farm products (for 1879), \$514,441. Of these there were 29,750 bushels of Indian corn, from 1032 acres; 17,546 bushels of oats, rye, and wheat, from 852 acres; and 3759 tons of hay, from 2361 acres. The principal industry, however, of this class is now in market-gardening. The number of manufacturing establishments was 971; average number of hands employed, 7146; capital, \$5,552,526; value of products, \$11,882,316.

The surface of the land of the District is generally undulating, and but little elevated above sea-level. Within the city limits it varies from about 20 feet up to about 90 feet above sea-level; the plateau on the western edge of which the capitol stands being from 60 feet to 90 feet: round the city the ground rises in the directions N. E., N., and N. W., to elevations of about 120, 360, and 300 feet respectively, at the District lines. Along the southeastern line there is a ridge about 150 to 200 feet in height.

Within the District there are two considerable creeks flowing into the Potomac River—Rock Creek and the so-called Eastern Branch. The former, entirely unnavigable, pursues a sinuous course from north to south, through a picturesque, well-wooded valley; while the latter, flowing from the N. E., though in early times it was navigable as far as Bladensburg, about 6 miles, whence was shipped much tobacco, is now silted up and disused. Near its outlet, however, the water is deep enough to afford a channel to the United States Navy Yard there situated. Between these two there runs into the Potomac a smaller one, bearing originally the name of Goose Creek, but now that of Tiber: tradition connecting with it one of the early land-owners by name of Pope, who, from mere whim, or with prophetic prescience, was accustomed to speak of his tract as another Rome, its rivulet as the Tiber, and the adjacent height as the Capitoline Hill.

The soil of the District is a light sandy loam, moderately fertile, reposing upon rocks of the cretaceous system, the surface covered by drift, consisting generally of sandstone, limestone, boulders and pebbles of quartz, gravel, sand, clay, and loam, affording in places a good brick-clay. West of Rock Creek gneiss appears and is quarried for building purposes.

The area of the District was in parts, in early times, well wooded, but is now generally bare and impoverished.

The climate of the District is that of its latitude, elevation, and distance from the ocean—the summers very warm—the winters in general mild, though subject to exceptional severity of cold. The climatological features of Washington City may be thus summarized: mean temperature of spring 52°; summer 75°; autumn 57°; winter 34°; mean temperature of the whole year 54½°. For a series of 28 years the rainfall has been found to average for the whole year 37.6 inches; spring 9.9 ins.; summer 11.0 ins.; autumn 8.6 ins.; winter 8.1 ins. Thunder-storms are frequent in some seasons, but this vicinity seems to be exempt from the violent windstorms which pass over regions farther west.

The District is generally healthy, although in places near the water-courses bilious and intermittent fevers during summer and autumn are experienced to some extent. These may be in the future subdued, by the extension of the drainage and sewerage systems, and by the improvements in progress on the lines of the river's channel and shores.

The mortality statistics of the District compare favorably with those of other large cities. As exhibited in the report of Dr. Smith Townshend, health officer of the District, for the year 1880 the death-rate was—for whites 17.63 per 1000; for the colored population 35.71; average for all 23.68 per 1000. For the

year ending June 30, 1883, in an estimated population of 191,980, the deaths were 4286, being at the rate of 17.98 for whites and 30.68 for colored; for all 22.33. The average death-rate of the whole population for 8 years ending in 1883 was 24.42 per 1000 per annum.

The commerce of the District, from Washington and its port of entry, Georgetown, is comparatively small—the brisk trade which the latter enjoyed in early times with Great Britain, the West India Islands, and coast-wise having fallen off almost entirely. Lines of steamboats run now to Baltimore, Norfolk, and New York. The Chesapeake and Ohio Canal (built between 1828 and 1850) connects the coal-field at Cumberland, Md., with the head of tide-water at Georgetown, and is continued, under another company, to Alexandria, Va. It is 184½ miles in length.

Four lines of railroad traverse the District: the Baltimore and Ohio Railroad by its Washington and Metropolitan branches, and by a branch to Shepherd on the Potomac opposite Alexandria; and the Baltimore and Potomac Railroad, which has its southern terminus in Washington. With these the Virginia railway system is joined by a bridge over the Potomac.

The water-supply of the city of Washington is furnished from the Potomac River—taken off by a dam above the Great Falls, about 14 miles above the city, and thence led by a conduit and pipes to a receiving reservoir on the N. W. line of the District, thence to a distributing reservoir, and carried across Rock Creek by an arched bridge of 200 feet span formed by the great main pipes (see article BRIDGES, Vol. I., p. 634), and around the northern part of the city, where another distributing reservoir is being constructed. The daily supply per capita is now larger than for any other city in the world, the total supply being upwards of 24,300,000 gallons in June, 1883. With a proposed public park on the banks of Rock Creek is conjoined the project for another storage reservoir of large capacity.

Government of the District.—We have already given the history of the establishment of the governmental control over the District of Columbia up to 1800. On May 3, 1802, the city of Washington was incorporated under a mayor, board of aldermen, council, and the requisite officers for municipal management. Congress still, as empowered by the organic law, claimed the right of "exclusive jurisdiction," but the laws of the two States from which the federal district was formed remained in force in the respective parts taken from each. The people of the District had no delegate or representative in Congress, and no voice in the choosing of the presidential electors. The city of Georgetown had likewise its municipal officers, and the remaining portion of the District outside the limits of these two cities was known as the county of Washington, and matters relating to it were referred to a managing body known as the levy court. These incorporations, with amendments from time to time in their details, continued to exist for nearly three-quarters of a century, during which, though assisted occasionally by Congress, they contrived to create a considerable debt, until they were abolished by an act of Congress (Feb. 21, 1871).

By the same act of Congress a territorial form of government was substituted, under which the citizens were granted the right of electing a delegate to Congress with the same privileges as the delegates of other Territories. The charters of the cities of Washington and Georgetown were repealed from June 1, 1871, and the levy court of the county was abolished, but the act provided that the portions of the District included within the limits of the two cities should continue to be known as the cities of Washington and Georgetown respectively. This territorial government, under the name of District of Columbia, had a governor, nominated by the President of the United States and confirmed by the Senate; a legislative assembly, composed of a council of 11 members, nomi-

nated by the President and confirmed by the Senate, and a house of delegates of 22 members, elected by the people. The wants and claims of the citizens were represented in Congress by the delegate. There were a board of health and a board of public works. This latter board, of which the governor was *ex officio* president, was in reality the most influential under the new arrangement, and projected and carried into execution a vast scheme of improvements in and around the city of Washington, adding at the same time enormously to the debt and to the temporary embarrassment of the property-holders.

This increase of debt, together with other reasons, led to the sweeping away, in its turn, of the territorial form of government by the passage of an act of Congress, June 20, 1874, substituting what was termed a "provisional" government, which was finally superseded, in 1878, by the "permanent" government constituted by act of Congress approved June 11, 1878, which has continued to the present time (1884). Under this the local government is known as the "District of Columbia," a municipal corporation whose jurisdiction extends over what were the municipalities of the "city of Washington," the "city of Georgetown," and the levy court of the "county of Washington." It is administered by a board of three commissioners, two of whom are appointed from civil life by the President of the United States, by and with the advice and consent of the Senate. The other commissioner is an officer of the corps of engineers of the army, detailed by the President of the United States. There is no local legislative body. Congress, as required by the Constitution of the United States, exercises exclusive legislation.

The District has no code. The District judiciary (or Supreme Court of the District of Columbia) consists of a chief-justice and five associate justices, with a district attorney, United States marshal, register of wills, and recorder of deeds. There is also a police court, with a judge. Under the control of the commissioners are the metropolitan police, the fire department, the health department, a collector of taxes, assessor, auditor and comptroller, coroner, surveyor, inspector of buildings, and the superintendent of the public schools. These schools, forty-five in number, are for whites and colored separately, and are in a high state of efficiency. They have 555 teachers, and a total enrollment of about 30,000 scholars.

The revenues of the District are derived from two sources: first, from taxes levied on private property and privileges, and, secondly, from appropriations by Congress of an amount equal to the receipts from private sources. In 1882 the assessed value of real property used for agricultural purposes was \$4,471,865 (rate of tax \$1 per \$100); other real property (exclusive of property of the United States), \$85,836,630 (rate of tax \$1.50 per \$100); personal property, \$9,666,272 (rate of tax \$1.50 per \$100); valuation of real property belonging to the United States (exclusive of the streets and avenues in the city of Washington, the fee-simple of which is in the United States), \$83,416,117.

For the year ending June 30, 1883, the receipts of the District of Columbia were \$4,184,376.23, and the expenditures \$3,722,795.94. There is no floating debt. The indebtedness is funded as a sinking-fund, of which the treasurer of the United States is *ex officio* commissioner. The debt at June 1, 1882, was \$21,888,790.18.

(W. L. N.)

DITTANY (Lat. *dictamnus*; Gr. *δίκταμνος*. Old writers derive the name from Mount Dictæ in Crete.) A powerfully fragrant herb of the order *Rutaceæ*, and also called *FRAXINELLA*, which see. The dittany of ancient writers is thought to be *Origanum dictamnus*, a species of marjoram. To it they ascribed remarkable virtues. The *Cunila mariana* is sometimes called dittany in the United States. It is a pleasantly fragrant herb, somewhat used in domestic medicine, and having diaphoretic and carminative qualities.

DIVORCE, as it comes under the purview and operation of civil law, has relations to public virtue which depend upon acknowledged common principles of public opinion. The public opinion of America in relation to divorce had its germinal origin in New England. Indeed most of the seeds of civic, public opinion, as well as their natural forces of evolution, have sprung from that soil.

The naturalistic opinion that marriage is a civil contract merely was wisdom in old pagan and philosophic Rome, and doubtless promoted that fundamental patriotism on which rested not only loyalty but the whole structure also of the state-religion. This was revived in the earliest form of Puritan law. Among the Puritans the belief that marriage was a divine institution was mingled with and affected by the conception that the state is a politico-religious commonwealth. The early New England idea of the state gave way before the pressure of immigration, but the widespread public opinion that marriage is "simply a civil contract," and that it only confers "purely a civil right," is an outgrowth of early New England teaching. Of course this principle did not do away, from the first, with all use of religious marriage ceremonies. The traditions were too strong in favor of solemn sanctions to the union; while a devout recognition of God's presence in every formal renewal of His own appointment of marriage, demanded, among religious people, that a religious ceremony should bless, and among cultivated people that it should grace, the occasion.

Still the leaven of the idea of "a merely civil contract" worked in the public mind. Hence at first legislatures were empowered to grant divorces. They who bound civil contracts could of course loose them. While legislatures kept this authority in their own hands divorces remained comparatively rare. But the acknowledged principle of the "civil contract," working naturally in the public mind, compelled legislatures to put marriage on the same ground with other civil contracts, and to allow or grant divorces.

While the theocratic opinions of the early Puritans prevailed, marriage was kept from degradation to the rank of a *secular* contract. The civil government itself was regarded by the Puritans as a divine institution: not formally indeed, but essentially. Hence the existing government was revered and obeyed as God's ministrant. While marriage, therefore, was counted a civil contract, it was not entirely shorn of religious obligation. This old view, however, has now very nearly died out, even in New England. The legislatures show very slight signs of consciously acting as under Divine authority. They have become so secularized that a civil contract is regarded by them as merely a secular contract. Even marriage itself has fallen into the latter category. As a secular contract, however, it still remains at the basis of social order and political stability. Hence it is a subject for statesmen to consider, and for governments to handle carefully; for the family, which marriage only forms, is the tap-root of the tree of national existence; indeed the basis of all social order.

This important and serious connection between marriage and all good public order seems to have been strangely overlooked by our State legislatures. Instead of retaining divorce within their own jurisdiction, they have committed it to the courts. Even here action is not confined to the courts of higher jurisdiction where learning and wisdom are supposed to prevail, but divorces may be granted in some mere county courts. The grounds of divorce also are extended beyond causes that vitiate the marriage itself, and made to include even such trivial points as alleged incompatibility of temper, neglect, or even desertion—this latter in some cases for only one year.

It will be observed, in the Digest of Divorce Laws, which is appended to this article, that the largest

liberty of divorce exists in Maine. There, in addition to all other causes, a divorce may be granted "when the judge deems it reasonable and proper, and consistent with peace and morality." Either party also may be a witness, and either may marry again.

In South Carolina, since 1878, no divorces have been legal. In New Mexico divorces to 1872 confirmed; none lawful since, except for adultery, inhuman treatment, or abandonment.

In Connecticut the divorce laws were extended in 1849, so as to include "general misconduct." A sudden increase of the number of divorces ensued; so that a popular pressure compelled the legislature, in 1878, to rescind this "omnibus clause." An equally sudden diminution in number of divorces followed.

It will be noticed that a great difference appears between the North and the South. In New England, and along the whole western course of northern migration, the State laws upon divorce are most lax. The extreme North-west responds to the extreme North-east, and Maine and Montana Territory lead the flank-wings of progress, in laxity of the marriage-bond. In the latter, divorce may be granted if the party "leaves the petitioner and the Territory without intention of returning." Utah perhaps contests the palm, in a clause granting divorce, "when it is proved that parties cannot live together amicably and separation is desired."

Every State has its own code and practice in divorce. Some confine jurisdiction to the Supreme Courts of State or county, some extend it to Common Pleas and Probate Courts. Some require assurance of due notice to the other party, and never "decree" a divorce by default; while others only require proof of diligence in sending copies of published notice to the last address of the absent party, and do grant divorces upon *ex parte* testimony. The legal causes of divorce begin at incest and adultery, and run down to impotency, force and fraud used in effecting marriage, crime against nature, gross neglect of marital duty, pregnancy by another at time of marriage, insupportable cruelty of either party, insanity or idiocy at marriage or in some cases after it, absence from seven years to one year, habitual drunkenness sometimes for only one year, habitual and wilful neglect, intolerable severity, neglect of husband for two years to support his wife unless great poverty is proved, refusal to provide wife with "necessaries of life," joining society adverse to marriage and refusing cohabitation, and finally, difference of color, including negroes, and in one case Chinese.

Divorces granted in one State do not legally extend to others. In Ohio, however, and probably in other States, a decree of divorce in another State is a valid plea for the same release to a petitioner bound by such decree. In Massachusetts an appeal lies in all cases to the governor in council.

The legislation which has resulted in the existing lax law of divorce has been partly a cause and partly an effect of laxity of public principles, both moral and political. Indeed the growth is remarkable of the idea that marriage is a simple bargain between man and woman; and that, like any other bargain, it may be closed or changed according to the wills, fancies, or even convenience of the parties. In fact, the relation of marriage to the permanent order of society is fast going out of popular knowledge; and the law-makers also are leaving it out of view. The popular mind is concentrating upon the individual instead of upon both the individual and the organisms of family, society, and state. It is, of course, difficult to keep these two correlative principles in view. It is easier for every person to think of what may benefit himself, or give him least annoyance, than of what may be necessary for the security, preservation, and good order of the body politic. Hence the drift of public opinion, and the consequent course of legal development, in codes and cases, is towards such enlargement of license in relation to marriage as may impose

the least possible restraint upon individual choice and changes of feeling or fancy.

Philanthropists are combining, and through the press and otherwise are making earnest efforts to check, if possible, the growing moral laxity touching the relations of the sexes. They are pointing out upon philosophico-economical grounds the exceeding importance for the stability of society and for the preservation of culture with the amenities of life, of the stability, inviolability and permanence of marriage. Statesmen are siding with the philanthropists. Unfortunately, however, the politicians who make, and the judges who administer, our laws, are not always statesmen and not often philanthropists. The honorable members of the bar are generally on the side of the permanency of marriage; though it is true that some lawyers of talent and even of high moral and social reputation do not scruple to aid in procuring very unnecessary and, in some cases, quite scandalous divorces. The confusion arising from differences in the laws of marriage have led to important movements towards securing uniformity of code between the States.

In Dr. Woolsey's learned and valuable work upon *Divorce and Divorce Legislation*, some important tables are given. One shows the average of divorces to the whole number of marriages in the State of Ohio, from 1865 to 1874, to have been as 1 to 26.7. In the first year it was 1:26, and in the last 1:23. The year 1867 showed 1:30, and 1868, 1:33.2. The close of the war explains this. Dr. Woolsey adds, "I am informed that the ratio of divorces to marriages in the year from July 1, 1878, to July 1, 1879, is as 1 to 18, which would imply a considerable increase since 1874." In the 12 western counties of Ohio, settled by New Englanders, especially from Connecticut, the ratio of divorce to marriage is as 1 to 11; it is in Cuyahoga co., 1 to 9.9; in Ashtabula, 1 to 8.5; and in Lake co., 1 to 7. In Gallia co., where Welshmen and Southerners form the bulk of the population, the ratio is 1 to 50, and in Coshocton co., 1 to 47." Pages 243-4.

In a comparative table between marriages and divorces for 1878, in the States of Massachusetts, Connecticut, Vermont, and Rhode Island, Dr. Woolsey gives the whole ratio respectively at 1 to 21.4, 1 to 10.76, 1 to 14, 1 to 11.8. If, however, the marriages of Roman Catholics be deducted—they not being allowed divorce for any cause—the ratio would stand for Massachusetts, 1 to 14.86; for Connecticut, 1 to 8.22; for Vermont, 1 to 12.4; and for Rhode Island, 1 to 8.5. This he proceeds to show may not be quite fair, since some Romanists do get divorced, yet upon the whole it is not far wrong.

In the annual address of Bishop Williams to his diocese of Connecticut, June 14, 1881, occurs the following quotation:

"If we sum up for New England, there were in the year of grace 1878, in Maine, 478 divorces; in New Hampshire, 241; in Vermont, 197; in Massachusetts, 600; in Connecticut, 401; and in Rhode Island, 196; making a total of 2113, and a larger ratio in proportion to the population than in France in the days of the revolution, though far less than in the city of Paris. On the basis of population by the present census, there was 1 divorce to every 1357 inhabitants in Maine; 1 to every 1439 in New Hampshire; 1 to every 1687 in Vermont; 1 to every 2971 in Massachusetts; 1 to every 1553 in Connecticut; and 1 to every 1411 in Rhode Island."

The statistics of the whole country are not available. Enough has been given to show the direction of the current in law, public opinion, and the prevailing moral sentiments, both personal and social. It is evident that the fundamental principle or idea—in the minds of the law-makers and administrators, and in that of the multitude who are their electors—is, that all questions of public importance and general interest must be settled, not upon enlarged views of what may best conduce to the purity of society and the good of

the whole, but upon the bearing of each case upon the comfort, convenience, feeling, or will of the parties directly interested. The result of this course is evidently not yet. The possibilities of license, which lie in the line of this downward progress, may soon become actual. Then, of course, our law-makers and administrators, with their constituents, will be brought face to face, not with a merely theoretic problem, but with a real mortal conflict, in which public good order will be at stake, family purity imperilled—perhaps its exclusive right invaded—political stability shaken, and our whole civilization tried as by fire. (B. F.)

II. DIVORCE LAWS IN THE UNITED STATES.—Divorce, under various conditions, is legal in every State and Territory of the Union, with the exception of South Carolina. In this State, by act of Dec. 20, 1878, all previous divorces were legalized, and none allowed after that date.

Divorce is of two kinds: the complete and total, called divorce *a vinculo matrimonii*, which usually restores both parties to their condition before marriage; and the partial, called divorce *a mensa et thoro*, which is simply legalized separation, and never involves any restoration of original condition, or dissolution of marital obligations as to support, etc. Of course, while the divorce *a mensa* can be granted alone, it is always included in our *a vinculo*. The differences of practice in the several States will be shown under the various headings which follow.

I. *Jurisdiction and kinds of divorce*.—Jurisdiction of divorce, until within recent years, lay with the legislatures of most of the States, but at the present time it is not expressly conferred on them in any State, and is constitutionally prohibited in nearly all. The only legislatures which exercise jurisdiction in divorce at present are those of Delaware, Idaho, Washington Territory, and one or two others—in all these co-ordinately with the courts. It is conferred on any Court in Chancery in Alabama, Kentucky, Maryland, Mississippi, New Jersey, New York, Oregon, Tennessee, and Wyoming; on the Courts of Common Pleas in Indiana, Ohio, and Pennsylvania; on the District Courts in Arizona, Dakota, Idaho, Iowa, Kansas, Louisiana, Minnesota, Montana, Nebraska, New Mexico, Texas, and Washington Territory; on the Circuit Courts in Florida, Illinois, Indiana, Iowa, Michigan, and Missouri; on Circuit Court in Chancery in Arkansas, Tennessee, Virginia, West Virginia, and Wisconsin; on Probate Courts in Nevada and Utah; on Supreme Courts in the District of Columbia, Massachusetts, and Rhode Island; on the Superior Courts in California, Connecticut, Delaware, Georgia, Indiana, Maine, New Hampshire, North Carolina, and Vermont; and on the District Court in Chancery in Colorado.

Both kinds of divorce are legal in Alabama, Arizona, California, Dakota, District of Columbia, Georgia, Kentucky, Maine, Maryland, Michigan, Nebraska, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, Tennessee, Virginia, West Virginia, and Wisconsin. In Louisiana and Utah no total divorce is granted until preceded by separation *a mensa et thoro* for one year (except for an infamous crime or adultery), and in Minnesota, though both kinds are legal, the partial divorce is granted only on petition of wife. A declaration by the court that a marriage is null and void *ab initio* is legal in some States for causes which in others are grounds of divorce.

Only one kind of divorce—that *a vinculo*—is legal in Arkansas, Colorado, Connecticut, Florida, Idaho, Illinois, Indiana, Iowa, Kansas, Massachusetts, Mississippi, Montana, Nevada, New Hampshire, New Mexico, Vermont, and Washington Territory.

II. *Causes for which divorce may be granted*.—At the head of this list stands (1) *Adultery* and (2) *Natural impotency at marriage*, which are valid grounds in every State. (3) *Bigamy*, either wilful or ignorant, is ground for a decree of nullity in most States, but of divorce in Arkansas, Colorado, Florida, Kansas, Ohio,

Pennsylvania, Tennessee, Montana, and New Jersey. (4) *Abandonment or desertion*. This must continue for one year in Arizona, Arkansas, California, Colorado, Dakota, Florida, Idaho, Kansas, Kentucky, Missouri, Montana, Nevada, Utah, Washington Territory, and Wisconsin; for two years in Alabama, Illinois, Indiana, Iowa, Michigan, Mississippi, Nebraska, Pennsylvania, and Tennessee; for three years in Connecticut, Delaware, District of Columbia, Georgia, Maine, Maryland, Massachusetts, Minnesota, New Jersey, Ohio, Oregon, Texas, Vermont, and West Virginia; for five years in Rhode Island and Virginia, and without specification of time in Louisiana, North Carolina, and New Mexico. (5) *Simple unexplained absence* is a good ground in Connecticut and Vermont, after seven years' duration; after three years in New Hampshire, and in Montana for any length of time, if intention of desertion is proved; also simple separation after five years in Kentucky and Wisconsin. (6) *Inhuman treatment* of varying degrees of aggravation is a valid cause in every State for either total or partial divorce. Intimately connected with this is (7) an *attempt on the life* of one consort by the other, specified as a cause in Illinois, Louisiana, and Tennessee. (8) *Habitual drunkenness* is valid in very many States, mostly unrestricted in time, but specified as two years in Idaho, Illinois, and Oregon; one year in Arkansas, California, Colorado, Dakota, Florida, Kentucky, Minnesota, Missouri, Montana, and Wisconsin, and three years in New Hampshire and Ohio. (9) *Neglect to provide support* is a good cause, if prolonged for three years, in Delaware; for two years in Idaho, Indiana, and Kansas; for one year in California, Colorado, Dakota, and Nevada; and without restriction of time in Massachusetts, Michigan, Minnesota, Nebraska, Rhode Island, Utah, Vermont, Virginia, West Virginia, and Wisconsin. (10) *Imprisonment for crime* can divorce after five years in Massachusetts; three years in Michigan, Nebraska, Vermont, and Wisconsin; two years in Alabama, Georgia, and Idaho; more than two years in Pennsylvania; and without limitation in Minnesota, Mississippi, Ohio, Virginia, and Washington Territory. Very similar is (11) *Conviction of felony*, which is a cause in Arizona, Arkansas, California, Colorado, Connecticut, Dakota, Delaware, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Missouri, Nevada, Oregon, Tennessee, Texas (twelve months afterward), Utah, Virginia, West Virginia, and Montana. In Rhode Island marriage is voidable on "civil death," i.e., a conviction of arson or homicide. (12) *Pregnancy of wife at marriage without agency or consent of husband* is a valid ground in Alabama, Georgia, Kansas, Kentucky, Missouri, North Carolina, Tennessee, Virginia, and West Virginia; so also in Iowa, unless the wife can prove that an illegitimate child of husband was alive at their marriage. (13) *Marriage within the prohibited degrees* in many States is invalidated *ab initio* without special proceedings, but in Florida, Georgia, Mississippi, Pennsylvania, Virginia, and New Jersey, it is merely a ground of divorce; so if (14) *the female is under age* and marries without consent of parent or guardian, in Arizona, Delaware, and Idaho, an action of divorce will lie; in most other States the marriage is invalid *ab initio*, unless confirmed by subsequent cohabitation after age was attained. (15) *Force or fraud* in contracting the marriage justifies divorce in Arizona, Connecticut, Delaware, Georgia, Idaho, Kansas, Kentucky, Ohio, Pennsylvania, and Washington Territory; in most other States such marriage is void. A divorce for (16) *lunacy or idiocy* may be had in the District of Columbia, Georgia, Mississippi, Virginia, and Wisconsin. (17) *Vagrancy* is a ground in Missouri; "any cause rendering cohabitation impossible," in Washington Territory. (18) *Uniting with any society which discountenances the marriage relation* is a valid ground in Kentucky, Massachusetts, and New Hampshire; so is "gross misbehavior" in Rhode Island, and the contracting or concealing of any loathsome disease in

Kentucky. Finally, *absolute discretion* as to the propriety of granting divorce in each individual case is conferred upon the court in Arizona and Maine.

III. *Conditions under which divorce will be refused*.—These are practically the same in all the States, though the local methods of interpretation vary slightly. 1. *Connivance*. If it be proved in any way that a conspiracy was entered into by the parties to obtain a divorce by collusion (see COLLUSION), such divorce will uniformly be refused. 2. *Condonation* bars divorce. This, in nearly every State, may be either (a) expressed, as by written or verbal contract in the presence of witnesses, or (b) implied, by such continued and voluntary cohabitation after the act complained of as will reasonably raise the presumption of forgiveness. 3. *Recrimination* will bar divorce. In most States this extends only to a recrimination of a similar offence—thus a counter charge of cruelty will not bar a divorce for adultery. This custom is not universal, however, and there is no definite statute on the subject.

Lastly, *lapse of time without entering suit* bars divorce. This is consonant with the doctrine of the statute of limitations. It is defined as one year in Oregon and Washington Territory; two years in California, Dakota, Idaho, Indiana, Nebraska, and New York, the application of the statute in the last four States being to divorce for impotency only; three years in Minnesota and Wisconsin, and five years in Arkansas, Michigan, New York, and Virginia. In Massachusetts it is defined as "unreasonable delay." In the other States, even where no statute exists on the subject, unreasonable delay will operate unfavorably against the plaintiff.

IV. *Residence of petitioner and notice to respondent*.—The majority of States favor a residence of one year before filing petition; such is the case in Alabama, Arkansas, Colorado, Illinois, Iowa, Kansas, Kentucky, Maine, Michigan, Minnesota, Mississippi, Missouri, Montana, New York, Ohio, Oregon, Pennsylvania, Utah, and Wisconsin, excepting in special cases. Two years is the limit in Florida, Maryland, Vermont, and Indiana (where six months in county is also required), three years in Connecticut, Massachusetts, and New Jersey (if for desertion), six months in Arizona, California, Idaho, Nebraska, and Wyoming; ninety days in Dakota; residence at time of cause in New Jersey; "bona fide residence" in New Hampshire and Texas; and no particular specification in the statutes of other States. Nearly all the above are with exceptions in particular cases, such as desertion, etc. In every State the notice of suit must be personal if possible, as in other civil cases, with time specified in the respective codes of civil procedure. This is particularly set forth as ten days in Indiana, twelve days in Vermont, fourteen days in Maine, thirty days in Nevada, and six weeks in Ohio. If personal service is impossible, on account of non-residence or uncertainty of defendant's whereabouts, publication in one or more county newspapers is generally had, the time for this being not stated in Alabama and California; specified as three months in Florida and Nevada; one month in Missouri; four weeks in Illinois, Iowa, and Pennsylvania; three weeks in Indiana and Vermont; six weeks in Rhode Island; six weeks and thirty days interval in Dakota, and at "discretion of court" in Connecticut, District of Columbia, Massachusetts, and New Hampshire. In other States local usages prevail.

V. *Legitimacy of issue*.—There is a continually increasing tendency throughout the United States toward refusing to allow divorce to bastardize previous issue. In many States divorce does not affect legitimacy in any case, and in nearly all in only one or two cases. These are as follows: in divorce for wilful bigamy in Colorado, Delaware, District of Columbia, Florida, Illinois, Indiana, Iowa, Maine, Massachusetts, Michigan, Mississippi, New Jersey, and Vermont;

at discretion of court for adultery in California, Nebraska, Wyoming, District of Columbia, and New Hampshire; expressly for adultery of wife only in Alabama, Idaho, and Louisiana; for pregnancy of wife at marriage without consent of husband in Georgia, Kentucky, and Mississippi; for incest and impotency in Iowa, and for incest only in Kentucky, Louisiana, and Maine. In some of the other States, in the case of void marriage, issue is illegitimate, but the above comprise the only instances of bastardy as the result of divorce.

VI. *Alimony*.—The discretion as to the amount and character of the alimony granted lies with the court exercising jurisdiction in every State. Decrees of alimony may also be revised or otherwise altered at any time subsequent to the decree of divorce. As to the distribution of joint property there is considerable diversity of statutes, with the general disposition to award in favor of the injured party. Special State practice on this point may be noted as follows: Arkansas statutes direct an equal division of joint property; so in California. Connecticut allows alimony not exceeding one-third of husband's estate; Florida prohibits alimony in suits for adultery of wife. A favorite rule seems to be to grant husband all of real estate of wife and so much of her personal estate as is not absolutely required for her support, if the fault is hers, but if his, then she is to have all her own property and part of his beside. This is the law in Delaware, Rhode Island, and Vermont; also in Ohio as to the latter clause. In Louisiana each take their original property and one-half of community. In Massachusetts real estate and part of personal goes to wife, except in case of her adultery; so in Minnesota and Nebraska. In North Carolina defendant loses all dower right estate by curtesy and estate of any kind derived from marriage, but in Texas "no person can be compelled to surrender title to real estate."

VII. *Other effects of divorce and miscellaneous points of practice*.—The general effect of absolute divorce in the various States may be said to be a restoration of both parties to their condition previous to marriage, and remarriage without restriction is usually allowed. Exceptions to this may be noted in Delaware, where defendant for adultery may not marry *particeps criminis*, and in Indiana, if divorce was decreed by default, defendant may not remarry at all for two years. In Georgia remarriage depends on discretion of court decreeing divorce, while in Virginia such discretion operates only against defendant. If divorce was through fault of wife, she may not remarry for ten months in Louisiana, while remarriage of the guilty party may be absolutely prohibited in Mississippi. In Massachusetts defendant may not remarry for two years; Vermont says three years, and Missouri five years, except by special permission of court. New York prohibits remarriage of defendant for five years, unless plaintiff has married again. Of course, in the event of the death of either of the parties subsequent to the divorce, any disability of the survivor as to remarriage is removed.

The various points of practice are as numerous as the States of the Union. Proceedings are usually the same as in other civil cases, following the formalities of a suit at equity if the statute indicates a court of equity as the proper tribunal; otherwise those characteristic of an ordinary suit at law. In Louisiana, except for adultery or crime, no absolute divorce is granted until one year from the entering of a decree of divorce *a mensa*, and every opportunity is thereby afforded for reconciliation in the intervening time. Similarly an absolute decree in Massachusetts is made *nisi*; i. e., conditional, for six months after date, for the same purpose, and in Utah discretion is granted to the court to defer absolute decree for one year. In many States a divorced wife may resume her maiden name if petition to that effect be included in her pleading. In most of the populous States a decree of divorce may

be entered on an *ex parte* hearing, without defendant's presence; but in most of the smaller ones such a course is prohibited. In New York a decree of *nullity of marriage* is made to serve many of the purposes of a decree of divorce in the other States, while in Oregon divorce proceedings are denominated a "suit for the dissolution of the marriage contract." A few States allow an appeal of either party to the Supreme Court of the State, and in almost every State, on proof of reconciliation and joint petition of both parties, a decree of divorce will be revoked by the courts. In most cases, also, an affidavit declaring that the cause is *bona fide*, and not the result of collusion, is required to make the petition valid.

DIX, DOROTHEA LYNDE, an American philanthropist, was born in Worcester, Mass. Her father was a physician, but died when she was quite young. She then went to Boston, where she established a select school for young ladies. Learning of the neglected condition of the inmates of the State prison at Charlestown, she devoted much time and attention to their instruction and moral welfare. About 1834 she inherited an estate which rendered her independent, and, as her health demanded rest, she gave up her school and went to Europe, where she remained till 1837. She then returned, and with the encouragement and assistance of Rev. Dr. Channing began an investigation of the condition of paupers, lunatics, and prisoners. In carrying out her plans she visited every State of the Union east of the Rocky Mountains, and sought to arouse the legislatures to their duty to the afflicted classes. Her exertions contributed to the founding of asylums for the insane in many States. She repeatedly asked from Congress grants of public lands in aid of the indigent insane, and a measure for this object was finally passed in 1854, but was vetoed by Pres. Pierce as unconstitutional. She continued her labors, however, with success among the States until the outbreak of the civil war. She then hastened to Washington, where she engaged at once in nursing wounded soldiers. Her administrative ability, as well as her philanthropic zeal, caused her to be appointed by Secretary Cameron as Superintendent of Female Nurses, July 10, 1861. She established excellent regulations, which were strictly carried out, but sometimes led to unpleasant controversies with others in authority. Miss Dix persevered to the end, carefully inspected the hospitals and the work of the nurses commissioned by her, and maintained a high standard of discipline among them. She served indefatigably and without salary, but made ample provision for the health of those laboring under her. When the war closed she resumed her efforts in behalf of the insane. She resides at Trenton, N. J., but for some years has been unable to continue her work with the same ardor as formerly. In early life she published *The Garland of Flora* (1829) and several books for children. In later years she wrote some tracts for prisoners and many memorials to legislatures on behalf of the insane. (E. F. S.)

DIX, JOHN ADAMS (1798–1879), an American statesman and soldier, was born at Boscowen, N. H., on July 24, 1798. At fourteen years of age, in consequence of the impending war, his father, Timothy Dix, then lieutenant-colonel in the United States army, removed him from the College of the Sulpicians in Montreal, and having procured him a cadetship with duties assigned at Baltimore, obtained his society and co-operation while engaged there on recruiting service. At St. Mary's College, in that city, the son continued his studies in Spanish, Greek, Latin, and mathematics. In March, 1813, he became ensign in the Fourteenth infantry, and was then the youngest officer in the United States army. But his position was far from enviable. There were reverses in the field, and there was also disease in the camp, to which his father fell a victim, leaving a widow and eight children and an estate that had long been neglected while he

was serving his country in the field. In March, 1814, John A. Dix became third lieutenant in the Twenty-third infantry, and in June, 1814, was placed on the staff of artillery. Previous to the close of this war, while adjutant of an independent battalion of nine companies, he carried through an expedition on the St. Lawrence River that was attended throughout with difficulties, dangers, misfortunes, and privations. In 1816 he became first lieutenant, and in 1819 was aide-de-camp to Gen. Brown. In 1821 he was transferred to the First artillery, then to the Third artillery, and in 1825 became captain of this regiment. The following year, the war being ended, and the young soldier having seen fourteen years' continuous and active service, retired, married, studied law, and in 1828 was admitted to the bar.

In 1833 Capt. Dix became secretary of state for New York; in 1842 he was elected to State assembly; in 1845 he was made senator in Congress; in 1853 he was appointed assistant treasurer of the United States at New York; and in 1859 was made postmaster of New York. The following year, when the secession of the Southern States was impending, he became secretary of treasury in Buchanan's administration. Within one month after accepting this appointment he sent to the special treasury agent at New Orleans the celebrated telegraphic order, "If any one attempts to haul down the American flag, shoot him on the spot." In a time of indecision and consequent inaction, the bold, even fierce, determination and defiance of this soldier-like command would naturally embolden the weak and timid, and stimulate and inspire the strong. It seems natural also that such intrepidity should lead its possessor once more into the field. Therefore the time of thought being past and that of action having arrived, he re-entered the military service under President Lincoln.

In 1861 this gallant soldier was raised to the rank of brigadier-general and major-general of volunteers, and then of the regular army. After having charge of the department of Maryland, he was transferred to Fortress Monroe, with command of the Seventh army corps. In 1863 he was transferred to New York, where he was military commandant during the riots that ensued upon President Lincoln's order for the draft of men in 1864 and the following year. General Dix was appointed minister at Paris, September, 1866, and in 1872 was elected governor of the State of New York. Gen. Dix died in the city of New York, April 21, 1879.

Being born while Washington was living, he long connected the past with the present. Gen. Dix was active in politics, a strong abolitionist, and favored schemes of general education, free libraries, etc. He interested himself in commercial law, in the annexation of Texas, in the structure and preservation of canals, and specially in the exposure of city frauds. Ten millions of dollars that were missing when he was made governor had been stolen. He edited a literary journal, called the *Northern Light*, published various original works and translations, including one of the celebrated *Dies Irae*, and gratified his artistic instincts by violin-playing. While aide-de-camp to Gen. Brown he was fond of playing duets with ex-President Jefferson. His religious character was firmly marked. He took conspicuous interest in the affairs of the Protestant Episcopal Church and of Trinity Church, of which he was a member and officer for many years. His *Speeches and Addresses* are published in two volumes. His *Winter in Madeira* and *A Summer in Spain and Florence* are among his best known writings. An excellent biography of him by his son, Rev. Morgan Dix, D.D., has been published (N. Y., 1883).

(S. A. P.)

DIX, MORGAN, S. T. D., an American theologian, son of Gen. John Adams Dix, was born Nov. 1, 1827, at Albany, N. Y. His education was conducted with great care in that city until 1842, when he matriculated

at Columbia College, New York, graduating there A. B. in 1848 and A. M. in 1851. After a course of study in the General Theological Seminary he was made deacon, and the following year ordained priest by Bishop Alonzo Potter. Dr. Dix became assistant minister in Trinity parish, New York, in September, 1855, assistant rector in 1859, and was appointed rector Nov. 10, 1862. Dr. Dix is a trustee of Columbia College, member of the standing committee of the General Theological Seminary of the Protestant Episcopal Church of America, and has been intrusted with many other responsible duties in the church. In 1883 he was a prominent candidate for the office of assistant bishop of New York. His published works include *A Guide for Candidates for Adult Baptism*; *Lectures on the Pantheistic Idea of an Impersonal Substance Deity, as contrasted with the Christian Faith concerning God*; *Lecture on the Two Estates: of the Wedded in the Lord, and of the Single for the Kingdom of Heaven's Sake*; *Manual for the Young People of the Church, with Prayers and Hymns*; *Manual of Christian Life*; *The Christian Altar*; *Manual of Instruction for Confirmation Classes*; *Historical Recollections of St. Paul's Chapel, New York*; *Thoughts on the Lost Unity of the Christian World, and on the Steps Necessary to Secure its Recovery*; *Commentaries on St. Paul's Epistle to the Romans*; *Expositions of the Epistle to the Galatians and Colossians*; *Christian Women*; and many sermons, lectures, etc. The time and thoughts of the Rev. Dr. Dix are necessarily greatly occupied with the duties that devolve upon a priest, and in the harmonious adjustment and conduct of the many affairs of his very large, highly endowed, and influential parish. (S. A. P.)

DIXON, the county-seat of Lee co., Ill., is on both sides of Rock River, 89 miles W. of Chicago, on the Illinois Central Railroad and the Chicago and Northwestern Railroad. Wagon and railroad bridges cross the river. The city has 2 national banks, 6 hotels, 2 weekly newspapers, 6 churches, and 4 schools, and is the seat of Northern Illinois College. The river furnishes water-power for several industries, comprising 2 flour-mills, planing-mill, an agricultural-implement-works, a foundry, manufactures of ploughs, doors, spring-beds, buttons. It has gas- and water-works, and a small park. Its property is valued at \$3,000,000, and the debt is \$84,000. It was settled in 1832. Population, 3658.

DIXON, JOSEPH (1799-1869), an American inventor, was born Jan. 19, 1799. He learned the trade of a shoemaker, but did not work at it. While yet a boy he constructed a machine for cutting files. He also learned the printer's trade, then lithography, and afterwards studied medicine. He invented friction-matches, originated the process for transferring on stone in 1841, and published his process for photolithography in 1854, several years before its value was understood. He originated the printing of colors on bank-notes to prevent counterfeiting, and originated the anti-friction metal known as "Babbitt metal," for which Babbitt obtained a patent. He was the first successful steel-melter in the United States, taught melters to use anthracite, and invented the present system of converting iron into steel in the crucible, thus avoiding the converting-furnace. He was an accomplished optician, and taught Prof. Morse the use of a reflector to prevent objects from being reversed; and was one of the first, if not the very first, to apply Daguerre's process to the taking of portraits. He perfected the preparation of collodion for photographers, and gave his process for public use. He was one of the most thorough chemists this country has produced. He originated the plumbago crucible as it is made in America. He built for his own amusement the largest orchestrion in the country, with cylinders ten feet in length. He died at Jersey City, N. J., June 14, 1869.

DIXON, WILLIAM HEPWORTH (1821-1879), an

English author, was born in Yorkshire, June 30, 1821. Brought up in the country, he was early employed in business in Manchester, but soon displayed literary ability and became editor of a paper at Cheltenham. He went to London in 1846 and commenced the study of law, but still continued to write for the newspapers. Among his more important contributions was *London Prisons* (1850), originally published in the *Daily News*. He also prepared a very popular *Life of John Howard* (1849), and afterwards wrote the biographies of *William Penn* (1851), and *Admiral Blake* (1852). He was a commissioner at the World's Fair in London in 1851, and travelled through Europe in 1852. He was then made chief editor of the *Athenæum*, and while still holding this position he travelled in the East, in the United States, and in Russia. In all of these he made careful studies of various phases of society which had been neglected by other observers; and he afterwards published his views in brilliant narratives. In 1869 he resigned his editorial connection with the *Athenæum*. He afterwards held some official positions in the city of London. He died Dec. 27, 1879. Among his publications are *The Personal History of Lord Bacon* (1861); *The Holy Land* (1858); *New America* (1867), in which he gave prominence to the socialistic attempts in the United States; *Spiritual Wives* (1868), which treated of life among the Mormons and similar communities; *Free Russia* (1870); *Her Majesty's Tower* (4 vols., 1869-71); *The Switzers* (1872); *History of Two Queens, Catharine of Arragon and Anne Boleyn* (1873); *White Conquest* (1876), in which he depicted the struggle of the white, red, and black races in America. His works were popular and were translated into most of the European languages.

DOANE, GEORGE WASHINGTON, D.D. (1799-1859), an American bishop, was born at Trenton, N. J., May 27, 1799. He was educated in New York city, and afterwards at Geneva, N. Y., and graduated at Union College in 1818. He began the study of law, but soon turned to theology. He was ordained deacon by Bishop Hobart in 1821, and became assistant minister in Trinity Church, New York. When Washington (now Trinity) College was founded at Hartford in 1824 he was appointed professor of rhetoric and belles-lettres. In 1828 he went to Boston as assistant minister of Trinity Church, and in 1830 became its rector. He was consecrated bishop of New Jersey Oct. 31, 1832, and removing to Burlington, N. J., became rector of St. Mary's Church. He devoted himself especially to the cause of education, establishing in 1837, at Burlington, St. Mary's Hall, a school of high order for the education of young ladies, and in 1840 Burlington College. Under his influence the former of these institutions especially obtained a high reputation and extensive patronage. In 1841 Bishop Doane visited Europe and preached at the consecration of a church in Leeds, this being the first instance of an American bishop preaching in an English church. In the following year a volume of his sermons was published in London. In 1824 he published *Songs by the Way, chiefly Devotional, with Translations and Imitations*. He was frequently engaged in theological controversy, and was an earnest advocate of high-church views. His style was scholarly, elegant, and spirited. He died at Burlington, N. J., April 27, 1859. His *Life* has been written by his son, Rev. W. Croswell Doane, who has also edited his *Poetical Works, Sermons, and Miscellaneous Writings* (5 vols., 1860).

DOBSON, AUSTIN, an English poet and critic, was born at Plymouth, England, Jan. 18, 1840. He is of French extraction, and his father, M. Georges Clarisse Dobson, a French civil engineer, of an English family, did not come to England until late in life. Mr. Austin Dobson was destined for the profession of his father. He was educated at Beaumaris, at Coventry, and at Strasburg. On his return to England at the age of

sixteen, he received an appointment at the Board of Trade, and there he has remained since Dec., 1856, rising steadily if slowly, until now he is at the head of an important bureau. His early ambition had been to be a painter; he designed on wood a little; but the training at the South Kensington schools of art did not in any way help the native faculty, if indeed it was not injurious. This early tendency has been of great service to the student of Hogarth and of Bewick. Mr. Dobson did not begin to write until he was twenty-four, and it was not until Mr. Anthony Trollope started *St. Paul's Magazine* that Mr. Dobson wrote much. Mr. Trollope was an excellent though an exacting editor; he appreciated Mr. Dobson's abilities, and he stimulated him to do his best. At the very first Mr. Dobson struck the true note of his talents, yet after a little he went afield in the imitation of Rossetti. This vagary lasted for a brief period only, and the poet returned to his old love—the poetry of society, of human nature as it is seen in modern civilization. It was soon noted that Mr. Dobson had great natural abilities, and that he had very carefully cultivated them by the study of the long line of English poets who have written brightly and brilliantly of man as he moves among his mates—Suckling, and Pope, and Gay, and Prior, and Praed. Gay's serio-comic verse and Tennyson's "Will Waterproof" were seemingly models for the young poet. In 1873 he gathered his poems into his first book, *Vignettes in Rhyme*, which was instantly and widely successful. Steadily in search of new tools fit for his handling, Mr. Dobson attempted to acclimatize in English the old French metrical forms which M. de Banville had revived in France. His were the first really good *rondeaux*, *ballades*, and *triolet*s in our language, and on the models set by him has been based nearly all subsequent work in these forms by English and American poets.

Mr. Dobson also wrote a set of airily graceful dialogues which gave the name to his second volume of verse, *Proverbs in Porcelain*, published in 1877. A selection from these two volumes, with the addition of certain later poems, was published in America in 1880 under the title of *Vignettes in Rhyme*, accompanied by an introductory essay by Mr. E. C. Stedman, in which the rare qualities of Mr. Dobson's genius were dwelt upon at length and with all the critic's wonted acuteness. Of late, Mr. Dobson has taken to the writing of fables, though without giving up the poems at once brilliant and tender by which he made his mark. His last work is as impeccable as Gautier's, but it has more heart and soul. There is the perfection of workmanship in the telling, and the story is always one worthy to be told. His style and taste are flawless, and behind his dexterity is a wit, a tenderness, a knowledge of humanity, very rarely found in conjunction. His satire is gentle, his humor is lambent, his pathos is never obtruded or unduly prolonged. His tone is the tone of Horace, of Thackeray, of Steele. He has ease and abundance and grace, and his verse never shows effort or reveals the labor spent to bring it to the utmost polish and point. It is with Praed that most critics have compared Mr. Dobson, but the comparison is plainly unfair to the later poet, who has at once a variety and a depth unknown to his predecessor. Mr. Stedman's criticism was juster when he said that "there is an English Horace in every generation, and Mr. Dobson is unquestionably the present holder of the title, if not of the Sabine farm." Where Mr. Dobson is unique—in the exact sense of that much-abused word—is in the extraordinary art with which he manages to fill a poem with the very color and time of the epoch when its story passes. His French poems are purely French. His eighteenth-century poems are such as Pope or Prior or Goldsmith might have signed with pleasure. His Elizabethan "Ballad of the Armada" contains no word not in use in the time, and this accuracy is not secured by a loss of spirit—far from it. There is life

and fire in all his ballad-work. In short, Mr. Dobson, though he seeks not the uppermost heights of Parnassus, has pre-empted a very pretty section on the side of the twin peaks, and this delightful garden, carefully tended and watered, is all his own.

As a prose-writer Mr. Dobson has not published much. In 1879 he wrote a *Life of Hogarth* for the "Great Artists" series; in 1881 he wrote a chapter on "Illustrated Books" for his friend Mr. Andrew Lang's volume on *The Library* in the "Art-at-Home" series; in 1882 he prepared and prefaced a selection of *Eighteenth-Century Essays* for the "Parchment Library;" and he is hard at work on the biography of Fielding for the "English-Men-of-Letters" series. A sketch of Bewick contributed to an American magazine in the fall of 1882 is likely to appear again somewhat enlarged as a book by itself. (J. B. M.)

DOCKET (apparently kindred in origin with the Germ. *docke*, a little bundle; Icel. *dockr*, a short tail, and derived from the verb *dock*, to cut off, abridge), in general, a brief or abstract in writing, usually of some larger document. In a legal sense the word has several modifications. In its most important meaning it denotes a formal record of judicial proceedings, giving the names of parties and their counsel, and a brief entry of every proceeding in the case. Such dockets are kept by the clerk or prothonotary of every court of record (though the presence of such a docket will not necessarily constitute a court of record), and are official evidence before the law. A list or calendar of causes ready for trial prepared for the use of courts and lawyers is also sometimes called a docket.

DODGE, MARY ABIGAIL, an American authoress, who writes under the name of Gail Hamilton, was born in Hamilton, Mass., about 1838. Her father was a farmer, and she was for some years an instructor in physical science in the high school at Hartford, Conn. Afterwards, while a governess in the family of Dr. Gamaliel Bailey, of Washington, D. C., she became a contributor to the *National Era*, a weekly anti-slavery paper, published by him. In 1862 she began to contribute to the *Atlantic Monthly*, and she has since written for *Harper's Bazar*, the *North American Review*, and other periodicals, treating of social, religious, and political subjects. Her style is vigorous and epigrammatic, and she delights in handling vexed questions. Her books have been chiefly collections of her magazine articles. The principal are *Country Living and Country Thinking* (1862); *Gala Days* (1863); *A New Atmosphere* (1864); *Stumbling-Blocks* (1865); *Summer Rest* (1866); *Wool-gathering* (1866), a sketch of a journey to Wisconsin and Minnesota; *Skirmishes and Sketches* (1867); *Woman's Wrongs, a Counter-Irritant* (1868), a reply to Rev. Dr. Bushnell's book on *Woman's Rights*; *Red-Letter Days* (1869); *Battle of the Books* (1870), which is a sketch of her quarrel with her former publishers; *Little Folk Life* (1871); *The Child World* (1872); *Twelve Miles from a Lemon* (1873); *Nursery Noonings* (1874); *First Love is Best* (1875); *Woman's Worth and Worthlessness* (1875); *What Think Ye of Christ?* (1876).

DOG. Upon the origin of the dog there has been great diversity of opinion, some writers declaring him a distinct species, and others simply a wolf, fox, or jackal, changed by domestication and subsequent breeding into his present form. Buffon claimed the shepherd dog as the parent of the race, while Pennant maintained it the result of crosses between the jackal and wolves or foxes. Bell, who wrote in 1837, thus upholds the wolf descent in his *British Quadrupeds*: "In order to come to any rational conclusion on this head, it will be necessary to ascertain to what type the animal approaches most nearly, after having for many successive generations existed in a wild state, removed from the influence of domestication, and association with mankind. Now we find that there are

several instances of the existence in dogs of such a state of wildness as to have lost even that common character of domestication, variety of color and marking. Of these two very remarkable ones are the dhole of India and the dingo of Australia. There is, besides, a half-reclaimed race amongst the Indians of North America, and another also partially tamed in South America, which deserve attention. And it is found that these races in different degrees, and in greater degree as they are more wild, exhibit the lank and gaunt form, the lengthened limbs, the long and slender muzzle, and the comparative strength which characterize the wolf; and the tail of the Australian dog, which may be considered as the most remote from a state of domestication, assumes the slightly bushy form of that animal.

"We have here a remarkable approximation to a well-known wild animal of the same genus, in races which, though doubtless descended from domesticated ancestors, have gradually assumed the wild condition; and it is worthy of special remark that the anatomy of the wolf, and its osteology in particular, does not differ from that of the dog in general, more than the different kinds of dogs do from each other. The cranium is absolutely similar, and so are all, or nearly all, the other essential parts; and to strengthen still further the probability of their identity, the dog and wolf will readily breed together, and their progeny is fertile. The obliquity of the position of the eyes in the wolf is one of the characters in which it differs from the dog; and although it is very desirable not to rest too much upon the effects of habit on structure, it is not perhaps straining the point to attribute the forward direction of the eyes in the dog to the constant habit, for many generations, of looking forward to his master, and obeying his voice." The fertility of the offspring of the dog and wolf herein claimed, though denied by many writers, has been amply proved by late investigation of the dogs belonging to Indians upon the Western frontier to which Bell alludes, it being now well established that these are the result of crosses between dogs, gray wolves, and coyotes, yet, though displaying a mixture of the forms and characteristics of their several ancestors, they breed freely together. As it is unquestionable that the offspring of dissimilar species are hybrids incapable of propagation *inter se*, this fertility must be accepted as settling the question of kinship between these races. The great variety in dogs, however, precludes the supposition that they are descended from any one ancestor, and scientific men now consequently hold, with scarcely any exception, that the race sprang from a combination of crosses between wolves, foxes, and jackals in different parts of the world; that the dog, in short, is neither a natural species nor yet a modified descendant of any one species which exists in nature, but a purely artificial product of domestication, the result of endless crossing and recrossing with various *Canidæ* of different parts of the world, and further modified to an extraordinary extent by systematic breeding and training, until the various breeds of dogs now known differ more from one another than most species, and even many genera of wild animals do. Were a naturalist supplied with a series of the skins and skulls of the animals exhibited at one of our large dog-shows, and desired to classify them as he would the same animals in a state of nature, he would divide them into some six or eight *genera* and fifteen or twenty *species*, as distinct from each other as recognized genera and species usually are in nature.

Upon the reversion to which Bell refers modern investigators have made many comments, regarding it as not only confirming present theories of origin, but also as showing the highly artificial state to which the race has been brought by breeding. This tendency is common to all domesticated animals, and under favorable circumstances is very rapid in action, a few generations being sufficient to produce an almost total loss of the characteristics acquired by domestication.

Association with man.—From the earliest times of

which we have any record the dog has been associated with man in all the familiar relations of the present day. The Mosaic law refers to him, and writers both sacred and profane mention him, sometimes as a term of reproach and again as a synonym of faithfulness. The most ancient sculptures exhumed from buried cities represent him as an inmate of his master's house and his companion in the chase. With the primitive weapons used in war and the chase the pursuit of game would have proved an almost total failure but for the sagacity, speed, and courage of the dog, and as in the early ages of the world men were largely dependent upon hunting for their subsistence, the value of his services cannot be overestimated. When men came to dwell together one of the first forms of property was in their flocks, and as these were of necessity imperfectly protected, they were constantly exposed to attacks of the wild beasts of the field, who would have scattered and wholly destroyed them but for the watchfulness of their canine guards. Nor did the dog serve his master in these ways alone, for by the Greeks and Romans—as by the Chinese of modern times—his flesh was esteemed a delicacy, and was served up at their feasts. Hippocrates speaks of it with commendation, and other writers bear testimony to its quality, so that altogether it may be claimed with justice no other animal has been so closely associated with man, or has ministered in so many different ways to his wants.

Habitat and Physical Characteristics.—The dog is confined to no portion of the globe, but is thoroughly cosmopolitan, and finds a home in nearly every section inhabited by man. In the wild state he is found in packs like his ancestor the wolf, and like him lives upon the flesh of animals, which his powers of scent and speed enable him to run down, or his cunning to outwit. The dog is of course carnivorous, belonging to the order *Feræ*, and family *Canidæ*. Domestication, however, has so changed him that he will subsist upon the crumbs that fall from his master's table, and thrives better upon a mixed diet than upon meat alone. Dogs brought up upon the seacoast also become very fond of fish; and, in short, association with man has induced as great changes in the canine nature in this as in other respects.

The dog is known to naturalists as *Canis familiaris*. By the ancients he was classed according to his uses, as *pugnaces*, *sagaces*, and *celeres*,—a division, of course, not recognized in modern times.

Promiscuous breeding in early days resulted in the production of a great many varieties, which in time came to be regarded as distinct breeds, and gave rise to the necessity for classification. Cuvier divided them into three primary classes, distinguished by the shape of the skull, as follows:

"I. *Matins*, characterized by head more or less elongated; parietal bones insensibly approaching each other; condyles of the lower jaw placed in a horizontal line with the upper molar teeth, exemplified by—Section 1. Half-reclaimed dogs, hunting in packs, such as the dingo, the dhole, the pariah, etc. Section 2. Domesticated dogs, hunting in packs or singly, but using the eye in preference to the nose, as for instance the Albanian dog, deerhound, etc. Section 3. Domesticated dogs, which hunt singly, and almost entirely by the eye. Example: the greyhound.

"II. *Spaniels*.—Characteristics—Head moderately elongated; parietal bones do not approach each other above the temples, but diverge and swell out, so as to enlarge the forehead and cavity of the brain. Section 4. Pastoral dogs, or such as are employed for domestic purposes. Example: Shepherd's dog. Section 5. Water-dogs, which delight in swimming. Examples: Newfoundland dog, water-spaniels, etc. Section 6. Fowlers, or such as have an inclination to chase or point birds by scenting only, and not killing. Examples: the setter, the pointer, the field-spaniel, etc. Section 7. Hounds, which hunt in packs by scent, and kill

their game. Examples: the fox-hound, the harrier, etc. Section 8. Cross breeds for sporting purposes. Example: the retriever.

"III. *House Dogs*.—Characteristics—Muzzle more or less shortened; skull high; frontal sinuses considerable; condyle of the lower jaw extending above the line of the upper cheek teeth. Cranium smaller in this group than in the first or second, in consequence of its peculiar formation. Section 9. Watch-dogs, which have no propensity to hunt, but are employed solely in the defence of man or his property. Examples: the mastiff, the bull-dog, the pug-dog, etc.

Commenting upon this division, "Stonehenge," the great sporting authority, calls attention to some anomalies as follows: "For instance, the greyhound is quite as ready to hunt in packs as any other hound, and is only prevented from doing so by the hand of his master. The same restraint keeps him from using his nose, or he could soon be nearly as good with that organ as with the eye. So also Cuvier defines his sixth section as having an inclination to chase and point birds, whereas they have as great and often a greater desire for hares and rabbits." These exceptions Stonehenge makes in considering the dog in his sporting works, but otherwise follows Cuvier's classification.

The size of bone and consequent weight of frame should be proportional to the uses to which the dog is put. Those kept for fast and long continued work, involving a severe strain upon the physical system, should have sufficient bone to insure strength, but no more, as the extra weight serves only as a burden without any corresponding benefit. In the greyhound, where speed is of the first consideration, and whose endurance is very seldom severely tested, the frame may be proportionally lighter than in the setter, pointer, or hound. With these, bones of medium weight are very essential, as the heavier tend to slowness in action and brevity in endurance, while the lighter, though they permit of a flashy turn of speed, are very apt to give out in the joints or suffer injury from blows received in hunting. The extremes of physical formation are met with in dogs bred for great size, and in their opposites the toys, which should be as small as possible; the former requiring the most massive bones, and the latter the lightest and most delicate.

The dog has a chest-action directly opposite to that of man. That is, while the man's chest rises and falls, varying its measurements from front to rear, the dog's dilates and contracts laterally. The ribs enclosing the lungs are curved, which not only facilitates this action, but also by their shape makes the good or bad formation of the chest when regarded in its adaptation to speed and endurance, as well as grace in movement. The more easily the dog can breathe when undergoing severe exertion the less he will be distressed thereby. The chest and ribs should, therefore, be of a formation favorable to the most perfect dilation and contraction, and this is found to exist in a chest of moderate width with ribs proportionally sprung. With ribs excessively curved the expansion must necessarily be small, while with those that are too straight the contracting power will be limited. The medium chest on the contrary is capable of both dilation and contraction of the highest degree, which enables it to receive and utilize the largest volume of air, and proportionally to promote the comfort of the dog under the most trying circumstances. A wide chest also produces a rolling gait in the gallop, and this, though it may not affect the endurance, is certainly detrimental to speed and ungraceful in appearance.

The shoulder is fastened to the body by strong muscles attached to the top of the shoulder-blade and the lower ribs, the motion forwards and backwards being controlled by other muscles extending to the neck and the spine. This arrangement, with the absence of a collar-bone, allows of the greatest freedom

of action, and is a safeguard against accidents which might occur to a rigidly fastened shoulder in an animal used as the dog is to travel at speed over every variety of surface.

The dog has forty-two teeth, viz.: six incisors in front, two canines or tusks and twelve molars in the upper jaw, with six incisors, two canines, and fourteen molars in the lower. Two of the teeth behind the canines are tubercular, and serve to distinguish the sub-family Canina from the rest of the family. There are two sets of teeth, the first or milk teeth lasting only till the dog is five or six months old, when the second set are developed.

The dog is also distinguished by having a round pupil in the eye, while the fox, which belongs to the same group, has a perpendicular slit in place of this.

The coat varies according to the breed. With some it is close and short, and with others long, accompanied by a fringe upon the backs of the legs and the lower edge of the tail, technically known as "feather." Some of the water-dogs are covered with close crisp curls, having an under-coat of thick short hair, admirably adapted for their protection when exposed to wet and cold. Modern breeding has also produced coats of opposite character in varieties of the same family, examples of this being found in the retrievers, the rough and smooth terriers, and the rough and smooth St. Bernards.

Though the dog does not arrive at full maturity till from eighteen to twenty-four months old, puberty is generally reached by the end of the first year, and the bitch comes in season at intervals of six months thereafter. In exceptional instances these intervals are shortened or lengthened according to the peculiarities of the individual. The season lasts about twenty-one days, the bitch permitting service after the first week, or as soon as her flowing ceases, and carrying her whelps from sixty-one to sixty-three days.

The greater the development of the higher senses by breeding the more sensitive the nervous system becomes, and the more prone the dog is to diseases of a severe and dangerous character. The curs that run the streets uncared for escape most of the ills to which their aristocratic brothers are liable, and when attacked by disease it is generally of a comparatively mild character, from which the dog recovers unaided. In this the dog does not differ from other domesticated animals, the higher and more valuable classes having to pay the penalty of their refinement and the care with which they are treated by extra predisposition to disease and less power of resistance to it.

That new maladies occasionally appear is unquestionably true, but these are not so common as many persons suppose, the new names and apparent new phases being due to greater study of cases, and consequent better discrimination and classification according to symptoms, formerly overlooked or comprehended under a general name. The dog has many of the diseases from which human beings suffer, and should be treated in precisely the same way, only varying the remedies prescribed in quantity according to their peculiar action upon the canine system. Medical authorities declare that no specific for any disease has been discovered, and that each case must be treated according to its symptoms. This is a death-blow to the empirics who advertise their nostrums as unfailing cures or preventives, but the falsehood of whose pretensions is made apparent in canine distemper, which may attack the lungs, the bowels, or the brain, and evidently cannot be controlled in all these widely different types by any one remedy. It is only within a few years that canine diseases have been deemed worthy of the attention of the better class of practitioners. Before that they were given over to ignorant quacks of the lowest character, and to such may be traced most of the false theories and pretentious cure-alls which still retain a hold upon the confidence of inexperienced and credulous dog-owners. The important

part now taken by dogs in the service or pleasures of their masters, with the increased value and attention to breeding resulting from this, has made them the subject of scientific study, and as a consequence past errors have been exposed, and a practice based upon scientific principles substituted in their stead.

Development.—The improvement of the dog upon his primary type, and the development of his character and instincts, have been accomplished in two ways; viz., first, by association with man, and second, by breeding for certain qualities. The association of a lower with a higher animal must of itself be beneficial to the inferior, and, when the superior is man, the acknowledged lord of creation, the influence exerted by him upon any of the lower orders from which he selects a companion must be in proportion to the natural comparative rank of the two races. Man has not simply accepted the dog as a hanger-on, but in return for food and shelter he demands service from him. To fit him for that service instruction has been needed, and this instruction, increased from generation to generation as the pupil has shown capacity to receive, and the advanced demands of the service have rendered greater knowledge necessary for the accomplishment of the desired ends, has resulted in making the dog an educated animal. The more intimate the association between man and dog, the greater has been the improvement of the latter, till educated instinct has raised its possessor almost to the altitude of a reasoning being. No animal displays so high a degree of intelligence as the colley, yet we have no reason to suppose him originally superior to other dogs, and we have only the alternative of crediting his present ability to his constant association, day and night, with his master, and the multitude and variety of the services demanded from him in herding the sheep intrusted to his care. The other classes of what may properly be called useful dogs are generally kept for some single and specific purpose; and, when the duties pertaining to it have been performed, they are released from attendance upon their masters and left to their own devices, the consequence of which is that, however highly accomplished in their particular line they may be, they are not so generally educated, or brought up to so high a standard in point of general intelligence and ability to perform any service occasion may make necessary, as the dogs which are seldom if ever out of their master's presence. Instances of rare intelligence and wonderful capacity for general service have been related of all classes of dogs, but, in such cases, the individual has almost invariably been the property of a man endowed with both a faculty for instruction and the inclination to make the dog his companion; so that the ability displayed by the latter has been the natural result of these combined influences. There is no reason why any other breed possessed of ordinary intelligence cannot be brought up to the colley standard by the same course of association and instruction to which he owes his goodness; but it is not to be expected that dogs which do not enjoy equal advantages will manifest equal powers. Though the characteristics displayed by the different varieties of dogs were doubtless originally due to accident or climatic influences, it is certain that when the value of these came to be recognized they were systematically bred for, and thus were developed far in excess of those possessed by dogs of earlier days. This improvement was not, however, effected in a short time, but was the work of many years, carried on through successive generations, since, in order to obtain the desired qualities in such degree that they could be relied on to reproduce themselves, it was not only necessary to intensify these, but also to breed out other qualities antagonistic to them. Great as was the change, there was still a too general ignorance of the laws of breeding, and too much carelessness or indifference in their application to the continued development of breeds, for the improvement to be more than comparative.

and it has only been within the last quarter of a century that the dog has been brought up to his present perfection. During this time the demands of fashion, the institution of bench-shows, and the increase in field-sports, have given dogs of the highest quality a value never before known, and have stimulated breeders to study the laws governing reproduction, and to exercise such care in mating their breeding stock that the dogs of the present day have been made superior to those of any other time. For all this, it is not supposable that the possibilities of the race have yet been reached. Many imperfections exist in even the most highly developed breeds, and, as these are in the line where some of the greatest improvements have been wrought, it is only reasonable to expect that time and persistence in the methods already so successful will eventually produce a class of dogs proportionally better than those we have now.

Uses.—The uses to which the dog is put vary with circumstances, and are too numerous for specific mention. From the cold and barren regions of the North, where he draws his master's sledge, it is a long step to the boudoir of the fashionable lady, yet the dog, in appropriate form, is found there, the pet and plaything of his mistress. Whether watching the flocks upon a thousand hills; acting as a beast of burden to the poor; guarding the house; accompanying the sportsman in all his pursuits in field and forest; furnishing a study to the savant; an employment for the leisure hours of the fancier, or even, by the exhibition of his savage passions, ministering to the pleasures of men more brutal than himself, the dog is attached to every rank and station of human life in some useful or ornamental capacity.

Show Classification.—Apart from scientific divisions, custom has classed the dog according to his uses and the classification of bench-shows as sporting and non-sporting, each variety of the several groups having a certain recognized standard by which it is judged, and to as close approximation as possible with which it is bred. This standard is based upon what experience has demonstrated to be the best form, having due regard for the preservation of original types, so far as this is compatible with necessary improvements. The standard accepted in England and this country is that laid down by Stonehenge in his "Dogs of the British Isles." In the sporting class he places the "dogs used with the gun, and hounds and their allies." The first division comprises setters, pointers, spaniels, and retrievers. The setters are the English, the black-and-tan or Gordon, and the Irish. The pointer has but one variety, but is divided into classes according to weight. The spaniels are the modern field-spaniel, the modern cocker, the Sussex, the Clumber, and the Irish and English water-spaniels. The retrievers are the wavy- and curly-coated black retrievers; retrievers other than black, wild-fowl retrievers, and the deer-hound.

"Hounds and their allies" comprise the greyhound; "modern hounds hunting by nose," viz., the bloodhound, the fox-hound, the harrier, the beagle, and the otter-hound. The fox-terriers, both rough and smooth, and the dachshund, or German badger-dog, complete the class.

The non-sporting division comprises watch-dogs, sheep- and cattle-dogs, terriers—other than fox and toy—and the toy-dogs. The watch-dogs are the bull-dog, the mastiff, the Newfoundland, the Labrador, or lesser Newfoundland, the St. Bernards—both rough and smooth—and the Dalmation. The sheep- and cattle-dogs are the colley, the bob-tailed sheep-dog, and the Pomeranian or Spitz. The terriers are the nondescripts, the rough terriers, including the Skye—both drop- and prick-eared—the Dandie Dinmont, the Bedlington, the Yorkshire, and the Irish. The smooth terriers are the black-and-tan, or Manchester, the white English, and the bull-terrier. The toy-dogs are the rough-coated, including the King-Charles and

Blenheim spaniels, the Maltese dog, and the rough toy-terrier. The smooth-coated include the pug, the Italian greyhound, and the smooth toy-terrier.

In an appendix Stonehenge also mentions the poodles, both French and Russian, the truffle dog, the Chinese crested dog, and the great Dane, these not being properly dogs of the country, though occasional specimens are met with.

The apparent inconsistency of classing the deer-hound with the retrievers is explained by the use to which this dog is put, viz., to pursue the deer after he is wounded, and, by bringing him to bay, secure his being retrieved. As his services are not required upon unwounded game, he cannot be properly associated with dogs used in the chase, as other hounds are used.

The greyhound is also excluded from the list of true hounds which hunt by nose, as he follows his quarry by sight. Stonehenge says: "From the latter half of the word greyhound and deerhound it might naturally be inferred that they should be considered hounds, but in sportsman's language they are not so, and if a man was heard to say that he saw a lot of hounds out on a certain farm, when it turned out that they were greyhounds he would at once be set down as ignorant of sport and its belongings. The term is therefore confined in the present day to the bloodhound, stag-hound, fox-hound, harrier, beagle, and otter-hound." The greyhound is so closely allied to the true hounds that he is classed with them. His manner of hunting is simply the result of education, but, as it has become habitual, it must be considered as constituting a distinction between himself and other dogs of his class.

The fox-terriers and the dachshund are also allied to the hounds, the former being used to balk the fox from his earth when driven into it by the hounds; and the latter, although he follows by scent, differs from the hounds in that he digs out his quarry when it takes to earth. He is also used for hunting the badger, which the true hound does not follow.

Dogs used in America.—Owing to the fact that sporting matters and canine-breeding are things of comparatively recent interest in this country, some of the dogs used in England are but little or not at all known here, and even these are kept for house or toy purposes rather than for their legitimate pursuits. We have no otter-hounds, stag-hounds, or harriers, and the fox-terrier, though coming into favor, is not used as a sporting-dog. The greyhound is found in limited numbers, and upon the plains and the Pacific coast is somewhat used for coursing. The bloodhound and dachshund are occasionally seen, and now and then a retriever, but none of these dogs can be said to be largely represented in this country, though they are recognized and have classes assigned to them at the principal shows. Sporting-dogs in America are confined to setters in their three varieties, viz., English, Irish, and Gordon; pointers; spaniels, chiefly the cocker; Irish water-spaniels, which are used for duck retrieving; fox-hounds, which are generally so mixed that the class may be said to embrace all varieties of large hounds, and which are also used for hunting the rabbit, as the small hare is called here, and a few beagles. The retriever is not popular in this country, despite the efforts of his admirers to make him so, owing to the breaking of setters and pointers to perform that as well as their peculiar duty, thus combining the qualities of two breeds in one and obviating the necessity for keeping a number of dogs, which would be very inconvenient to the great majority of sportsmen.

The non-sporting class embraces nearly all the varieties mentioned by Stonehenge. The colley is, however, the only recognized cattle-dog, as the bob-tailed sheep-dog is practically unknown, and the Spitz is kept only as a house-pet.

Breaking and Training.—These terms, often im-

properly used synonymously, have, in sporting parlance, very different significations, the former being restricted to mere education, and the latter to fitting the dog physically for his work. Setters, pointers, spaniels, and retrievers are broken; that is, taught to find game, point or flush it, and to retrieve from land and water, with such other matters as tend to the performance of these duties in the manner most promotive of sport. Hounds are broken to obey the horn and commands of the huntsman, and to follow the trail of the quarry. Sheep-dogs are broken to watch, collect, and drive the cattle or sheep intrusted to them. Trick-dogs are also broken in their own line. Greyhounds, with whom speed and wind are all-important, are prepared for their matches by a systematic course of exercise, medicine, and food, which is purely physical in its effects, and is known as training. Fighting dogs and ratters are trained before they are put into the pit, just as prize-fighters go into training to prepare themselves for the ring. Of course setters or pointers may at times get so out of condition that they are incapable of efficient work, but the course by which this is remedied certainly cannot with propriety be called breaking, and there is no more reason for the misapplication of one term than of the other.

Importations.—The narrow limits to which American sporting was restricted prior to the last few years naturally precluded proper attention to canine breeding and the preservation of pure strains. Anything that would work fairly well in the field was deemed good enough; and the indiscriminate mating of individuals solely on account of their field qualities, and without any consideration for their fitness for each other, resulted, as might be expected, in such mixture of blood that not only was there a great preponderance of dogs of inferior quality, but even the best became wholly unreliable as producers of progeny equal to themselves. The first effort of the pioneers in canine reformation was directed to obtaining blood which, from its purity, could be relied on to transmit the qualities of its possessors, and this led to importations from the most celebrated kennels in England, where the different strains had been kept pure, and their representatives brought up to the highest standard by intelligent breeding, designed to intensify desirable qualities and eradicate those which were undesirable. The superiority of the imported dogs was speedily recognized, and the interest awakened by them led to other importations and to the elevation of canine breeding to an equality with the breeding of fine horses and cattle, so that it was taken up by gentlemen of means, education, and position, and as a result we have now in the descendants of the various imported strains a class of dogs equal to those of any other country.

Bench-shows and Field-trials.—The benefits which English breeders had derived from shows and trials was too apparent to be overlooked by those interested in the improvement of American dogs, and about the time of the first importations of our present blood, these were instituted and have since become very popular. It is certainly not unjust to say that, prior to the institution of shows, comparatively very few men knew what constituted good form in any breed. The acceptance of a standard which was framed by the experience of the best recognized authorities, and the judging of dogs by it, very quickly exposed physical defects not hitherto suspected, and by educating breeders, led to the production of far superior dogs, so that at any prominent show of to-day one will scarcely find a single specimen as defective in form or lacking in quality as were the majority of the dogs exhibited a decade ago. Bench-shows are mere beauty exhibitions. They are intended solely to promote breeding for the best physical form, and have nothing to do with field-quality, so that an utterly worthless dog with correct form will beat a crack fielder that is not up to show standard. Field-trials on the other hand are intended

to test the working abilities of the competitors, by running them on game and judging by a scale of merit and demerit, tending to show both the natural quality and breaking of each individual. With well-devised rules all qualities except endurance can be fairly tested, but this the brevity of time which can be given to the running forbids, thus leaving trials open to the objection that a dog may win at them, which would utterly fail if subjected to the test of severe field-work. This objection cannot be done away with, but with this field trials still afford a sufficiently reliable exhibition of quality to be of great value to breeders and sportsmen generally. There are now in this country, besides the National Kennel Club, associations in the East and South, which hold their trials annually upon quails, besides an association in California, which holds its trials upon the quails of that section. With some slight variations the rules of the National Club have been generally adopted by the Eastern and Southern associations, so that a dog can compete at any and all trials without having his chances for success imperilled by great diversity of the different scales by which he is judged.

While the importance of bench-shows must not be undervalued, the awards of trials naturally take a higher rank with those who look first of all to the working abilities of a dog; but over and above either is the combination of both show and field qualities in the same individual, and to this *summum bonum* the attention of the best breeders is directed. Winners of the double event have been produced, and the possibilities of the race will not be accomplished till dogs of this high character become proportionally common.

(A. B.)

DOGETT, DAVID SETH, D.D. (1810–1880), one of the bishops of the Methodist Episcopal Church South, was born in Lancaster co., Va., Jan. 23, 1810, being the youngest child of John Doggett, a local preacher, who had been a Revolutionary soldier. The younger Doggett had few educational advantages, but of them he made the most. He united with the Methodist Church in his seventeenth year; when he was nineteen he became an itinerant preacher in the Virginia Conference. In 1839 he was chaplain to the University of Virginia; from 1840 to 1846 he was professor in Randolph-Macon College, Virginia. From 1850 to 1856 he was editor of the *Southern Methodist Quarterly Review*. In 1865 he founded, in connection with the Rev. John E. Edwards, D.D., the *Episcopal Methodist*, a weekly newspaper published in the interests of his church. During his itinerant ministry he served as pastor the most important churches in his conference, and had the reputation of being an eloquent and useful preacher. In 1866, at the session of the general conference that met in New Orleans, La., he was elected one of the bishops of the Methodist Episcopal Church South. He performed the duties of his office till his death in the city of Richmond, Va., Oct. 27, 1880. Bishop Doggett wrote much for the periodicals published by his church; there is a posthumous volume of *Sermons* (Nashville, 1881).

DOGSBANE. Dogsbane is the familiar name given to the natural order *Apocynaceæ*, of which the genus *Apocynum* is the type. In many respects it is one of the most remarkable orders in the vegetable kingdom. The order is closely related to the gentians on the one hand, and has many characters in common with milkworts, or *Asclepiadaceæ*. The plants of the order are well marked by a peculiar pistil, which has the stigmas collected into a comparatively large head, expanded at the base in the form of a ring, and contracted in the middle, and the style usually tapering from the head of the stigmas to the base. The flowers are monopetalous, but more or less deeply five-lobed, the lobes twisted in the bud, the five stamens inserted on the corolla, the anthers adhering to the stigma, though the filaments are distinct; the two ovaries are also usually

distinct, though the stigmas are united. The species in nearly the whole of the order have mostly opposite and entire leaves, without stipules, and with a milky, acrid juice, which occasionally furnishes some of the most active poisons known. The name *Apocynum* is an ancient one, and significant of the virulent character of the plant. It is employed by Pliny, who says, "*Canes et omnis quadrupes necat in cibo datum*" ("Given in their food, it kills dogs and quadrupeds"). It seems to have been generally employed to destroy worthless dogs, as strychnine now often is; and in this way arose the familiar name of "dogbane." The most celebrated plant of the order is the Tanghin bean of Madagascar, *Tanghinia venenifera*. The bean is no larger than an almond-kernel, but one is sufficient to destroy twenty men. It is said that the priests of Madagascar possessed a secret antidote, causing vomiting, by which the poison could be taken in safety, and that the poison was cunningly made a test of innocence and in this way obnoxious persons were murdered under the guise of a religious ceremony. Another virulent plant of the order is the *Nerium*, the common oleander of our gardens. It is evidently confounded by modern commentators with the *rhododendron* of ancient writers, and the poisonous character often attributed to the azalea and *rhododendron* was intended for the oleander. Rat-poison is still made of its powdered wood and bark, and it is on record that in 1809, when the French troops were lying before Madrid, a soldier used the wood for skewers in roasting meat, and of twelve who ate the meat all were taken ill, and eight died. The beauty of the flowers, however, renders the plant very popular in gardens, and it is extremely rare that any ill results of this culture are reported.

When the acidity is moderated the properties become nutritious. *Tabernaemontana utilis* in tropical America is a "cow tree," the sap being used as we use milk. Many species have delicate forms of caoutchouc prepared from the milk. Mr. Thistleton Dyer has recently stated that in Africa the natives smear the juices of a number of species of Apocynaceous plants over their arms and breasts, and in this way sheets of caoutchouc of much value are prepared.

The order is chiefly a tropical one. About nine genera and twenty species enter the United States, and of these two, *Apocynum androsaefolium* and *A. cannabinum*, are found in the northern parts, and are the plants generally known as "dogbane" in that region. Besides dogbane, they are known as "Indian hemp," and in South Carolina they go by the name of "Amyer Marion's root," from having been a favorite medicinal plant with the famous Revolutionary general Marion of South Carolina. They are also known as "fly-catchers," in common with other species of the order. The flowers secrete a sweet liquid. The insect inserts its proboscis between the filaments; in withdrawing it, it is often caught between the anthers, which, as already noted, are united to the stigmas. Drawing the proboscis up into these narrowing spaces, of course the insect is held the tighter for its struggles. Though often referred to in modern times by fresh observers, the fly-catching ability was recorded by Erasmus Darwin, who in his notes to the *Botanic Garden* gives the observations of some of his correspondents made in 1788; and it is mentioned by Ray in his *Historia Plantarum*, which was issued in that year. Insects are believed by many to be specially designed for effecting the cross-fertilization of flowers, or rather flowers are believed to be specially adapted to the visits of insects in regard to cross-fertilization. In his works on cross-fertilization no reference is made to Apocynaceæ by Mr. C. Darwin, as this destruction of insect friends on their useful mission is necessarily an anomaly such as is often met with by those engaged in the endeavor to interpret the laws of Nature.

The name "Indian hemp" is derived from its use by the North American Indians. The bark-fibre is extremely fine and tough, and the natives used it for cord-

age, fishing-nets, baskets, coarse cloth, and indeed for almost all purposes that our hemp would be put to. It is much finer than hemp, whiter, and much more durable. It is remarkable that the moderns have not given this fibre more attention. Recently a German author has called attention to its value, enumerating it among other "new" substances, such as *Abutilon Avicennæ*, *Laportea pustulata*, and *Asclepias Cornuti* (see Fuchling's *Landw. Zeitung*, 1880). But similar observations were made by Gerard, who wrote in 1597. He says: "The cods of the greater upright broad-leaved American plant are stuffed full with a most pure silk of a shining white color; and every nerve or sinew, wherewith the nerves are ribbed, are likewise most pure silk; as also are the Peelings or Bark of the Stems or Branches, like as is the Peeling or Bark of Flax or Hemp Cordage for making Linnen. But the Indians have not the Understanding in them to make use of it so as to cover their Nakedness, notwithstanding the Earth is covered over with this Silk. This they daily tread under their Feet, which would be sufficient to Cloath many Kingdoms if it was carefully Cherished and Manured."

The two species are widely spread over the United States. *A. androsaefolium* is found from Canada to Georgia, and across from New Mexico and California to British Columbia. *A. cannabinum* has smaller flowers than the other, and a rather more southern range. It has had a good chance to hold its own, as no animal is known to eat its leaves. Some authors and encyclopædias quote Kalm as saying that the plant is poisonous to some people and not to others, but Kalm refers to the *Rhus* or "poison-vine," and not to the dogbane. *Apocynum* yields a peculiar principle known as *apocynin*. The juice of the plant has been used medicinally as an emeto-cathartic. It induces drowsiness. In doses of 15 to 20 grains it produces vomiting. When employed it is usually given in six-grain doses, but in modern times other drugs have almost superseded it.

A European species, *Apocynum venetum*, is believed to have been the one referred to by the ancients. (T. M.)

DOGWOOD. This is the common name of the plants represented by the genus *Cornus*, which name is derived from the old English word *dagge*; that is to say, a dagger or skewer, the wood being from time immemorial used in connection with bows and arrows, javelins, lances, skewers, and wherever a strong, light wood was desirable. The European species, *Cornus mascula* and *Cornus sanguinea*, are still used when wood of such character is needed. The last-named species is still known among the English peasantry as "arrow-wood" and "skewer-wood." In Latin and Greek classics *Cornus mascula* is the species generally referred to, the name *Cornus* being supposed also to refer to the hard and horny character of the wood. The berries of this species were classed among the fruits, and are referred to as the cornelian cherry, or the cherry of the cornus or cornel tree. It grows to be a tree 20 feet high, and is wild in Asia Minor. It has oval red berries about the size of a cherry, and with a single stone inside. The Romans used the fruits in a fresh condition, as well as dried, and put them up in salt. They also fed them freely to their hogs. They have been freely used to the present time, but have had to give way to better things. The tree is, however, very ornamental, and will always be popular for its early flowers and handsome red berries. The berries of the *Cornus sanguinea*, female or English red dogwood, are often employed in adulterating buckthorn-berries.

In America by "dogwood" is generally understood *Cornus florida*, the flowering dogwood, so called from the series of white leaves or bracts which form an involucre under the real flowers. This peculiarity is shared by a species on the Pacific coast, *Cornus Nuttalli*, which was so named and figured by Audubon in his *Birds of America*, plate 467. This species has the bracts nearly six inches wide, or double the size of its Eastern rela-

See Vol.
VII. p. 297
Am. ed. (p.
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ed.).

tive. Besides these there are sixteen other species natives of North America—namely, *C. alternifolia*, which also makes a small tree, sometimes 20 feet high; *asperifolia*; *Californica*; *Canadensis*, an herbaceous species, which by its numerous red berries, often covering the ground in the greatest abundance, gives so much attraction to Northern forest scenery; *circinatum*; *Drummondii*; *glabra*; *paniculata*, interesting from its pure white berries; *pubescens*, also almost a tree, and the prevailing species of the mountains of Colorado and Utah, sometimes growing in dense masses and forming excellent covers for mountain-bears, which are fond of the berries; *sericea*, a species common along river-banks in the eastern parts of the United States: according to B. S. Barton, the Indians used its bark for flavoring tobacco, made baskets of the young twigs, and prepared a scarlet dye from the branches and the roots; *sessilis*; *stolonifera*, which is known in gardens as the white-berried dogwood, from its large white berries, though other species have smaller white berries, and which has had many other names, now given as synonyms; it is also called red dogwood, which name confuses it with *Cornus sanguinea* of Europe, the twigs being much more entitled to the name of red than the European; *striata*; *Suecica*; *Torreyi*; and *Unalaskensis*.

Though not a large tree, the common dogwood serves many useful purposes. The wood is very hard and light, and bends considerably before breaking. It is in common use for lumbermen's levers, for making cogs for mill-wheels, wedges, and the handles of many tools and implements. It splits easily, and thus makes excellent hoops for small kegs. The specific gravity of the wood, taking hickory at 1000, is 815, and it gives 765 pounds of charcoal to a cord of wood. It is in good demand for the finer kinds of gunpowder. The wood has been used for coarse engravings. The young branches are employed as a dentifrice. The bark has been extensively used in intermittent fevers. Nuttall says of *Cornus Nuttallii*, "An extract of the bark, boiled down to a solid consistence, contains in a very concentrated state the vegetable principle *cornine*, which we found of singular service in the settlement of Wahlamet, where in the autumn of 1835 the intermittent fever prevailed. In most cases pills of this extract, timely administered, gave perfect relief." Medical authorities regard 35 grains of the bark as equal to 30 grains of cinchona, but it is liable to produce pain in the bowels unless carefully administered. During the war of the rebellion in the United States the bark and berries were freely used in the South when quinine became scarce. The berries are sometimes steeped in brandy, and then give "dogwood bitters." Birds are very fond of the berries of all the species. Dr. Walker makes an excellent ink thus: Half an ounce of dogwood bark, 40 grains of sulphate of iron, 40 grains of gum-arabic, in 16 ounces of rain-water. It is said that an oil fit for table use or burning has been obtained from the American red-twigged dogwood, but it was more probably from the *Cornus sanguinea* of Europe. *Cornus florida* extends from Canada to Florida, and its analogue, *Cornus Nuttallii*, has about the same range of latitude on the Pacific coast.

DOGWOOD, Jamaica or West Indian. Unlike the common dogwood, this seems to have derived its name from real service to the canine race, being used in the West Indies to cure the mange in dogs. It is, botanically, *Piscidia Erythrina*, the generic name being from *piscis*, a fish, and the specific (once a generic name) from the Greek *erythros*, red. The powdered bark of the root when thrown into water makes it red, and according to Jacquin, who wrote a history of American plants in 1763, "the leaves and branches, when thrown into the water, intoxicate the fish, which then float on the surface of the water, and may be captured by hand. Many other American plants have this virtue." This early observation has been confirmed by modern authorities. While the larger fish are simply

intoxicated, the smaller ones are killed. The narcotic property of the plant has been the theme of many able essays by medical men. Some assert that it is much safer than opium, leaving none of the unpleasant results of that drug. As with laudanum, when dipped in cotton and put into a hollow tooth it relieves the toothache. It grows in South Florida as well as in the West Indies, forming a straggling tree of about 20 feet in height; the flowers appear before the leaves, in April, and have much the appearance of the common locust-flowers, *Robinia pseud-acacia*. They are white, with a purplish tinge. The seed-pods are singular among the rest of the family, *Leguminosæ*, in having four strong wings along the entire length, giving them the appearance of being almost square. The pod is about two or three inches long, the lower portion being very slender, indeed thread-like, and about half an inch in length. (T. M.)

DOLLAR. See MONEY.

DÖLLINGER, JOHANN JOSEPH IGNAZ VON, a German theologian, leader of the "Old Catholic" movement, was born at Bamberg, Bavaria, Feb. 28, 1799, being the son of the celebrated anatomist and physiologist, Ignaz Döllinger (1770–1841). He studied theology at Würzburg and Bamberg, and immediately after he received priestly orders; in 1822 he was made chaplain and in the next year became professor in the Lyceum at Aschaffenburg. His first theological work, *The Doctrine of the Eucharist in the First Three Centuries*, was published in 1826; and in the same year he was called to the University of Munich as professor of church history and canon law. His course of lectures was published in 1828 under the title of *Manual of the History of the Church*. This work was afterwards enlarged into a *Treatise on the History of the Church* (1836–38). In 1845, as the representative of the University of Munich, he entered the Bavarian Parliament, and in 1849, while a delegate to the Frankfort Diet, he voted for the entire separation of church and state. In 1861 he discussed the question of the temporal power of the pope in some writings which attracted much attention. In his work, *The Papacy and the State of the Church*, he counselled the abandonment of the temporal power, and thus gave occasion for a lively polemical discussion. His name became still more widely known by his opposition to the decrees of the Vatican Council of 1868–70, and particularly to the one relating to the infallibility of the pope. In a series of articles published in the *Augsburg Gazette* he demanded liberty of discussion in the Œcumenical Council, and argued that the new decisions, to have authority, should be adopted almost unanimously. Certain anonymous writings vigorously attacking the infallibility of the pope were attributed to him, and the *Roemische Briefe vom Council* brought against him an energetic attack. As he resolutely refused to submit to the decrees of the Vatican Council, he was, on April 17, 1871, formally excommunicated by the archbishop of Munich. By this, however, his popularity in Bavaria was increased. His resistance was sustained by the government, and he became the acknowledged leader of those who, holding the previous teachings of the church, have become disaffected toward the Holy See. The University of Oxford conferred on him the degree of D.C.L., Jan. 6, 1871, and on July 29 he was elected rector of the University of Munich by a vote of fifty-four to six. He took a leading part in the "Old Catholic" congresses of Munich in 1871 and Cologne in 1872: but while firm on the question of doctrines he avoided any association in the political tendencies of the party. Since then he has presided, at Bonn, over several conferences of Old Catholics, with representatives of English, American, and oriental churches, with the purpose of effecting a unity of doctrine and to prepare for the fusion of all the Christian churches. In 1873 he was nominated, by King Louis of Bavaria, president of the Royal Academy of Sciences of Munich

and conservator-general of the scientific collections of the kingdom.

In addition to the works named he has published : *Origins of Christianity* (1833-35); *The Religion of Mohammed* (1838); *The Reformation, its Interior Development and its Effects* (3 vols., 1846-8); *A Sketch of Luther* (1851); *Hippolytus and Callistus, or the Roman Church in the First Half of the Third Century* (1854); *Paganism and Judaism* (1857); *Christianity and the Church* (1860); *The Papacy and the Temporal Power* (1861); *Papacy Legends of the Middle Ages* (1863); and *History of the Religious Sects of the Middle Ages* (3 vols., 1870); *Lectures on the Reunion of the Churches* (1872); with numerous pamphlets and periodical articles, several of which have been collected under the title, *Essays on the Political, Ecclesiastical, and Social History of the last Six Centuries* (1862-82).

DOMINICAN REPUBLIC, or SAN DOMINGO (Spanish *Republica Dominicana*, or *Santo Domingo*), a republic of the West Indies, comprising the eastern two-thirds of the island of Hayti (Santo Domingo), of which the western one-third constitutes the republic of Hayti (Haiti). The Dominican Republic has an area stated at 20,597 square miles, while that of the Haytian Republic is but 9232 square miles. The Dominicans are a Spanish-speaking people of negro origin, with a large admixture of white and Indian blood; the Haytians speak a French *patois*, and are of more purely African stock. In the report of the United States commission of 1871 it is stated that in Santo Domingo there is a marked preponderance of white blood over the negro. Very few pure-blooded negroes are found; one-tenth of the people are of pure Spanish descent.

Mountains and Valleys.—The central range or backbone of the island (*Sierra del Cibao*) lies chiefly in Dominican territory, and has a general course from W. N. W. to E. S. E., and then turns to the E., extending to Cape Engaño, the E. point of the island. Northwardly this range is separated by the noble plain or valley of Cibao (called *la Vega Real*) from the northern coast-range (or *Sierra de Monte Cristi*). This plain is watered by the Gran Yaqui (the largest river of the island), flowing W. N. W., and by the Yuna, flowing E. S. E. The third or southernmost range lies mostly in the Haytian territory, but also occupies the S. W. parts of the Dominican republic. Between this and the central range is a valley broken by hill-ranges, and traversed by the head-streams of the Haytian river Artibonite, flowing generally westward, and by the Neyba, or Lesser Yaqui, flowing S. S. E. The central range is the highest, several of its peaks, according to some authorities, exceeding 9000 feet in height; but Mount Yaqui, the highest point, has been recently stated not to exceed 7560 feet. The southern range is not quite so high as the first; while the *Sierra de Monte Cristi* on the N. is believed to have no peak reaching 4000 feet. Yaqui, the highest mountain, is near the centre of the island.

Rivers.—The rivers comprise (1) the Artibonite (chiefly Haytian); (2) the Great Yaqui (called also Yacki, Yaque, Northern Yaqui, and Monte Cristi); it is the largest Dominican stream, yet has a shoal mouth, and is boatable rather than navigable; (3) the Yuna, flowing into the head of Samaná Bay; it has a sand-bar at the mouth, with only four feet of water, but boats can ascend it forty miles, nearly to the town of Cotuy; (4) the Neyba, Neyva, Neiva, or Lesser Yaqui, also called South Yacki; (5) the Nisao, a swift stream with a bad bar, scarcely passable for boats; (6) the Ozama, on the S. coast, and on which is the city of Santo Domingo; this stream at low tide can receive vessels of eleven to thirteen feet draught; inside the bar the water is twenty feet deep for some distance; (7) the four little rivers called Yeguada, Guanabo, Real, and Jayan; these all flow into the port of Jicaco, or Eng-

lish Port, eleven miles W. of Cape Rafael, as do also small streams called Capiton, Culebras, and Magüa; (8) the Higüey, or Yuma, whose mouth is near the S. E. point of the island; it has eight feet on the bar and twelve feet within; not far off are the Anamuya, Maymon, and Nisibon; (9) the Quiabon, with a bar often dry, and never more than three feet under water; (10) the Romana, a deep stream, whose mouth makes a good anchorage; ten feet may be carried for two miles up; (11) the Cumayazo, which may be entered by large ships; (12) the Soco, large but shallow, though passable for boats; (13) the Macoris, whose mouth forms the port of the same name; (14) the Jaina, which is not properly navigable, though mahogany is shipped from it; (15) the Nigua, Najallo, Nisao, Via, or Bya, Tabara, Nisaito, Agujero-Chico, Trou-Jacob, and Pedernales, all small streams of the south coast; (16) the small rivers of the north coast, the Estillero, Lateriana, Yasica, Bobo, San Marco, and Dajabon or Massacre River.

Boundaries, Coast-lines, Harbors.—The Dominican Republic is bounded W. by Hayti, the river Dajabon (Daxabon, or Massacre) marking the limit on the N. and the Pedernales that on the S. coast. Between the heads of these rivers the boundary line is not clearly established, though in part it follows the crest of a range called the Black Mountains. The only outlying islands worth naming are Saona, Catalina, and Beata, all to the S. The peninsula of Samana on the E. was an island in the colonial period. Cape Engaño, the E. point, is in lat. 18° 35' 51" N., lon. 68° 20' 40" W. The island of Beata, the southernmost point in the republic, is in 17° 36' 45" N., 71° 32' 54" W. The republic has few good harbors, but there are many tolerable anchorages and roadsteads.

Climate, Productions, etc.—The climate of course varies with altitude. The ports and low plains are hot and sickly, the yellow fever being endemic. The rainy season lasts from May till November, and is the worst time for strangers to visit the country. The dry season has strong N. E. and N. W. winds, while the violent winds of the rainy season are oftenest from the S.; most of the hurricanes pass N. of the island, but they are not very unfrequent between July 1 and the end of October. The mineral wealth is great; gold, silver, mercury, copper, platinum, iron, tin, sulphur, salt, antimony, and manganese are reported. Gold was formerly wrought on an important scale; it is now collected in a very small way. There are fisheries of some local importance. The forests yield oak, pine, mahogany of finest quality, *lignum vitæ*, satinwood, fustic, logwood, etc.; and nearly all tropical fruits can be grown in perfection. Charcoal and firewood are exported to some extent, but the principal exports are of hides, cattle, sugar, rum, tobacco, coffee, cacao, *lignum vitæ*, logwood extract, tortoise shell, honey, wax, mahogany, furniture-woods, and especially dyewoods. Santo Domingo, Puerto Plata, Samaná, Azua, and Monte Cristi are the chief ports for trade. The raising of cattle and of swine are leading industries. There is of late an active shipment of guano from the coast islets. Much of the soil is of unsurpassed fertility, but there are large barren tracts towards the west; while in the east agriculture is of the most slovenly description. There is little real industry, yet the people are in general happy and careless, and the criminal class is small.

Government, social life.—The government is republican in form, the president being chosen for six years. The republic is divided into five provinces and four maritime districts, each province or district having its governor. The provinces are Santo Domingo (with capital of the same name), Santiago (capital, Santiago de los Caballeros), La Vega (capital, Concepcion de la Vega), Azua de Compostela (capital, Azua), and El Seybo (capital, Santa Cruz del Seybo). The maritime districts are Puerto Plata, Monte Cristi, Samaná, and Barahona, each with a capital and seaport of the same name.

There is a national congress, in two houses, and each province has a legislature. There is a small standing army, rendered necessary by frequent Haytian trespasses on the west frontier. The general outlook for Santo Domingo is rather encouraging. The country is more quiet and prosperous than is Hayti, and the recent increase of sugar-production is in part a cause, in part an effect, of increased tranquillity.

The state religion is Roman Catholic. The capital city is an archiepiscopal see, now under the charge of a delegate apostolic. There is an institution called the University of Santo Domingo; but schools are not numerous or important, although there is a department of public instruction. There are few decent roads, and no railways except one in construction from Samaná to Santiago; another is to be made from Barahona to certain salt mines. Canoes carry freights on some of the rivers, but transportation is mostly by mules and pack-horses, which travel over mere bridle-paths in the forests and mountains. The only towns of importance are Santo Domingo (the capital population, 16,000), Santiago de los Caballeros, Concepcion de la Vega, Azua, Santa Cruz del Seybo, Puerto Plata, Monte Cristi, Samaná, and Barahona.

Finances.—The receipts for 1882 (chiefly from import duties) were about \$1,500,000, the expenses somewhat less. A government debt of £757,000 was contracted in London in 1869, of which only a part is recognized by the Dominican government. There is also a home debt of \$2,000,000, towards the extinction of which 15 per centum of the entry duties is applied. The population is variously estimated, but probably does not exceed 180,000. (C. W. G.)

DONALDSON, JAMES, LL.D., a Scotch classical scholar, was born at Aberdeen, April 26, 1831. He was educated in Marischal College, Aberdeen, New College, London, and the University of Berlin. He was appointed Greek tutor in Edinburgh University in 1852, rector of the High-school of Stirling in 1854, classical master in the High-school of Edinburgh in 1856, and rector of the latter school in 1866. In 1881 he was appointed professor of humanity in the University of Aberdeen. He has contributed to the *ENCYCLOPÆDIA BRITANNICA*, and to several periodicals. Among his works are a *Modern Greek Grammar for the use of Classical Students* (1853); *Lyra Græca: Specimens of the Greek Lyric Poets from Callinus to Soutsos, with Critical Notes* (1854); *Critical History of Christian Literature and Doctrine from the Death of the Apostles to the Nicene Council* (3 vols., 1864-66); *The Expiatory and Substitutionary Sacrifices of the Greeks* (1875); and *On the Position of Women in Greece*. In conjunction with the Rev. Alexander Roberts he edited *The Ante-Nicene Christian Library* (24 vols., 1867-72).

DONALDSON, JAMES LOWRY, an American general, was born in Baltimore, March 17, 1814. He graduated at West Point in 1836, then served in the Florida war and in removing the Cherokee Indians to the West. During the controversy about the boundary of Maine he served in that State, and in 1844 he was engaged in the survey of the line agreed upon, having previously furnished the maps upon which the treaty was principally drawn. He took part in the military occupation of Texas in 1846, and in the Mexican War. He was engaged on duty as chief quartermaster of the department of New Mexico when the Civil War broke out. In 1862 he was ordered to Pittsburg, Pa., and became chief quartermaster of the Middle department. He established the great dépôt at Nashville, which furnished Gen. Sherman's supplies during the Atlanta campaign and the subsequent "March to the Sea." Under the orders of Maj.-Gen. George H. Thomas, commanding the military division of the Tennessee, he established the system of national cemeteries, which was afterwards adopted by the quartermaster's department and approved by Congress. Gen. Donaldson became by successive promotions major-general of volunteers and brevet major-general in the regular army.

He retired voluntarily from active service March 15, 1869, and from the army Jan. 1, 1874. He published in 1871 a tale of the Florida war called *Sergeant Atkins*.

DONALDSONVILLE, a town of Louisiana, the county-seat of Ascension co., is on the right bank of the Mississippi River at the head of Bayou Lafourche. It is 78 miles from New Orleans by river, and 65 by the Southern Pacific Railroad. It has a court-house, market-house, 4 hotels, 2 weekly newspapers, 5 churches, 2 public and 4 private schools. St. Vincent's Orphan Asylum occupies a fine building. Donaldsonville is the third oldest town in the State, and was incorporated in 1836. Its property is valued at \$600,000. The population is 2600, about half of whom are colored. Bayou Lafourche flows from the Mississippi into Barataria Bay, an arm of the Gulf of Mexico. Population of Donaldsonville, 2600.

DONDERS, FRANTS CORNELIS, a Dutch physician, was born at Tilburg, in Northern Brabant, May 27, 1818. He was educated at the university and military medical school of Utrecht, and became physician at the hospital of Haag, and afterwards professor at the Utrecht school. In 1847 he was made professor in the University of Utrecht, where he taught physiology and histology, to which he added a course in ophthalmology, and a clinic on maladies of the eye. In 1863 he received the title of ordinary professor, and with the assistance of the government established a physiological laboratory, which was inaugurated in 1867. His works include: *Micro-chemical Researches upon the Animal Tissues* (1846); *Forms, Combinations, and Functions of the Primitive Tissue* (1849); and, in ophthalmic science, *Study of the Movements of the Eyes* (1847); *Astigmatism* (1862); *Anomalies of Accommodation and Refraction of the Eye, and their results* (1865); (an English translation of which was published by the New Sydenham Society). He has, besides, contributed numerous papers to medical journals, and has edited the *Researches made in the Laboratory of the University of Utrecht* (Utrecht, 1849-57; 2d series, 1867).

DONELSON, ANDREW JACKSON, LL.D. (1800-1871), an American diplomatist and politician, was born near Nashville, Tenn., Aug. 25, 1800. He graduated at West Point in 1820, and became aide-de-camp to his uncle, Gen. Andrew Jackson, then governor of Florida, which had recently been obtained from Spain. He resigned from the army in 1822, and studied law at Nashville. Gen. Jackson, on his accession to the presidency in 1829, appointed Donelson his private secretary, but the latter finally withdrew from Washington in consequence of the trouble caused by Pres. Jackson's insisting on the social recognition of Mrs. Eaton. In 1844 Donelson was sent by Pres. Tyler to Texas as chargé d'affaires, and negotiated its annexation to the United States. He was United States minister to Prussia in 1846. Returning to this country in 1849 he took an active part in the political discussions concerning slavery, and in 1851 became editor of the *Washington Union*. In 1856 he was nominated by the American party as their candidate for Vice-President, but was defeated. He then retired from public life, and lived as a planter in Mississippi. He died at Memphis, Tenn., June 26, 1871.

DONGAN, THOMAS (1634-1715), colonial governor of New York, and afterwards Earl of Limerick, was born in 1634, at Castletown, county Kildare, Ireland, being the second son of Sir John Dongan. Having adopted the military profession, he was, by the influence of his uncle Talbot, Earl of Tyrconnel, soon promoted to a colonelcy. He afterwards entered the service of France with the same rank, but in 1678, when Charles II. ordered all British subjects home, Dongan returned at considerable sacrifice. For this he was compensated by an English pension, and was appointed lieutenant-governor of Tangier. In 1682, when Sir Edmund Andros was recalled from the governorship

of New York, Col. Dongan was appointed by the Duke of York to succeed him. He arrived Aug. 25, 1683, but was met with some distrust on account of his being a Roman Catholic. His firm and judicious policy as well as his pleasing address soon conciliated all classes. He had brought instructions under which the first general assembly of the colony was convened in New York city, Oct. 17, 1683. When the Duke of York became king, Dongan was continued in office, and April 27, 1686, he granted a charter to the city of New York, which has remained for two centuries the basis of its municipal rights. He also chartered the city of Albany, and endeavored to unite New Jersey and Connecticut with his own province. His policy with the Indians was to continue their instruction in Christianity which had been commenced by French missionaries, but to have the work carried on by English Catholic priests, so that French political influence might be restrained. But these views did not meet the king's approval, and in April, 1688, Dongan, resigning his office, retired to private life in New York and on Staten Island. In 1691 he returned to England, and in 1698 he succeeded to the title of Earl of Limerick by the death of his elder brother, but the estates had been forfeited by the adherence of the latter to James II. after the revolution of 1688. An act of parliament for his relief was passed May 25, 1702. He died in London, Dec. 14, 1715, without issue.

DONIPHAN, ALEXANDER WILLIAM, an American general, was born in Mason co., Ky., July 9, 1808, the youngest of ten children. When he was five years old, his father died. He was carefully trained and graduated from Augusta College at the age of eighteen. Having studied law, he was admitted to the bar in 1830 and removed to Lexington, Mo., where he began the practice of his profession. In 1833 he removed to Liberty, in Clay co., then on the verge of civilization. His eloquence and ability not only gave him prominence as a lawyer, but caused him to be elected to the Missouri legislature in 1836, in 1840, and again in 1854. When the State militia were called out in 1838 to enforce the law against the Mormons, Doniphan was in command of the First brigade and secured the surrender of their prophet, Joseph Smith; yet he was afterwards employed as the counsel of the prophet, who, however, escaped from jail and joined his people in Illinois. In 1846, at the outbreak of the Mexican war, a regiment of mounted volunteers from Missouri was organized June 18, with Doniphan as colonel. This regiment with some infantry, rangers, and artillery from Missouri, and six troops of United States dragoons, amounting in all to 1658 men, formed the Army of the West, under command of Col. S. W. Kearney, U. S. A. They marched 900 miles to Santa Fé, and took peaceable possession of New Mexico. On Sept. 25 Gen. Kearney set out for California, with his dragoons, and ordered Doniphan to march to Chihuahua to report to Gen. Wool, but afterwards directed him first to reduce the unruly Navajos to submission. In spite of the difficulties of a campaign late in the autumn, this was done. Then on Dec. 14 Doniphan set out from Valverde to seek Gen. Wool, far to the southward. His regiment had been reinforced and had two batteries. In bitterly cold weather they crossed a treeless desert of 90 miles, and on Christmas day the advance party of 500 encountered a Mexican army on the banks of the Bracito. The Missourians were summoned to surrender with a threat of "no quarter," but Doniphan refused. After a sharp contest of 30 minutes the Mexicans fled, leaving 63 dead and 150 wounded, while of the Missourians only 7 were wounded. On Dec. 27 Doniphan entered El Paso, but he still had 250 miles to march to Chihuahua; and in the meantime Gen. Wool had left that place to reinforce Gen. Taylor. On Feb. 8, 1847, Doniphan resumed his march with 954 men, pushed on through a sandy desert, and finally, on Feb. 28, encountered an army

of 4000 men in front of Chihuahua. After three hours of hard fighting the Mexicans were routed, leaving 304 killed and nearly 500 wounded. The loss of the Missourians was 1 killed and 11 wounded. On March 1, 1847, Doniphan entered Chihuahua in triumph. He immediately despatched scouts in search of Gen. Wool, who was found on April 2, at Saltillo, 700 miles distant. Thither the Missourians were ordered to march, and on May 21 they joined Gen. Wool near Buena Vista. Their term of enlistment had now nearly expired, and it was decided by the commanding general that they should return home by way of New Orleans. At St. Louis they had a public reception, in which Col. T. H. Benton welcomed them back to their native State. This arduous and memorable march was the means of largely increasing the extent of the United States, being the ground of the annexation of New Mexico and other Territories, rich in the precious metals. Col. Doniphan returned to the practice of law in Liberty, but in 1854, during the troubles in Kansas, he was elected to the Missouri legislature, and in February, 1861, he was a commissioner from his State to the Peace Convention at Washington which vainly sought to avert civil war. He took no part in the dreadful strife that ensued, but awaited the result with deep anxiety. He still lives in Western Missouri, highly respected by the community.

DORAN, JOHN, PH. D. (1807-1878), an English miscellaneous author, was born in London, March 11, 1807. His family had long held an honorable position in Drogheda, Ireland, but his father, having taken part in the rebellion of 1798, removed to London after the failure of that attempt. Here, becoming a merchant, he made a contract to supply the Channel fleet with provisions during the war with Napoleon, and while so engaged was seized and carried to France. After a captivity of two years he was restored to his family. The son was well taught by his father and in a private school in London, and at an early age showed literary talent. His play of *The Wandering Jew* was performed at the Surrey Theatre when the author was only fifteen. On account of his proficiency in French, acquired from his father, he was selected while still quite young to take charge of the son of Lord Glenlyon (afterwards duke of Athole) during his residence in France. A series of letters from Paris, contributed by him at this time to the London *Literary Chronicle*, was reprinted in 1828 under the title *Sketches and Reminiscences*. For some years he was tutor in the family of Mr. Lascelles (afterwards earl of Harewood), and did much miscellaneous reading and writing. Part of this related to the *History and Antiquities of Reading in Berkshire*, which was published in 1835. He then spent two years on the Continent, during which he received on examination the degree of Ph. D. from the University of Marburg. Returning to England, he determined to devote himself to literature, and took up his residence in London. For eleven years he was connected with the *Church-and-State Gazette*, at first as literary editor, but afterwards doing all the work. Though the father had been a rebel, the son, who cherished his memory, was a Tory, full of hatred and scorn for political agitators, and also of tenderest regard for old laws and institutions. While editor of the *Gazette* he published *Filia Dolorosa*, *Memoirs of the Duchess of Angoulême* (1852), and wrote a *Life of Dr. Young* for a new edition of Young's *Poems* in 1854. He then began to write for *The Athenæum*, and was soon regularly employed on that journal. For fifteen years scarcely a number of it appeared without an important article from his pen, and at times he was the acting editor. During this period also he produced most of his books, whose titles show the wide range and curious character of their contents. They comprise—*Table Traits, and Something on Them* (1854), *Habits and Men* (1854), *Lives of the Queens of England of the House of Hanover* (1855), *Knights and their Days* (1856), *Monarchs Re-*

tired from *Business* (1857), *History of Court Fools* (1858), *New Pictures and Old Panels* (1859), *Lives of the Princes of Wales* (1860), *Saints and Sinners* (1868). He also edited *The Last Journals of Horace Walpole* (1859) and *The Bentley Ballads, with original Poems by the Editor* (1861). His most important work was a history of the English stage, published under the title *Their Majesties' Servants* (1864). In the same year he was associated with Mr. W. Hepworth Dixon in editing *Court and Society*, which appeared, however, under the name of the Duke of Manchester, who had furnished the material for the volumes from the "Kimbolton Papers." In 1869 Dr. Doran became editor of *Notes and Queries*, a position for which he was eminently suited by taste and multifarious knowledge. He also contributed to the leading reviews and magazines of the times. In 1873 he published *A Lady of the Last Century—Mrs. Elizabeth Montague*, and in 1877 appeared his last work, *London in Jacobite Times*. He died in London, Jan. 25, 1878.

DORÉ, PAUL GUSTAVE (1832–1883), a French artist celebrated for his originality, his imaginative powers, his grotesque talent, and the enormous number of designs which he has made, was born at Strasburg, Jan. 6, 1832. It is said that before he was eight years of age he made satirical and other sketches which indicated great and original talent. He began his education at the College of Bourg, but in 1847 was taken to Paris by his father and entered at the Lycée Charlemagne. While still at school he had a regular engagement as contributor to the *Journal pour Rire*, and by 1850, when he left the Lycée, he had produced many hundreds of drawings, and had established a reputation as an original and prolific designer of grotesque and satirical sketches. It was only four years after this that he published his first set of illustrations of the works of Rabelais. The grim and boisterous humor of the curé of Mendon was interpreted with so much sympathy and with such entire adequacy in this series of drawings that the peculiar genius of Doré obtained through them recognition of a portion of the public which had given but little consideration to his contributions to the *Journal pour Rire*. Doré, nearly twenty years later, returned to this subject, but the second set of Rabelaisian designs scarcely equalled the first in the peculiar qualities of excellence which had enabled the youth of twenty-two to win fame by a single stroke. It was evidently a labor of love for Doré to illustrate Rabelais, and it was equally so for him, two years later, to illustrate *Les Contes drôlatiques* of Balzac. The edition of this work containing Doré's designs has frequently been referred to as a remarkable instance of entire sympathy between author and artist. That there was abundant sympathy in certain respects is true enough, but Doré's genius is different in many essential particulars from Balzac's, and there is much in Doré's designs beyond what Balzac ever imagined. Balzac, in this work, attempted a deliberate imitation of Rabelais, but the designs of Doré have the true Rabelaisian flavor to a far greater extent than does Balzac's text. In truth, however, Doré was indebted to neither author for much more than hints and fillips to his fancy, and he gave to them quite as much as he received from them. To this period also belongs the singular series of drawings illustrative of the Wandering Jew legend, in which the pathetic and the grotesque are most audaciously combined. If we except certain of his landscapes and a comparatively small list of particularly powerful and original drawings that are scattered here and there through the immense number of books which he has illustrated, then these sets of designs may be regarded as the best expressions of the peculiar genius of Doré. He has never surpassed them, while he has many times fallen far below these special excellences, and that, too, in the treatment of themes which apparently should have stimulated him to put forth all his powers. From this time Doré was

full of employment as a book-illustrator and contributor to the illustrated newspapers, and as a painter of pictures.

He first exhibited at the Salon in 1848; and thenceforth he nearly always contributed one or more works—often of huge dimensions—to the annual exhibition at Paris. His pictures represented Alpine and Spanish scenery, episodes of the *Divine Comedy*, scriptural incident, and what-not. Meanwhile he was busily engaged in illustrating books—now Perrault, now Montaigne, now Dante, now *Don Quixote*, now La Fontaine, until the promises of his publishers induced him to take up such uncongenial subjects as Tennyson's Arthurian poems, and the Scriptures and *Paradise Lost*. The illustrations of Perrault and La Fontaine are many of them admirable, while those to *Don Quixote*, although of uneven merit, frequently exhibit author and artist in entire accord. A few of the biblical designs are fine, but the series, as a whole, has a catchpenny appearance, and does the artist no particular credit. The Tennysonian illustrations are perfunctory, and of those made for the *Divine Comedy*, with few exceptions, the landscapes are the best. There is more of the real spirit of Dante in the two pictures painted by Ary Scheffer, and in the one great painting of a Dantean theme by Eugene Delacroix, than in all of the multitude of drawings made by Doré. Doré might possibly have received an inspiration from Coleridge's *Ancient Mariner*, had it been a French poem, but it is certain that the English work did not inspire him. With *Paradise Lost* he was equally unsuccessful: Milton was even further beyond his reach than Dante. The drawings made from Chateaubriand's *Atala* (published in 1863) are among the best by Doré that attempt to deal seriously with serious subjects. Many of the landscapes in this series are finely imaginative treatment of imposing subjects.

In addition to the works mentioned Doré made illustrations for the *Voyage aux Pyrénées* of M. Taine, *L'Espagne* of Baron Davillier, *Roland Furieux* and *London* by Louis Enault and Blanchard Jerrold. Insufficient as many of these drawings are, all of the series mentioned contain pieces that have extraordinary merit. In the *London*, for instance, are some effects which would not have done discredit to Rembrandt, and which could not have been produced except by an artist of real and very exceptional genius. The truth about Doré is that he permitted himself to be ruled too much by his publishers, and especially by his English publishers, and he not only undertook tasks for which he had no special qualifications, but he did more than it was possible for any man to do and at the same time maintain a high standard of excellence. The wonder with regard to him, considering his ceaseless activity and the enormous number of elaborate designs which he made, is not that he should have produced so much that is comparatively worthless as that he should have accomplished so much that is really excellent; for if all the manifestly inferior performances for which he is responsible were to be rejected, there would still remain many hundreds of designs marked by qualities which would stamp their author as one of the greatest artists of the age. In fact, the very multitude of this artist's designs, of one sort or another, has had the effect of preventing many persons of good artistic judgment from giving him the credit which is his due. Despite his manifold shortcomings, despite his lack of artistic conscience, and despite his fecundity, he is entitled to be regarded as a great artist, with exceptional and peculiar gifts, and with imaginative powers of all but the highest order.

Of the many huge canvases that Doré painted the most celebrated, if not the best, are his representation of a gambling-scene at Baden, his *Triumph of Christianity*, and his *Christ Leaving the Prætorium*. Doré's color is bad and his handling coarse, and although some of his paintings have impressive passages in them, they have added little or nothing to

his real reputation. In the way of sculpture, also, he produced several pieces, among which may be mentioned the composition entitled *The Vine*—a huge flagon-shaped vase upon which a multitude of figures in violent action are modelled—which was shown at the Paris Exhibition of 1878, and a group entitled *Fate*. This last is a much more dignified and serious work than was to have been expected from the hand of the author. Fate is represented as a rather cadaverous woman, with a look of pitiless serenity on her countenance, who is about to snap the thread which an Eros with troubled countenance, who rests between her knees, holds in his hands. It is perhaps not a very great work, if we measure its worth by the standard of the greatest performances of the greatest sculptors. It is both in matter and manner far removed from the commonplace, however, and, whatever its strictly technical demerits may be, it has a real impressiveness such as belongs to very few contemporary sculptures.

Doré died suddenly in Paris, Jan. 22, 1883, having barely reached the age of fifty-one. (W. J. C., JR.)

DORN, JOHANN ALBRECHT BERNHARD (1805–1881), a German orientalist, was born May 11, 1805, at Schenerfeld, Saxe-Coburg. He was educated in the Universities of Halle and Leipsic, and after his graduation in divinity travelled in France and England, becoming in 1829 ordinary professor of oriental languages at the Russian University of Charkow. Six years afterward he was called to St. Petersburg, where he became, first, professor of history and of Asiatic geography at the Oriental Institute, and in 1843 keeper of the Imperial Library and director of the Asiatic Museum. He was a member of the Imperial Academy of Sciences and of the French Academy of Inscriptions. His studies and works were principally devoted to the history and language of the Afghans (Pushtu), the history and geography of the Caucasus and of the regions bordering the Caspian Sea. He died at St. Petersburg, May 18, 1881. He published an English translation of Neamet-Ullah's *History of the Afghans* (London, 1829–36, 2 vols.); *Grammatical Observations upon the Language of the Afghans* (St. Petersburg, 1840); *Chrestomathy of the Pushtu or Afghan Language*, with glossary (1847); a German translation and the Persian text of Shih-ed-din's *History of Tabaristan, of Rujan, and of Masenderan* (2 vols., 1850); of Chondemir's *History of Tabaristan* (1850), and various other translations of oriental works on history and geography. In 1860–61 he made a scientific journey to the Caucasus, and obtained a rich collection of inscriptions of great importance in the history of the Caucasian dialects. He published the results in an important work entitled *Caspia, Invasion of the Ancient Russians in Tabaristan* (1875).

DORNER, ISAAC AUGUST (1809–1884), a German Lutheran theologian, was born June 20, 1809, at Neuhausen-ob-Eck, Württemberg, where his father was pastor. He received his preliminary education at Maulbronn, and in 1827 entered the University of Tübingen, where he studied philosophy and theology. In 1832 he returned to Neuhausen to become vicar of his father's church. In 1834 he became a repetent at Tübingen, and in 1836 he received the degree of doctor. He then travelled through Holland and Great Britain to make a personal examination of the state of the Reformed churches. He was made extraordinary professor of theology at Tübingen in 1838, and ordinary professor at Kiel in 1839. In 1843 he took a similar position at Königsburg, and in 1847 at Bonn. From 1853 he taught in the University of Göttingen, and from 1861 in Berlin. In 1873 he visited the United States as a delegate to the meeting of the Evangelical Alliance in New York. He died at Wiesbaden, July 9, 1884. His principal work is *The History of the Development of the Doctrine of the Person of Christ*, which was originally published in

the *Tübingen Zeitschrift für Theologie* in 1835, and was subsequently elaborated in four volumes (1845–56). An English translation appeared in 1859. The work is a model of historical learning and critical speculation, while it also bears witness to the firm faith of the writer. Among his other works are *Der Pietismus* (Hamburg, 1840); *Das Prinzip unserer Kirche* (Kiel, 1841); *De oratione Christi eschatologica*, Matt. xxiv. (Stuttgart, 1844); *Geschichte der Protestantischen Theologie* (2d ed., Munich, 1868); *Augustinus: Sein Theologisches System* (1873); *Christliche Glaubenslehre* (2 vols., Berlin, 1880–81); *Gesammelte Schriften aus dem Gebiet der systematischen Theologie, Exegese und Geschichte* (1883). Dr. Dorner died at Wiesbaden, July 8, 1884. By his teaching and writing he did much to turn the current of German thought from rationalism to belief in orthodox Christianity.

DORR, BENJAMIN, D.D. (1796–1869), an American Episcopalian clergyman and author, was born at Salisbury, Mass., March 22, 1796. He graduated at Dartmouth College in 1817, and commenced the study of law at Troy, N. Y., but in 1819 went to New York city, where he became one of the first class in the General Theological Seminary of the Protestant Episcopal Church. He was ordained by Bishop Hobart in 1820, and had charge of the churches of Lansingburg and Waterford, N. Y. In 1829 he became rector of Trinity Church, Utica, and in 1835 he was appointed general agent of the domestic committee of the board of missions. In discharge of his duties he visited most of the churches and missionary-stations in the United States, travelling 15,000 miles in eighteen months. In 1837 he was called to be rector of Christ Church, Philadelphia, succeeding the venerable Bishop White. In the next year the degree of D. D. was conferred on him by the University of Pennsylvania. In 1853 he made an extensive tour in Europe and the East, an account of which he published in 1856 under the title *Notes of Travel in Egypt, the Holy Land, Turkey, and Greece*. His other publications were—*The Churchman's Manual, an Exposition of the Doctrines, Ministry, and Worship of the Protestant Episcopal Church*; *The Recognition of Friends in Another World*; *Prophecies and Types relative to Christ*; *The History of a Pocket Prayer-Book, written by Itself*; *An Historical Account of Christ Church, Philadelphia, from its Foundation in 1695 to 1841*, and a *Memoir of John Fanning Watson, the Annalist of Philadelphia and New York* (1861). Dr. Dorr died at Germantown, Pa., Sept. 18, 1869.

DORR, THOMAS WILSON (1805–1854), a Rhode Island politician, was born at Providence, R. I., Nov. 5, 1805. His father, Sullivan Dorr, was a successful manufacturer. Thomas graduated at Harvard College in 1823, studied law with Chancellor James Kent, and was admitted to the bar in 1827. He was elected to the Rhode Island legislature in 1833, and soon began his efforts to obtain a new constitution for the State, instead of the colonial charter granted by Charles II. in 1663, which was still the fundamental law. Under it the right of suffrage was restricted to the holders of real estate valued at not less than \$134 and to their eldest sons. The apportionment of representatives in the legislature had become very unequal. In 1824 a convention called by the legislature framed a constitution which was rejected by the legal voters. Another convention was called in 1834, but broke up without completing its task. In January, 1841, the legislature called a convention to meet in the following November, the delegates to be chosen by the legal voters. But the advocates of the extension of the right of suffrage, of whom Dorr was the most prominent, despaired of ever effecting a reform in the way proposed, and called upon the adult male population to elect delegates to a convention to be held at Providence in October. This was done, and a constitution was prepared and voted upon by the people, and declared to be accepted by a small majority. The other convention met at the ap-

pointed time, and in March, 1842, the constitution framed by them, which still somewhat restricted the elective franchise, was submitted to the people and rejected. In April the people, acting under the constitution informally constructed and ratified, elected Mr. Dorr governor of the State, and also elected senators and representatives to form a legislature. Appeal was made by both parties to the Federal Government for support, but President Tyler declared himself bound to respect the requisitions of the existing government. In May, Mr. Dorr and his government attempted to organize and get possession of the State arsenal and other property. The legal governor, Samuel W. King, successfully resisted the attempt and dispersed Dorr's legislature. Dorr himself escaped arrest, and on June 25 renewed his effort with 700 men, and intrenched himself at Chepachet. Gov. King now proclaimed martial law and called out 3000 militia, whereupon Dorr's partisans deserted their camp, and he fled to Connecticut, and afterwards to New Hampshire. A reward of \$4000 having been offered for his apprehension, he returned, was arrested, tried, and convicted of high treason. He was sentenced to imprisonment for life, but three years later was released under a general amnesty. In 1851 the legislature restored him to full citizenship, and ordered the record of his sentence expunged. In June, 1842, the legislature called a convention to meet in September, and a new constitution was framed and ratified in November, and went into operation May, 1843. Mr. Dorr died at Providence, Dec. 27, 1854.

DOUGLASS, FREDERICK, the foremost representative of the colored race in the United States, was born in Tuckahoe, near Easton, Md., about 1817. His father was a white man and his mother was a negro slave, who, though a field-hand, had learned to read. Frederick was brought up on the plantation of Col. Edward Lloyd. When he was ten years old he was sent to Baltimore to be a servant in the house of Mrs. Sophia Auld, who taught him the alphabet, and he soon learned to read and write. He was said to be difficult to manage, and afterwards allowed to hire his own time and found employment as a caulker in a ship-yard. He had, however, determined to escape from slavery, and at last put his resolution in practice, fleeing from Baltimore Sept. 3, 1838. He found his way to New York, whence he soon removed to New Bedford, where he first assumed the name Douglass. He was steady and industrious, and, using every opportunity for intellectual advancement, became an exhorter in the colored Methodist church. He subscribed to William Lloyd Garrison's paper, *The Liberator*, and in 1841 he attended an anti-slavery meeting in Nantucket under direction of Mr. Garrison. Here Douglass was induced to make an address, which first revealed his gift of eloquence. He was engaged as an agent of the Anti-Slavery Society. At first he told simply his own experience, though concealing the place, but gradually his oratory took a wider range and he became a prophet of denunciation against the whole system of slavery. After having visited the greater part of New England he went to Europe in 1845, and spent nearly two years in Great Britain and Ireland. He then published his first book, *Life of an American Slave* (London, 1847). While he was abroad some of his friends purchased his freedom from his former owner. After his return to America he dissolved his connection with Mr. Garrison, and settled in Rochester, N. Y., where he began, with the assistance of Gerrit Smith, to publish a weekly paper called *The North Star*. After a time he became sole proprietor and changed its title to *Frederick Douglass's Paper*. He continued also his work as a lecturer and debater of public questions. He enlarged his autobiographical sketch into a volume called *My Bondage and Freedom* (1855). To escape annoyance on account of John Brown's raid on Harper's Ferry, he went again to England in 1860. During the civil war he strongly urged Pres. Lincoln to issue the proclamation

of emancipation and to employ colored troops. As soon as this was done he sent his three sons into the service and took an active part in raising colored regiments. At the close of the war he moved to Washington and labored zealously in behalf of the freedmen. He was still frequently called upon to deliver lectures in various parts of the country. In September, 1870, he became editor of the *New National Era*, which he afterwards transferred to his sons. When Gen. Grant recommended the annexation of San Domingo, Douglass was appointed secretary of the commission to visit the island. He afterwards served as one of the territorial council of the District of Columbia. In 1872 he was elected presidential elector at large for the State of New York. He was a trustee of Howard University, and of the Freedmen's Savings Bank and Trust Company, being president of the latter at the time of its failure. In 1877 Pres. Hayes appointed Douglass United States marshal for the District of Columbia, and in 1881 Pres. Garfield appointed him recorder of deeds for the same district, which position he still holds. While he has done much to elevate the race to which he belongs his views have not always been favorably accepted by them. In 1879 he remonstrated against the "exodus" of the colored people from the South. In 1884 he was married to a white lady who had been a clerk in his office. Throughout his diversified career he has been honest, industrious, and honorable; his character is without a stain, and his success has won for him a memorable place in American history.

DOVE, HEINRICH WILHELM (1803-1879), a German physicist, was born at Liegnitz, in Silesia, Oct. 6, 1803. He was educated at Breslau and Berlin, where he studied the physical and mathematical sciences, and graduating as doctor in 1826, with a thesis, *De Barometricis mutationibus*. He became, in 1828, assistant professor of natural philosophy at Königsberg, and in 1829 at Berlin, where his works on meteorology brought him, in 1845, the title of full professor and a seat in the Royal Academy of Sciences. He investigated the movements of the winds, and sought to establish a theory of cyclones. Close attention was also given to the principles of electricity and the properties of polarized light. He became very popular from the interesting character of his lectures. He died in Berlin, April 4, 1879. His principal works are—*Ueber Mass und Messen* (2d ed., Berlin, 1835), which compares the different metric systems of civilized states; *Meteorologische Untersuchungen* (1837); *Ueber die nicht periodischen Aenderungen der Temperaturvertheilung* (6 vols., 1840-59); *Untersuchungen im Gebiete der Inductionselectricität* (1843); *Ueber den Zusammenhang der Waermeveraenderungen der Atmosphäre mit der Entwicklung der Pflanzen* (1846). His work on *Heat Distribution* was published in English by the British Association in 1853. Among his optical discoveries, one of practical importance is the application of the stereoscope to the detection of forged bank-notes. As director of all the Prussian observatories, he published, annually, an account of their work.

DOVER, a town of Delaware, capital of the State, and county-seat of Kent co., is on Jones River, 4 miles W. of Delaware Bay, and 48 miles by rail S. of Wilmington. It is on the Delaware division of the Philadelphia, Wilmington, and Baltimore Railroad. It is neatly built, with wide and well-shaded streets, and is lighted with gas. It contains the state-house and other State and county buildings, has 2 banks (1 national), 2 weekly newspapers, 7 churches, 8 public and several private schools and an academy; railroad shops, flour-mills, fruit-drying and canning-works, and manufactories of fertilizers. Its property is valued at \$1,600,000; its public debt is \$25,000, and yearly expenses, \$7000. It was settled in 1687 and incorporated about 1720. Population, 2811.

DOVER, a city of New Hampshire, county-seat of Strafford co., on both sides of the river of Cocheco, up to this point a navigable tidal stream, being an affluent of the Piscataqua. It is 11 miles N. N. W. of Portsmouth by the Portsmouth and Dover Railroad, and is on the Boston and Maine Railroad, at the junction of the branch leading to Alton Bay on Lake Winnipisaukee. The site is somewhat uneven, but the city is laid out with considerable regularity. It has a fine city-hall, a court-house, a good high-school building, an academy, 12 churches, 3 national banks, 3 savings banks, 1 daily, 4 weekly, and 2 other newspapers, a subscription library with 6000 volumes, and abundant water-power furnished by the Cocheco and Black rivers. It has several large cotton-mills, print-works, and manufactures of woollens, shoes, leather, castings, and other goods. Settled in 1623, Dover is the oldest town in the State. It became a city in 1855. Population, 11,687.

DOWAGIAC, a city of Cass co., Mich., is on the Dowagiac River and on the Michigan Central Railroad, 178 miles W. of Detroit and 106 E. of Chicago. It has a national bank, 2 weekly newspapers, 3 hotels, 6 churches, good schools, and a public library. It was settled about the year 1840, was incorporated as a village in 1847, and received a city charter in 1877. It is chiefly supported by trade with the surrounding country, though since 1880 considerable interest has been taken in manufacturing, for which the Dowagiac River gives good water-power. It has 2 agricultural-works, stove-works, flour-mills, planing-mills, broom-factories, and saw-mills. Population, 2100.

DOWDEN, EDWARD, LL.D., an Irish poet and critic, was born at Cork, May 3, 1843. He is of English descent, and was educated at Trinity College, Dublin, in which also, in 1867, he was made professor of oratory and English literature. His work on *Shakespeare, his Mind and Art* (1872; 5th ed., 1880) is a valuable contribution to Shakespearian criticism. He also published a volume of *Poems* (1876); *Studies in Literature, 1789-1877* (1878); *Southey* (1879); *Goethe* (1880), and has edited *Shakespeare's Sonnets* (1881) and *The Correspondence of Southey and Caroline Bowles* (1881).

DOWER, the provision which the law makes for a widow out of the lands and tenements of her husband. The various writers on the subject of dower differ widely as to its origin. Mr. Cruise is of opinion that it was an ancient Teutonic custom in use among the Saxons, and thus transplanted into the common law. Blackstone holds, on the contrary, that it was first imported into England by the Danes. Sir Martin Wright finds no traces of its existence prior to the Conquest, and supposes it, therefore, to have been of Norman origin. Mr. Maine ascribes it to the influence of the Church. No thoroughly satisfactory account of its origin has as yet been given.

As early as the reign of Henry III. the right of dower was firmly settled in the English law, an express provision being inserted in the great charter obtained from that king to guard the widow's rights. The right of dower has been much affected in England by Stat. 3 & 4 Wm. IV. c. 105, known as the Dower Act, by which many of its peculiar features have been altered.

In the United States the right of dower still generally exists, though it has been modified from time to time by statute in the several States so as to suit the supposed wants and condition of their citizens. In Louisiana the right of dower has never existed. In Iowa, Kansas, Indiana, Nevada, and Dakota the right of dower is abolished.

Dower in the ancient English law was of five sorts: (1) Dower by the common law, by virtue of which the widow was entitled to a life estate in one-third of the lands, tenements, and hereditaments whereof her husband was seised in fee or in tail during the marriage. (2) Dower by particular custom, by virtue whereof the

widow became entitled to either a greater or less interest in her husband's estate than was secured to her by the common law. (3) Dower *ad ostium ecclesie* (at the church-door), where a freeholder endowed his wife of certain lands immediately after the marriage. (4) Dower *ex assensu patris*, which was merely a species of dower *ad ostium ecclesie*, where, the husband's father being alive, the wife was endowed of specific lands whereof said husband was the heir, with his father's consent. (5) Dower *de la plus belle*, where a widow, on suing the guardian in chivalry for dower, was required by him to endow herself of the fairest portion of any lands she might hold as guardian in socage, and thus release from her dower all lands of her husband held in chivalry. The latter form of dower was abolished by 12 Chas. II. c. 24. All the remaining forms above mentioned, except dower at the common law and dower by special custom, are also abolished by Stat. 3 & 4 Wm. IV. c. 105, already referred to.

A widow was at common law dowable only of lands and tenements whereof her husband was seised in fee or in fee-tail during the marriage. She was therefore not entitled to dower in estates for years. This is still generally the law. In Missouri, however, a widow may claim dower in leasehold estates of twenty years or over. An estate in common is subject to dower, but not an estate in joint tenancy, strictly speaking, for the right of survivorship is superior to the right of dower. Where there is an exchange of lands, a widow may claim dower in either of the properties, but not in both. Actual seisin or possession of the land on the part of the husband is no longer very strictly required. Constructive possession is enough, at least in the United States. Where the husband is seised of lands as a trustee merely, the widow has no right of dower therein. Formerly, this right did not attach where the husband was the *cestui que trust* of land, but this restriction is now generally abandoned. A widow is accordingly held dowable of an equity of redemption and of the interest of a vendee under articles of agreement. In some States a widow can only claim dower out of those lands whereof her husband died seised. Where there are no children the right of dower is very generally extended so as to embrace one-half of the husband's land.

The right to dower may be barred in several ways at common law. Alienage on the part of either husband or wife produced this effect, but by Stat. 7 & 8 Vict. c. 66 the disability of alienage has been almost entirely removed. Similar statutes are in force in all of the United States. At common law the widow of an attainted traitor could not claim dower of his lands. This principle has not, however, been imported into the United States. By the Stat. Westminster the Second, 13 Edw. I. c. 34, it was provided that the elopement and adultery of the wife should constitute a bar to her claim of dower. In some of the United States, as in Virginia, Missouri, and South Carolina, this statute has been re-enacted; in others it is considered as part of the common law. In Massachusetts, New York, Rhode Island, and Delaware, however, elopement and adultery unaccompanied by a divorce will not bar dower. A divorce *a vinculo matrimonii* bars dower, but not a divorce *a mensa et thoro* merely. Where a title paramount to that of the husband is set up, the right of dower will not of course attach; nor can it be claimed as against a vendee at a foreclosure sale upon a mortgage given by the husband before marriage. In almost all of the United States dower will not be divested by a judicial sale for the debts of the husband. In Pennsylvania, however, this result follows.

A married woman could anciently release her right of dower in land by suffering with her husband a fine or recovery. By the custom of London she might, however, effect the same result by simply joining her husband in the deed, to which a certificate of some magistrate was appended to the effect that the married woman had executed the deed of her own free will and

consent. This custom was imported into the United States, and is still in general use. By 3 & 4 Wm. IV. c. 74 a similar system was introduced in England. The joinder of a married woman in a mortgage by her husband of his lands is generally essential to bar her dower. In Pennsylvania, however, this is not the case. The common method formerly employed to bar dower was a jointure. This consisted of a settlement of certain lands to the use of the wife from and after her husband's death for and during the term of her life. By Stat. 27 Hen. VIII. c. 10, known as the Statute of Uses, it was provided that where such a jointure was made before marriage the widow should have no right to claim dower. Where it was made after marriage it was provided that the widow might claim either the jointure or the dower, but not both. Jointures are occasionally, but not often, employed in the United States.

By the provisions of Stat. 3 & 4 Wm. IV. c. 105 a husband may now in England prevent his wife's right of dower from attaching to any of his land by inserting a clause to that effect in the deed or will by which he alienates the same. In the United States generally he has no such power. Where, however, there is a testamentary provision made for the wife, this will generally be presumed to be in lieu of dower, unless a contrary intention appear from the terms of the will; and in such case the widow is put to her election within a certain limited time whether she will accept the benefit under the will and forego her dower, or claim her dower and renounce her rights under the will.

The right of the widow to have her dower assigned to her accrues immediately upon the death of the husband. It was provided by Magna Charta that she should be allowed to remain in her husband's mansion for forty days after his death ("the widow's quarantine"), during which time it was the duty of the heir at law to apportion and set out to her her dower-land by metes and bounds. If he failed to do so, she had her action of *dower unde hihil habet*, or, in the event of the allotment being insufficient, an action of *dower*. The action of dower also lay against any alienee of the husband during coverture holding lands as to which the right of dower attached. In certain cases a bill in equity will also lie to set out dower-lands. Where an action of dower is brought against the heir, the rights of the plaintiff are ascertained by the value of the land in question at the time of the assignment. But where the action is against the husband's alienee, such rights are determined by the value of the property at the time of the alienation. In no case can the dowress avail herself of the enhanced value communicated to the land by the buildings and improvements erected thereon by the alienee. It seems, however, that she may avail herself of any enhancement of value caused by extraneous circumstances since the alienation—such, for example, as the general improvement of the neighborhood. Where the land has deteriorated in the hands of the alienee the widow has no remedy. In many of the States statutory provisions have been adopted whereby new remedies have been adopted in lieu of the action of dower. (L. L., JR.)

DOWNING, ANDREW JACKSON (1815–52), an American landscape-gardener and author, was born at Newburg, N. Y., Oct. 31, 1815. His father was a nurseryman, and from an early age the son showed strong inclination for the natural sciences. He was educated at an academy in Montgomery, N. Y., but left it at the age of sixteen to assist his brother in the management of the nursery. Having resolved to become a rural architect, he used every opportunity to improve his knowledge and his natural good taste. In 1838 he built an elegant mansion on his estate, in which he showed what he considered the true idea of an American country home. In 1841 he published a *Treatise on the Theory and Practice of Landscape-Gardening*, which at once attracted attention both in America and in England. In 1842 he published

Cottage Residences, and was henceforth universally regarded as the highest American authority on the construction and embellishment of country residences. In 1845 he published his *Fruits and Fruit Trees of America*, and in the next year became the editor of the *Horticulturist*, a monthly magazine published at Albany. In 1850 he visited the chief country-seats in England, and wrote good descriptions of them. In 1851 he was appointed to lay out the public grounds of Washington, and was still engaged in this work when he sailed from Newburg on the steamer Henry Clay, July 28, 1852. The steamer took fire near Yonkers, and he was drowned in his efforts to save other passengers. Several of his contributions to the *Horticulturist* were collected and published in 1854, under the title *Rural Essays*, together with a memoir by George W. Curtis. His works are still highly esteemed.

DOYLE, RICHARD (1826–1883), an English artist and book-illustrator, was born in London in 1826. His father, John Doyle, was of Irish descent, and had some celebrity in his day as the maker of certain political sketches signed "H. B." Doyle was one of the earliest artistic contributors to *Punch*, and began those humorous delineations of every-day English life which, more than any other feature, have given the publication celebrity, and which have been continued successfully by Leech, Keen, and Du Maurier. The well-known title-page of *Punch* is his design. In 1850, Doyle severed his connection with *Punch* on account of its anti-Catholic course, and especially on account of the unmerciful lampoons on Cardinal Wiseman which it published. Doyle's most important independent publications are *The Continental Tour of Messrs. Brown, Jones, and Robinson* (1854) and a Christmas book entitled *In Fairy-Land: Pictures of the Elf-World* (1869). He contributed illustrations to Leigh Hunt's *Jar of Honey*, Ruskin's *King of the Golden River*, Montalba's *Fairy-Tales of All Nations*, Thackeray's *Newcomes*, *Jack the Giant-Killer* and other fairy stories, and *The Cornhill Magazine*. Doyle's most pleasing designs have been made in illustration of grotesque and fanciful themes, such as the fairy-stories above mentioned. His illustrations to *The Newcomes*, although not without merit, are, most of them, too much in the nature of caricatures, and fail to do justice to the subject. The title-page of *Punch* is a favorable example of Doyle's manner. This composition and the *Newcomes* series very adequately represent his style and the range of his abilities. Personally he was a favorite in London society. He died Dec. 11, 1883.

DOYLESTOWN, a borough of Pennsylvania, the county-seat of Bucks co., is 25 miles N. of Philadelphia, and 10 miles W. of the Delaware River. It is the terminus of the Doylestown branch of the North Pennsylvania Railroad. It is on a high plateau, 600 feet above tide-water, and commanding a fine view of the surrounding country, which is highly cultivated.

Its streets are well shaded and the side-walks paved and curbed. It has gas-and water-works, a fine courthouse, a jail, a hall and market-house, 2 banks, 7 weekly newspapers (3 German), a Masonic hall, 9 churches, an academy, graded public schools, and a Catholic parochial school. The industries are manufacturing of agricultural machinery, sash and blinds, cheese-boxes, spokes and shirts, etc. Doylestown has the finest agricultural fair-grounds in the State, with suitable buildings. In the centre of the town there is a handsome monument erected to the memory of the officers and men of the 104th Pennsylvania Regiment, who fell in the war for the Union. Doylestown was settled by the Doyle family from the North of Ireland about 1730; in 1812 it became the county-seat; in 1833 it was made a borough. Population, 2070.

DOZY, REINHART (1820–1883), a Dutch orientalist and historian, was born at Leyden, Feb. 21, 1820, being descended from a Huguenot family, which had sought refuge in the Low Countries after the revoca-

tion of the Edict of Nantes. He studied history and philology in the University of Leyden, graduated as doctor in 1844, and became in 1850 extraordinary professor of history in the same university, attaining the full professorship in 1857. He died June 6, 1883. His works relate chiefly to the history, language, and literature of the Arabs in Spain and Africa. Among them are *Scriptorum Arabum loci de Abbaditis* (3 vols., 1846-63); *Recherches sur l'histoire et la littérature d'Espagne pendant le Moyen-âge* (1849; enlarged ed., 1881), a work which shed a flood of new light on its subject; *Al-Makkari, Analectes sur l'histoire et la littérature des Arabes d'Espagne* (2 vols., 1855-61), prepared in conjunction with Dugat, Krehl, and Wright; *Histoire des Musulmans d'Espagne jusqu'à la Conquête de l'Andalousie par les Almoravides* (4 vols., 1861; last ed., 1881); *Het Islamismus* (1863); *Die Israeliten zu Mekka* (1864). He also edited several Arabic historical and geographical works. His excellent *Supplément aux dictionnaires Arabes* (2 vols., 1877-81) takes rank among the best works on Arabic lexicography.

DRACHMANN, HOLGER HENRIK HERHOLDT, a Danish poet and novelist, was born Oct. 9, 1846, in Copenhagen. He studied at the academy of fine arts, 1866-70, and his marine views became very celebrated. Since 1870 he has devoted himself chiefly to literature, though he still paints occasionally a landscape or marine view. As a poet and novelist he must be classed as a realist of the highest rank and is probably the most popular Danish writer now living. He began his literary career with a small volume, *Digte* (1862). In 1875 he published *Dæmpede Melodier*, illustrated by the author himself; *Ranker og Roser* (1879); *Ungdom i digt og Sang* (1879); *Prinsessen og det halve Kongerige* (1878), an epic poem, as is also *Østenfer Sol og vestenfer Maane* (1880). Drachmann has been particularly productive as a novelist. In rapid succession have appeared *En Overcomplet* (1876); *Tannhäuser* (1877); *Ungt Blod* (1877); *Paa Sömands Tro og Love* (1878); *Paul og Virgine* (1879); *Under nordlige Bredde* (1879); *Derovre fra Grænsen* (1871; 8th ed., 1882). His latest works are: *Peder Tordenskjold* (1881); a translation of Byron's *Don Juan* (1881-82); *Puppe og Sommerfugl* (1882); and *Reisebilleder* (1882). Since 1879 Drachmann has been honored with a literary pension from the Danish Parliament.

DRAKE, DANIEL (1785-1852), an American physician and author, was born at Plainfield, N. J., Oct. 20, 1785. His father, Isaac Drake, removed to Kentucky in 1788, where Daniel was brought up amid all the hardships to which settlers in the backwoods were then exposed. At the age of fifteen he went to Cincinnati, then a village of four hundred inhabitants, to study medicine under Dr. William Goforth. In 1805 he journeyed to Philadelphia to attend the lectures at the University of Pennsylvania, and on his return he practised for a year at Mayslick, Ky., his father's home, and then settled at Cincinnati. In 1810 Dr. Drake published *Notices Concerning Cincinnati*, and afterwards helped in movements from which in 1815 sprang the Cincinnati College. He also published a *Picture of Cincinnati and Miami County* (1815), which attracted attention to that region. In 1816 he obtained from the University of Pennsylvania the first diploma ever given to a resident of Cincinnati. In 1817 he was chosen professor of materia medica and medical botany in the Transylvania University, then newly established at Lexington, Ky. Resigning this position in 1818, he obtained a charter for the Medical College of Ohio, at Cincinnati, which went into operation in November, 1820, with twenty-four students, Dr. Drake being professor of the institutes and practice of medicine and obstetrics. But he soon resumed his professorship in Transylvania University, where he continued to lecture till April, 1827, though still residing in Cincinnati. He established there an eye-and-ear infirmary, and became editor of the *Western Medi-*

cal and Physical Journal, a monthly magazine whose name was afterwards changed to *The Western Journal of Medical and Physical Science*. In the winter of 1830-31 he lectured in Jefferson Medical College, Philadelphia, and in the following lectured on clinical medicine in the Medical College of Ohio. In June, 1835, he joined with others in forming a medical department in connection with Cincinnati College, which continued four years, and then accepted a professorship in the Louisville, Ky., Medical Institute, which he held for ten years till 1852, with the exception of the winter of 1849-50, when he lectured in the Medical College of Ohio. He died, after a brief illness, at Cincinnati, Nov. 5, 1852. His chief work was a *Treatise on the Principal Diseases of the Interior Valley of North America*, the first volume of which was published in 1850, after laborious researches extending over thirty years. After his death the second volume of this work was edited by Dr. S. Hanbury Smith, of Cincinnati, and Dr. F. Gurney Smith, of Philadelphia. His other publications were *Essays on Medical Education and the Medical Profession in the United States* (1832), and addresses before literary societies.

DRAKE, SAMUEL GARDNER (1798-1875), an American antiquary, was born at Pittsfield, N. H., Oct. 11, 1798. He received his education in the common schools and at the age of twenty became a teacher in them. In 1825 he removed to Boston and republished with notes Capt. Church's *Entertaining History of King Philip's War*. In 1828 he opened an antiquarian bookstore, the first of its kind in the United States. He was one of the founders of the New England Historical and Genealogical Society, and was its president in 1858. He then resided in London for two years. He died at Boston, June 14, 1875. His historical and antiquarian publications were numerous. Among them are *Indian Biography* (1832); *Book of the Indians* (1833), often republished; *Old Indian Chronicles* (1836); *Indian Captivities* (1839); *Drake Family* (1845); *History and Antiquities of Boston* (1856); *Researches among the British Archives* (1860); *Memoir of Sir Walter Raleigh* (1862); *Annals of Witchcraft in the United States* (1869); and *History of the Five Years' French and Indian War* (1870). He also edited with care some early New England works.

His son, FRANCIS SAMUEL, born at Northwood, N. H., Feb. 22, 1828, has published a very complete and accurate *Dictionary of American Biography* (1872).

DRAMA, AMERICAN. The beginnings of the drama

in America are very obscure and almost impossible now to define with precision. See Vol. VII. p. 338 Am. ed. (p. 39. Edin. ed.). Probably the first theatrical performances in the New World were given in those parts of America early colonized by the Spaniards. The Spanish stage was at the height of its glory at the very time when Spanish adventure was spreading itself abroad. There was no antagonism between church and stage in Spain; on the contrary there was almost an alliance. Lope de Vega was a priest and a familiar of the Inquisition, and Calderon's finest plays turn, as on a pivot, about the peculiar tenets of his creed. It is highly probable that at least some of the *Autos sacramentales*, or religious interludes, of Calderon or Lope de Vega were acted in Mexico, Cuba, Peru, or Florida. One at least of the chief Spanish dramatists was born in Spanish America. This was Alarcon, born in Mexico, and best known to us as the author of the *Verdad Suspiciosa*, imitated by Corneille in his *Menteur*, which again was copied by Foote in his *Liar*. Such Spanish plays as may have been acted in America in the early days of colonization were no doubt performed by amateur actors, and the first theatrical performances in North America of which there seems to be any trustworthy record were also by amateur players; these were given at Quebec in 1694, when New France was under the government of Count Frontenac. In Mr. Parkman's history there is an account of the performance

of Corneille's *Nicomède* and *Mithridate*, and of an attempt, or at least a threat, to act *Tartuffe* as an attack on the local Jesuits, with whom the governor had a deadly feud. It was a company of amateur actors, again, who gave the first performances in America in English; this was in 1745, in the island of Jamaica, and among them was Moody, who afterward became famous as an actor of Irish characters. Their success was so great (so John Bernard tells us in the posthumous papers on the *Early Days of the American Stage*, edited by his son, Bayle Bernard) that Moody went to England to bring out a regular company of actors, with whom he seems to have returned in 1746, and to have been very successful. It was a band of amateur actors, once more, who gave the first performance of an English play in English in what is now the United States. This was at the coffee-house in State Street in Boston, Mass., where Otway's *Orphan* was acted in 1749, some time before the first regular company of actors arrived on these shores. This attempt to introduce the drama into Puritan New England was received with deepest horror.

The next general court passed a strict law forbidding all theatrical performances, and fining the owner of any building used for such a purpose £20 "for each and every day or time," and fining the spectators and actors £5 apiece. This law prevented public acting for nearly fifty years, although private theatricals were not uncommon. In this same year (1749) a company of amateurs had also made an attempt to open a theatre in Philadelphia. William Dunlap, the author of an invaluable *History of the American Theatre*, refers humorously to this occurrence in these words: "As early as 1749 it is on record that the magistracy of the city [Philadelphia] had been disturbed by some idle young men perpetrating the murder of sundry plays in the skirts of the town, but the culprits had been arrested and bound over to their good behavior, after confessing their crime and promising to spare the poor poets for the future." According, however, to the highly probable surmise of Mr. Joseph N. Ireland, whose *Records of the New York Stage* is perhaps the most trustworthy and altogether admirable book of its kind ever written, it was this band of young Philadelphian amateurs who gave the first professional performances ever seen in New York. Judge Daly has discovered in *Bradford's Gazette* of October, 1733, an advertisement of a merchant who announces that his store is "next door to the Play-house," but his later and more minute researches led him to believe that this play-house of 1733 was used principally for puppet-shows and similar entertainments. But the performances given in 1750 by the Philadelphia company are beyond all doubt; and for the first time we are on the solid ground of assured fact. *The New York Gazette* revived in the *Weekly Post-Boy*, of Feb. 26, 1750, announced that "last week arrived here a company of comedians from Philadelphia, who we hear have taken a convenient room for their purpose in one of the buildings lately belonging to the Hon. Rip Van Dam, Esq., deceased, in Nassau Street, where they intend to perform as long as the season lasts, provided they meet with suitable encouragement." A later advertisement in the same paper declared that "By his Excellency's Permission, at the Theatre in Nassau Street, On Monday, the 5th day of March next (1750), Will be presented, the Historical Tragedy of King Richard 3d! Wrote originally by Shakspeare and altered by Colley Cibber, Esq. . . . To begin precisely at half an hour after 6 o'clock, and no person to be admitted behind the scenes." In the course of the season the company acted Otway's *Orphan*, the *Beaux' Stratagem*, *Love for Love*, Addison's *Cato*, the *Beggar's Opera*, the *Fair Penitent*, the *Busybody*, the *Distrest Mother*, *George Barnwell*, and the *Recruiting Officer*. The season lasted from March 5, 1750, to July 8, 1751, with the exception of six weeks in the summer of 1750. It speaks very highly for the char-

acter and ability of this company, whether they were originally amateurs from Philadelphia or not, that they were attractive enough to continue for so very long a season as this in a city which then had but ten thousand inhabitants. The managers of this company were named Murray and Kean, and they were also the chief actors. After this first long season the company seems to have disbanded, but the remains of it came together again under a Mr. Upton, and acted with but little fortune during the fall of 1751 and the winter of 1752, closing February 20.

Moody, about 1749, had returned to England for recruits, and was at once engaged by David Garrick for Drury Lane. But the rumor of his success had spread in London, and William Hallam, a brother of Admiral Hallam, and lately the manager of the Goodman Fields Theatre (at which Garrick had made his first great hit not long before, and in the management of which Hallam had failed), determined to send a company of London actors to America. He abandoned the West Indies to the company Moody had founded, and chose the more liberal Virginia as his objective point. The company sent there by William Hallam was ample and effective; it was headed by Mr. and Mrs. Lewis Hallam, and it had the advantage of the stock of scenery and costumes used at the Goodman Field's house. The company was what is known as a "commonwealth;" that is to say, the actors received no salaries, but divided the gross receipts among themselves, giving certain specified parts to the manager for the use of scenery, costumes, properties, etc., and for managerial expenses: this was the plan which obtained in England in Shakespeare's day, and in France in Molière's, and which now survives at the Théâtre Français in Paris. Hallam's company met in London, arranged a list of pieces, studied their parts, and, taking ship together, rehearsed on the way over, arriving at Yorktown, Va., late in June, 1752. Williamsburg was then the capital of Virginia, and here, by permission of Gov. Dinwiddie, Hallam altered an old storehouse into a theatre, and opened it, on Sept. 5, 1752, with the *Merchant of Venice* and Garrick's farce *Lethe*. There was also delivered a prologue composed at sea, probably by Mr. Singleton, who played *Gratiano*; it was spoken by Mr. Rigby, the actor of *Bassanio*. This prologue was a plea for the propriety of dramatic performances, and declared that the actors came

"to shew
Patterns of every virtue they should know,
Though gloomy minds through ignorance may rail,
Yet bold examples strike where languid precepts fail.
The world's a stage where mankind act their various parts,
The stage a world to show their various arts.

Yet, if the Muse, unfaithful to her trust,
Has sometimes strayed from what is pure and just,
Has she not oft, with awful, virtuous rage,
Struck home at vice and nobly trod the stage—
Made tyrants weep, the conscious murderer stand,
And drop the dagger from his trembling hand?
Then, as you treat a favorite fair's mistake,
Pray spare her foibles for her virtue's sake;
And while her chastest scenes are made appear
(For none but such will find admittance here),
The Muse's friends, we hope, will join our cause,
And crown our best endeavors with applause."

This prologue, written down by Dunlap from the lips of Lewis Hallam's son, a boy of ten or twelve years of age when it was delivered, shows that the actors feared to find in the New World that prejudice against the playhouse which exists in many respectable but dull communities to this day. In Virginia they met with no recorded opposition on moral grounds, and they took away with them when they left the colony a certificate from Gov. Dinwiddie, signed in council, recommending them as comedians, and testifying to the propriety of their behavior as men. From Virginia the actors went to Maryland, and at Annapolis acted in the first regular theatre erected in what is now the

United States. In June, 1753, they went north to New York, and met with unexpected opposition. Lewis Hallam not only found that the Mr. Upton he had sent out to prepare a theatre had abused his trust, but that, partly perhaps on Upton's account, permission to perform was denied him. He plead his case before the public in the *New York Mercury* of July 2, 1753, and appealed to the authorities with Gov. Dinwiddie's certificate in his hand. At last he obtained the desired permission, and built a new theatre in Nassau Street, on the site of the old one. This was opened Sept. 17, 1753, with Steele's *Conscious Lovers*, a farce, a new occasional prologue spoken by Mr. Rigby, and an epilogue (addressed to the ladies), delivered by Mrs. Hallam. After a prosperous season of six months in New York the company went to Philadelphia, and here, too, they met with violent opposition. Petitions and counter-petitions were signed, and the city was rent in twain by the dispute. In the end the manager was favored by Gov. Hamilton, and permission was granted to perform twenty-four plays, with their attendant afterpieces, on condition that they "offered nothing indecent or immoral," and that the actors should give one night for the benefit of the poor of the city. "The storehouse of Mr. William Plumstead, at the corner of the first alley above Pine Street," so Dunlap tells us, was altered into a theatre, and there, in April, 1754, the company began to perform, appearing in Rowe's *Fair Penitent*. The season was very successful, and the governor added six nights to the original twenty-four. Acting three times a week, the company remained in Philadelphia until July. Then they went to the West Indies, where Lewis Hallam died, and his widow married a Mr. Douglass. In 1758 Mr. Douglass led the actors back to New York, and, after much opposition, built a new theatre on Cruger's wharf, the old one in Nassau Street having been turned into a church.

In the spring ensuing Douglass went to Philadelphia, where he had built a theatre on the corner of Vernon and South Streets, at a place called "Society Hill." This was the first regular theatre erected in Philadelphia; it was outside the precincts of the city authorities, but this did not prevent a renewal of the opposition of five years before. Shortly after a temporary theatre was built at Newport, R. I., and here, on Sept. 7, 1761, was acted *The Provoked Husband*. This was the first performance by professional actors in New England, and it is to be noted that it was given in spite of a formal vote at a town meeting. In 1762 the company visited Providence also. Thus was formed a theatrical circuit along which the comedians might find employment for the better part of the year. This circuit included Williamsburg, Annapolis, Philadelphia, New York, Newport, Providence, and a few smaller places where there was a court-house or other large building which might be made to serve as a temporary theatre; among these was Perth-Amboy. Along this American circuit, and with occasional visits to the West Indies, the company continued to play, headed now by the Lewis Hallam who had been but a boy when they first landed in this country. In New York a new theatre was built in Chapel Street, and during one of the disturbances caused by the Stamp Act (passed in March, 1765) this theatre was wrecked, but not totally destroyed. This seems to have been the first of the theatrical riots of which New York has had many. In 1767 a new and handsome theatre was built in John Street, New York. Albany was visited in July, 1769, the governor having authorized it "for one month only." The officers of a regiment quartered there had, in 1760, given private theatricals; to both amateurs and professionals was there much opposition. In September, 1773, a theatre was opened in Charleston, S. C., by invitation of the inhabitants and permission of the magistrates, and the season there lasted fifty-one performances, ending in June, 1774. Of course in all these years changes had

taken place in the company. Lewis Hallam's cousin Wignell arrived from England, and his future partner, Henry, had shown himself an admirable and versatile actor. The actors, assured of support in this country, called themselves "The American Company." It is highly probable that they were equal in histrionic ability to any company in England outside of the three London theatres.

But on Oct. 24, 1774, the Continental Congress, assembled in Philadelphia, recommended a suspension of all public amusements. The American Company was in New York, ready to begin the winter season. The resolution of Congress was conveyed to Douglass by the president, Peyton Randolph, and he was also notified by the New York committee. There was nothing left for the actors but to try their luck again in the loyal West Indies, where they were always welcome; and with their departure closes the record of professional performances in the colonies until after the declaration of peace had left them a free and prosperous people.

During the Revolutionary struggle the only theatrical performances were those given by the British officers. Burgoyne, who had written *The Maid of the Oaks* in 1775, was with the British troops in Boston, and there wrote his second play, seemingly of great contemporaneous human interest, as it was called *The Blockade of Boston*. While it was acting an alarm was given that the Americans had made an assault on the British works; and when a sergeant entered, saying, "The rebels have attacked the lines on the Neck," the audience applauded his spirited delivery, believing them to be part of the piece until the prompt cessation of the performance proved, as Dunlap neatly puts it, that the prompter was not behind the scenes, but behind the trenches. Driven from Boston, the British officers took possession of the John Street Theatre in New York, which they called the Theatre Royal, and in which they acted for the benefit of the military poor. Major André was among the chief actors. When the British army held Philadelphia also, the officers opened the Southwark Theatre, and here Major André was not only an actor, but the scene-painter as well. Certain of the scenes painted by him lasted for many years, and it is recorded that on July 4, 1807, a play on the capture of André (probably Dunlap's) was produced with the aid of scenery painted by the ill-fated spy himself, and signed with his name in bold black letters. Although we have here referred only to the private theatricals of the British in Boston, New York, and Philadelphia, it is probable that they gratified their histrionic tastes elsewhere also.

After the peace the players came back. Hallam came first to spy out the land, bringing but a weak detachment with him. He opened the Southwark Theatre in Philadelphia, March 11, 1785. He acted with profit, and then went to New York, where he announced a course of lectures, each followed by a farce, beginning Aug. 24, 1785. After he left Philadelphia the legislature of Pennsylvania discussed the prohibition of all plays, but the fatal clause was at last stricken out. In New York there was also some trouble with the city authorities. But Hallam, who had taken in Henry as a partner, felt encouraged, and, sending for the rest of the actors, he opened the John Street Theatre, Nov. 19, 1785, when *The Gamester* was performed by "the old American Company," for so it called itself on the bills. The legislature of New York was at this time petitioned to forbid the theatre, but counter-petitions in its favor prevailed. In 1786 a new theatre was built in Charleston, S. C.; and in August of that year the first playhouse was opened in Baltimore, then rapidly growing ahead of Annapolis. In October the company went to Richmond, Va., which in like manner was surpassing Williamsburg. The old American Company were alone in serving the circuit thus laid out for nearly forty years from the time of their first arrival in 1752. But in 1792 Wignell found that he could no longer

agree amicably with Hallam and Henry, and he withdrew, taking with him two of the chief members of the company, Mr. and Mrs. Morris. He went to England for recruits, and organized a company superior to that he had deserted, although this was also strengthened, especially by the addition of Hodgkinson, the most versatile actor of his day, with the possible exception of Elliston in England. After much dispute and many delays Wignell opened the new theatre he had built for himself in Chestnut Street, Philadelphia, on Feb. 17, 1794. From this time forth the United States had two stock companies of very extraordinary merit, surpassed only by the companies at the three patent houses in London. In Wignell's company, for example, were Fennell, Harwood, Darley, and Mrs. Whitlock, the sister of John Kemble and Sarah Siddons.

After Wignell had laid hands on Philadelphia, Hallam and Henry turned their attention to Boston, where in 1792 a new exhibition room had been opened with a variety performance, rope-dancing, gymnastics, etc. A later playbill announced "A moral lecture in five parts, in which the dreadful effects of conspiracy will be exemplified." This was an underhand way of advertising Otway's *Venice Preserved*. *Hamlet* and *Romeo and Juliet* were also given as "moral lectures" or "moral dialogues." But this flagrant violation of the law was not long allowed, and in December, 1792, the exhibition room was closed. Hallam and Henry had in June, 1790, petitioned for a repeal of the prohibitory law of 1750, but in vain. In 1791 a petition was presented to the selectmen of Boston, who debated it, and instructed the representatives of Boston in the legislature to endeavor to effect a repeal of the law, at least as regards Boston. In January, 1792, the subject came before the house of representatives; a committee reported that a repeal was inexpedient; and this report was accepted, in spite of strenuous efforts. It was after this that the attempt to get around the law had been made at the exhibition room. In 1793, however, the legislature of Massachusetts repealed the law against the theatre, and on Feb. 4, 1794, the Federal Street Theatre was opened with a prologue by Robert Treat Paine, Jr.; and it remained open until July 4. In Hartford, Conn., a theatre was opened in August, 1795, by Hodgkinson and a part of the old American Company.

Thus far the attempt has here been made to show the difficulties under which the early actors labored, and to give the exact dates on which the first theatrical performances were given in each town. But with the beginning of this century the drama found itself firmly established, and spread itself with such rapidity as to make a minute chronicle of its growth too tedious to be inserted here. A few more dates of beginnings, and we leave the playhouses to consider the players and the playwrights. In New Orleans the first performances seem to have been given in 1791 in French by a company fleeing from the insurrection in St. Domingo. The first theatre seems to have been built about 1808. Dec. 24, 1817, was acted the first English play given by a regular company; and in 1822 James H. Caldwell, the manager of this company, began to build the first American theatre in New Orleans. In 1817 Caldwell had managed a theatre at Washington, D. C.; in 1818 he built a playhouse at Petersburg, Va.; in 1826 he opened theatres at Nashville, Tenn., and in Huntsville, Ala.; and in 1828 he built a brick theatre in Natchez, Miss. In 1819 N. M. Ludlow gave the first dramatic performance in St. Louis. The first performance in Cincinnati is said to have been given in October, 1801, but the first company of any consequence appeared there in 1815.

The first play on record written by an American is the *Prince of Parthia*, by Thomas Godfrey, of Philadelphia, the son of the inventor of the quadrant. This was published in 1765, but never acted. The first play written and acted in America seems to have

been Burgoyne's *Blockade of Boston*, already referred to. Almost contemporaneous with this, however, was a polemic play called the *Americans Roused, or A Cure for the Spleen*, which was printed in New York by Rivington; it was a Tory pamphlet, and probably not intended to be acted. The first play written in America and by an American, and acted by a professional company, was the *Contrast* of Royal Tyler, some time chief-justice of Vermont; this play was performed at the John Street Theatre in New York, by the old American Company, on April 16, 1786. It is a comedy in five acts, and it contains the first Yankee part ever seen on the stage. Its success led the author to write a farce called *May-day, or New York in an Uproar*. And it was the popularity of the *Contrast* which incited to playwriting the first professional dramatist of this country, William Dunlap. His first play, *The Modest Soldier; or Love in New York*, although accepted, was never acted. His second, *The Father of an Only Child*, was produced Sept. 7, 1789; and for years thereafter Dunlap was one of the most fertile of playwrights. William Dunlap had been born in Perth-Amboy in 1766; showing a taste for painting, he had been sent to England when seventeen to study under Benjamin West. He returned in 1787, having seen the best acting of London and with a strong liking for the stage. His *Father of an Only Child* so pleased Wignell that he induced the author to write a farce for his benefit, a sequel to the *Poor Soldier*, called *Darby's Return*. In 1794 Dunlap's tragedy of *Leicester* was acted, and in 1795 a second tragedy, *Fountainville Abbey*. The next year he wrote a musical piece, called the *Archers*, and founded on the story of William Tell. By the persuasion of Hodgkinson he was induced to take an interest in the management of the theatre in 1796; two years later he became sole director. In 1805 he gave it up, having lost all he had, but in 1810 and 1811 he was again connected with the theatre. He was one of the founders of the National Academy of Design, and he wrote a *History of the Arts of Design in America*. His *History of the American Theatre* is an excellent book and an invaluable authority. A biography of George Frederick Cooke also attests his interest in the stage. He died in New York in 1839, at the age of seventy-three. He was the author, adaptor, or translator of fifty plays. One was *André*, afterwards revised as *The Glory of Columbia, her Yeomanry*. Many of Dunlap's pieces were versions of Kotzebue's plays, bearing the same titles as the English adaptations acted in London, and not seldom surpassing them in theatrical effect. Probably half of Dunlap's dramas were published by Longworth in the quaint little pamphlets familiar to all dramatic collectors.

Another dramatist whose plays may be found occasionally was John D. Burk, the historian of Virginia, who was killed in a duel in 1808. His *Bunker Hill; or the Death of General Warren*, was acted in both Boston and New York in 1797, and a *Joan of Arc* and half-a-dozen other pieces of varying merit were also tried by the light of the lamps. J. N. Barker wrote *Tears and Smiles*, a comedy, acted March 4, 1807, and, besides other plays, *The Indian Princess* (i. e., Pocahontas), acted April 6, 1808; his *Marmion*, a dramatization from Scott, was announced in 1812 as an English play—so strong was the belief that nothing good could come from an American dramatist. Richard Penn Smith wrote *William Penn*, acted in Philadelphia, and also made various adaptations from the German. The most prominent American dramatist after Dunlap was, however, John Howard Payne, the author of "Home, Sweet Home." Born in New York in 1792, he had gone on the stage at the age of seventeen, making almost as great a success as "Master Payne," as was made by his predecessor, "Master Betty," the English "Infant Roscius." He wrote some sixteen plays, mostly adaptations from the French.

Clari, a melodrama, is remembered now chiefly because it contains his famous song, for which Bishop adapted a Sicilian air. Payne's tragedy of *Brutus*, written originally for Kean, was often acted by Booth, and holds the stage to this day. Most of Payne's plays were originally produced in England, and even now the majority of Englishmen do not know that the author of "Home, Sweet Home" was an American. Appointed United States consul to Tunis in 1841, Payne died there in 1852. Another American songwriter, Samuel Woodworth, the author of "The Old Oaken Bucket," was also a writer of plays, among which the *Forest Rose*, acted in 1825, was the most successful. George P. Morris, the author of "Woodman, Spare that Tree!" also tried his hand at play-making, and his *Briercliff*, produced in 1826, kept the stage for years. When to these plays we add *Metamora*, written by John A. Stone and acted in 1829 by Edwin Forrest, we have briefly passed in review the native drama as it had existed up to 1833, when Dunlap published his *History of the American Theatre*, to which he appended a list of the plays written by Americans. In this list he was able to set down the names of a hundred writers of plays and of nearly three hundred pieces. Yet we must not be led astray by his massing of figures. Even as late as 1833 the American dramatist was seen but seldom on the boards of an American theatre. The enormous majority of the plays acted in this country were imported from England. The latest London success was always soon reproduced in the chief theatres of the United States. In time the number of American dramatists increased, and it became no longer a disadvantage to a comedy that it had been written on this side of the Atlantic. But before considering the plays and playwrights of the past half century since Dunlap published his *History*, it may be well first to set forth the players who had come on the scene.

The Park Theatre of New York, built after the designs of Brunel, the engineer of the Thames tunnel, was opened in January, 1798, and for a quarter of a century it remained the foremost theatre of the United States, although there were years when the company at the Chestnut Street Theatre of Philadelphia excelled the company at the Park of New York. The Park Theatre Company included at one time or another, Hallam, Henry, Hodgkinson, Conway, and Cooper. The Chestnut had Wignell, W. B. Wood, Warren, and Jefferson (the father and grandfather of the William Warren and Joseph Jefferson, known to all play-goers of to-day). The Boston Theatre was headed by John Bernard. These were all remarkable actors. Perhaps the foremost was Thomas Abthorpe Cooper, born in England in 1776, brought up by Godwin, the author of *Caleb Williams*, and advised by Holcroft, the dramatist. He acted in Edinburgh first without success, but he studied and worked hard, and before he was nineteen he acted Hamlet and Macbeth in London with great applause. In 1796 he came to America, acting Macbeth, December 9, in Philadelphia. He first appeared in New York, Feb. 28, 1798, as Hamlet. For years he was the first actor of America; and when he went back to act for a season in England he was treated coldly as an American. He died in 1849, at the age of seventy-three. Cooper was the first actor in America to "star;" that is to say, he attached himself to no company, but went in turn to each of the chief cities, playing the chief parts in tragedy. In itself this early starring was not injurious. The presence of Mr. Cooper strengthened the company, which, however, had to be strong enough to play the very same pieces without him, before and after Cooper's visit. Performances were given at first only three nights a week, and even after the theatre was opened every night but Sunday, the same play was rarely acted twice in succession; the star might appear in tragedy two or three times a week, and a comedy with a farce or two would fill the bill on the other

nights. This is the system once universal, which still obtains at the Théâtre Français in Paris, where the most successful play is never acted oftener than three nights out of six. At the Park and the Chestnut, and the other theatres modelled on these, every actor was supposed to be perfect and ready in every part in his "line of business;" and the theatre had thus a repertory on which it could draw at will. As time passed on, the "star" became of more and more importance, and the company of less. Instead of going to see a good performance of a play by a competent company, with a very fine actor in the chief part, audiences were contented with the fine actor in a bad performance by a poor company.

But the evil effects of this starring system were not visible in Cooper's day. The first great actor to come to this country after Cooper was George Frederick Cooke, who acted Richard III. at the Park Theatre, Nov. 21, 1809, being then fifty-four years old, erratic, obstinate, fiery, and worn with drink. Yet he was a genius, and was welcomed as one. His brief but brilliant career in this country was ended by his death in New York, Sept. 26, 1812. Eleven years after Cooke came Edmund Kean, who also appeared as Richard III., Nov. 29, 1820, at the Anthony Street Theatre in New York, where the Park Theatre Company was acting, their own house being in ruins. In Boston, Kean refused to act one night because there was only a small audience. This was so much resented that Kean quit the country. He returned, and on Nov. 14, 1825, reappeared at the Park as Richard III., the recollection of his slight to a Boston audience causing one of the worst riots known to theatrical history. Kean apologized and filled his engagement in New York. But when he appeared in Boston, Dec. 21, a riot broke out there, and almost all the audience part of the theatre was destroyed. Kean made no further attempt to play in Boston, but he acted in the other cities without causing trouble. While in New York he put up a monument over Cooke's grave in St. Paul's church-yard. A year after Kean came his English rival, Junius Brutus Booth, and he also made his first appearance before an American audience as Richard III. in the theatre at Richmond, July 13, 1821. He appeared at the Park Theatre, New York, later in the season, and was at once acknowledged as a master.

He bought a farm in Maryland, and, although he returned to England for a brief visit, he was ever after an American, playing all over the country, even going to California in 1851. He died Nov. 23, 1852, on a steamboat bound for Cincinnati from New Orleans, where he had made his last appearance four days before. No actor ever exerted as much influence on acting in America as Junius Brutus Booth. Forgotten in England except as the actor whom Kean crushed, he was received here, coming after Kean, as Kean's equal. It is not a little curious to note how quickly the American public took to the lively style of Cooke, Kean, and Booth, who were all plainly of the same fiery school; yet Cooper was as plainly of the scholarly and more reflective school of John Philip Kemble. Certainly it was a great good-fortune for the young stage of the United States that tragic actors of the value of Cooper, Cooke, Kean, and Booth should be seen here to serve as models to the histrionic student. It was upon Cooper, apparently, that the first native actor who achieved eminence had modelled himself, yet it can hardly be doubted that Edwin Forrest was almost as much influenced by Kean, with whom he acted in Albany in 1825, and by Booth, whom he had many opportunities of observing.

Edwin Forrest was born in Philadelphia, March 9, 1806. He first appeared as Douglas when he was only fourteen. Two years later he played on a Southern and Western circuit, proving himself. In 1825 he was the leading actor of the Albany Theatre, playing Iago to Kean's Othello so well that Kean at a public dinner

in Philadelphia took special occasion to praise him. It was as Othello that Forrest made his first appearance at the New York Park, June 23, 1826; he was chief actor at the Bowery and the Park for several years. Then he starred, playing Metamora in Stone's Indian drama and Spartacus in Dr. Bird's *Gladiator*, both parts having been written for him and exactly suiting his stalwart and massive style. In 1834, after a public dinner and the presentation of a gold medal, he went to Europe to travel, and in 1836 he acted Spartacus at Drury Lane Theatre, London. In England he was married. On his return he received another public dinner. In 1845 he again visited England, and then began his quarrel with Macready, whom he accused of having had him hissed, and whom he himself hissed openly. Forrest was a strong and headstrong man, and he brooked no opposition. The trouble with Macready ended in a riot in New York in 1849, by which many people lost their lives. Three years later came the discreditable divorce proceedings between Forrest and his wife. After these events the better class of people fell away from Forrest, and he resented the abandonment. As an actor and as a man he had been bold and forcible, but lacking wholly in refinement. After his scandals he became surly and almost morose. His acting, to say the least, was not improved by the change in his character, although by some law of compensation certain personifications, notably King Lear, became mellowed and more poetic. He died Dec. 12, 1872, leaving his fortune to found a home for the decayed members of his profession. The critical verdict that he was best in parts of physical rather than of mental display was not far out. Yet so shrewd and unprejudiced an observer as Mr. Ireland declares that portions of Forrest's Othello, Macbeth, and Lear thrilled to the very soul and made one stand aghast with horror. Beyond all peradventure, Forrest was a great actor, but he might have been much greater than he was.

Here, indeed, was the marked difference between Forrest and Macready, who was less gifted by nature and owed far more to art and to a dogged determination to conquer at any cost. William Charles Macready, born in 1793, and therefore thirteen years older than Forrest, first appeared in America as Virginius, Oct. 2, 1826, and was at once accepted as the best actor of the colder and more classical school seen in America since Cooper in his prime. In 1843 Macready came a second time to this country, and in 1848 he arrived here for the third time, and after his first engagement at the Astor Place Opera House he made a tour of the smaller cities, receiving a public dinner at New Orleans. In May, 1849, he was announced to play Macbeth in New York again; a riot ensued, excited by the fierce partisanship of Forrest's friends, who had taken his cause to heart. The militia fired on the mob and left twenty-two dead and thirty-six wounded on the pavement. Both actors were to blame in the unseemly quarrel which had this fatal end; but on Forrest lies the heavier burden, for he did nothing to check the violence of his riotous supporters.

Nor were the actresses seen on the earlier stage inferior to the actors. Mrs. Merry, especially, was the equal of any contemporary English actress except Mrs. Siddons, and possibly Miss O'Neil, in her best parts. Mrs. Duff, a sister of the wife of Thomas Moore, the poet, came after Mrs. Merry, and surpassed her in some parts. Her life has been told with loving care by Mr. J. N. Ireland, and we can no longer doubt that she was an actress of very remarkable powers, equalled rarely, and excelled only by Fanny Kemble at the best, and by Charlotte Cushman in the parts she had made her own. Mrs. Duff's first appearance in America was made in Boston, Dec. 31, 1810, when she acted Juliet for the first time. She afterward joined the Chestnut Street Theatre, and at intervals played in New York. While she was on the stage she was the foremost actress of America. She left the theatre in 1838, and

lived until 1857 in an obscurity of her own seeking, for she had become deeply religious and felt no desire to recall the days of her histrionic triumphs.

A year before Mrs. Duff retired Charlotte Cushman was engaged in the stock company of the Park Theatre. Born in Boston, in 1815, of straight Puritan stock, she set out when only fifteen to help her family by her voice. When she was twenty she was prima donna at New Orleans, but unfortunately, as it seemed then, the change of climate and injudicious advice ruined her singing voice. Self-reliant, she appeared for a benefit as Lady Macbeth, and, having been well received, she determined to be an actress. After many rebuffs and trials she was engaged at the Park in 1837, and here in time she made her mark. Macready gave her good counsel, and after acting with him in 1844 she determined to play in London, which she did the next year, after many a hard struggle. But she made a brilliant success, and her engagement lasted eighty-four nights. In 1850 she played again throughout the United States, and for the next twenty-five years, during which she appeared at irregular intervals, she was acknowledged by all as the greatest actress of America. She died Feb. 18, 1876. Charlotte Cushman's first great hits were as Nancy in a version of *Oliver Twist*, and as Meg Merrilies in the melodrama of *Guy Randal*. Later, Lady Macbeth, Queen Katherine, Emilia, and Bianca in *Fazio* were her most striking characters. Sturdy, strong, with a man's figure and a man's strength, she was fond of playing male parts; Wolsey was one; Cherubino was another; and the best of them was Romeo.

Between Mrs. Duff's earlier successes and Charlotte Cushman's came Fanny Kemble's. In September, 1832, Mr. Charles Kemble, the younger brother of John Kemble and Sarah Siddons, made his first appearance in America, accompanied by his daughter, Frances Anne Kemble. Charles Kemble was an actor of great skill, and in comedy he had no equal in his day. Miss Fanny Kemble, though almost a novice (she was only twenty years old when she appeared here), had the personal charm which made everything she did seem just the right thing to be done. She was hailed as a beauty and as a genius, and her sway there was none to dispute. She had the fire and impetuosity and fascination of a very clever young woman who builded better than she knew, and whose instinct was a true dramatic touchstone. In June, 1834, she left the stage and married Mr. Pierce Butler, of Philadelphia, in which city she has since resided more often than anywhere else. In time incompatibility of temper led to a divorce between her and her husband, and she resumed her father's name. Afterward Mrs. Kemble appeared a few times on the stage in England, but the personal exhibition of the theatre was always repulsive to her, and she gave up acting and confined herself to occasional courses of readings, generally from Shakespeare. One of these readings called forth one of Longfellow's best sonnets. Mrs. Kemble has written several plays, of which *Francis the First* is the best known. Most of her writing has been autobiographical. Her *Journal in America*, published just after her first visit, caused great and needless dissatisfaction, for the Americans were a very thin-skinned people in those days, and Miss Kemble was a lively young lady. Within the last few years she has published *Recollections of a Girlhood* and *Recollections of Later Years*, two as charming autobiographic books as it is possible to find in modern literature.

Before Charles Kemble had come Charles Mathews, whose eccentric comedy was as highly esteemed in England as Kemble's light comedy. Charles Mathews, born in 1776, first appeared in America in 1822. He acted Goldfinch in the *Road to Ruin*, Dr. Ollapod, and a variety of farces, and he gave his celebrated entertainment, "Mathews at Home." His trip here

was profitable and pleasant, and on his return to England he utilized his experiences on this side of the water in a new entertainment, called "Mathews in America," some of the caricatures in which gave offence to a few highly sensitive Americans. Yet, when he returned in 1834 and produced his entertainment before the American people, no cause of complaint was found. His son, Charles James Mathews, the foremost light comedian of his day, first came to this country in 1838 in company with Madame Vestris, whom he had married just before his departure. Madame Vestris was over forty years of age when she appeared here, and this fact no doubt accounts for the general disappointment of play-goers, who had heard much of her great beauty. C. J. Mathews made more of a hit than his wife, and after her death he returned here in 1857 and married Mrs. A. H. Davenport, with whom he came here again in 1871. Charles Mathews "the younger," as he was generally called, was a comedian of extraordinary lightness and ease, and his influence on the younger generation of comedians survives to this day.

It must not be supposed, because mention is here made of the chief English comedians who crossed the Atlantic from time to time, that there were not American comedians of conspicuous merit. In the early days Hallam and Henry and Hodgkinson, especially the latter, were performers of great comic force. Then came Wignell, Prigmore, Bernard, Wood, Warren, Jefferson, Nelson, Barnes, and many more. Many of them were born in England, although they had settled here for life and considered themselves good Americans. In 1826 James H. Hackett, a merchant of New York who had married an actress, took to the stage himself, and became one of the foremost of American comedians. He was the first to make a specialty of Yankee parts, and although he repeatedly acted Richard III., Hamlet, and King Lear, it was as a comedian, and especially as an actor of dialect characters, that he was best received. He acted in England in 1827, and again in 1830, 1840, 1845, and 1851; and he was the first to introduce the stage Yankee to the English public. Hackett was probably the earliest performer of Rip Van Winkle, and in John K. Paulding's comedy, the *Lion of the West*, he appeared as Col. Nimrod Wildfire. It was possibly the success of a Yankee part in Woodworth's *Forest Rose* which turned Hackett's attention to the New England dialect; but this part was soon appropriated by an experienced comedian, George Handel Hill, who took advantage of Hackett's second trip to England to push himself forward as an actor of Yankee characters. Hill too went to England in 1836, personating the dramatic Down-Easter at Drury Lane and the Haymarket; he even acted twice in Paris, but the French did not understand the Solomon Swop of 1837 any better than they comprehended Asa Trenchard when Mr. John T. Raymond acted it there in 1867. After Hackett and Hill came Dan Marble, a coarser comedian, whose hit was made in *Sam Patch*; he acted also in *Yankee-Land* and the *Vermont Wool-dealer*, both written for him by Cornelius Logan, a brother of Senator Logan and the father of Eliza Logan. Ten years later (in 1848) Mr. F. S. Chanfrau set on the stage Mose, the New York fireman and the Bowery boy, and for ten years this type maintained its popularity and appeared in many pieces. Mr. Chanfrau achieved over a score of years later a second success in *Kit, the Arkansaw Traveller*, in which he has been acting now for the past twelve years or so: it is very rarely that an actor is ever able to make as decided a hit in a second part as broadly marked as the first. Other types of American character have been seen in the Salem Scudder and Asa Trenchard of Mr. Joseph Jefferson, in the Solon Shingle of Mr. John E. Owens, in the Colonel Sellers of Mr. John T. Raymond, the Judge Bardwell Sloc of Mr. W. J. Florence, and the Davy Crockett of Mr. Frank Mayo. More famous than any of these is the

Rip Van Winkle of Mr. Joseph Jefferson. After Hackett had acted in a dramatization of Irving's folk-tale many other actors attempted it, and among them were Mr. Chanfrau and Charles Burke, Mr. Jefferson's half-brother, who made a new version of the play. This version Mr. Jefferson acted many times, and it grew under his loving touch. In 1865, when he was about to act at the Adelphi Theatre, London, he got Mr. Dion Boucicault to put the play into shape, and in its new form Mr. Jefferson made one of the most remarkable successes ever known in the history of the stage.

During all these years, as these actors were coming forward in succession, there was a great growth in the number of theatres throughout the country. Nearly every town had its playhouse, called a theatre or an opera-house, or haply an academy of music. Theatres which had formed part of a circuit served by a company from a larger city came in time to have companies of their own. In the earlier days the manager depended on his own actors to attract audiences; in time he began to rely more and more on wandering stars. Cooper was the first of these; then came the great English actors Cooke and Kean and Booth, who could not well be expected to join a stock company. Following in Cooper's footsteps came Forrest and others now more or less forgotten. Mrs. Duff was starred now and again, and after her great hit Charlotte Cushman was a star only. So it was with others who had less right—Hackett, Hill, Marble. With the increase in the number of theatres it began to be difficult to get a good stock company together; and the difficulty was increased by the pecuniary temptation a profitable starring-trip offered to a favorite actor. At first stars only acted on special nights, the regular company appearing alone the other nights of the week. In the end, the star, for his own profit, was willing to act every night, and this made the regular company of less importance. Then the number of stars increased, so that instead of having half a dozen very eminent performers strengthening the company at intervals during the year, it became possible to engage a constant succession of stars following close on each other's heels. When this had come about the manager speedily discovered that it was the name of the star which attracted a large audience, and not the excellent performance of the whole company. Obviously it was possible to economize on the company, as a star supported as best he could be drew nearly as well as a star playing with a stock company. Then the star, seeing that the manager relied on him to get people into the house, demanded the lion's share of the profits; and the result of all this was that, except in four or five large cities, there were no stock companies able to give a creditable performance of any of the stock plays. The really capable and conscientious actors were forced either to star or to remain in the few surviving stock companies. Of course this process and this progression were slow in their action. Cooper did not begin to star until after 1800, and it was quite 1860 before things had come to the pass depicted above. And equally of course there were exceptions. In the large cities—in New York, Boston, Philadelphia, and later in New Orleans, Chicago, and San Francisco—the theatres kept fine companies, most of them admitting stars, but always with discretion and only at intervals, as when the system began. In Philadelphia the Chestnut Street Theatre held its own, and had for its chief rival the Walnut Street Theatre. In Boston the Boston Theatre and the Museum maintained a worthy rivalry; to this day the Boston Museum is one of the best-managed theatres in the country, and it has one of the most capable companies. In New York the first real rival of the Park Theatre was the Bowery, but it was not until James W. Wallack took in hand the National Theatre that the supremacy of the elder house was shaken. Wallack was a handsome, dashing actor, gentlemanly and popular in the best society, and

fashion was ready to follow him; but the theatre was burnt in 1839. What Wallack had begun was finished by William E. Burton, perhaps the best actor of broad, low comedy parts yet seen here. In 1848 he opened as Burton's Theatre what had been the Palmer Opera House in Chamber street, and within a few months the Park Theatre was burnt down. Burton was a man of education, and for a while edited the *Philadelphia Gentleman's Magazine*. He continued to manage Burton's Theatre until 1856, when he moved uptown for two years. Then he left the field to Mr. Wallack, who had in 1852 taken Brougham's Lyceum and called it Wallack's Theatre. John Brougham was a genial and generous Irish-American actor and author, who had originally been part author of *London Assurance*, and who had written the version of *Dombey and Son* which had been the first great success at Burton's Theatre. He wrote many plays, all easy and amusing; among them the comedy of *Romance and Reality*, the burlesque of *Pocahontas*, and the adaptation of *The Duke's Motto*. He attempted management several times, but never with good fortune; he lacked the stern firmness of a business man. When Brougham failed Wallack took his theatre, and from that day to this there has been a Wallack's Theatre in New York. Ten years later a new house was built at the corner of Broadway and Thirteenth Street. In this Wallack never acted, but it was managed by his son, Mr. John Lester Wallack, a light comedian trained in the best school. In 1881 this house was found to be too far down town, and Wallack's Theatre was again moved up, this time to Broadway and Thirtieth Street. With the lapse of time, however, has come a distinct deterioration both in the company and in the class of plays presented, and Wallack's is no longer the first theatre in America.

Just as Wallack had taken Brougham's Lyceum in 1852 to rival Burton's Theatre and to seize the succession of the old Park Theatre, so in 1869 Mr. Augustin Daly took another house Brougham had opened in Twenty-fourth Street, and began at once a strong opposition to Wallack's. For eight years Mr. Daly engaged a very strong company; it is on record that he gave the *School for Scandal* at Newark and *London Assurance* at his own theatre on the same evening without enlarging his company; and he mounted his plays with lavish beauty. While Mr. Wallack, inheriting his traditions from his father, relied almost exclusively on the London stage for his plays, even if they were adaptations from the French, Mr. Daly imported his foreign dramas himself, and threw before the American public French and German comedy, drama, and farce in rapid succession. A dramatist himself of no little force and of great skill, Mr. Daly also brought forward other American authors—notably Mr. Bronson Howard, whose *Saratoga* proved a most amusing farce, equal in ingenuity to a Frenchman's work. It may be noted that this play was acted several hundred times in London, and was translated into German and played in Berlin. In 1870 was opened the Union Square Theatre, managed by Mr. A. M. Palmer, who followed Mr. Daly in relying on America and on France for his pieces, and not on England. Its most noted plays have been the *Two Orphans*, by MM. Dennery and Cormon, and Mr. Bronson Howard's *Banker's Daughter*, which, like his *Saratoga*, has been acted in London with popular approval equal to that bestowed on it here. For twelve years the Union Square Theatre has had a strong and varied company, most of the members of which were native Americans, and therefore capable of appreciating the American character and of giving full effect to American plays. About the same time that Mr. Daly opened the Fifth Avenue and Mr. Palmer the Union Square Mr. Edwin Booth opened the theatre he had erected for himself. Acting in 1864 in a fine revival of *Hamlet* at the Winter Garden Theatre, Mr. Edwin Booth, the son of Junius Brutus Booth, and an heir of much

of his histrionic genius, was so acceptable to the public of New York that the tragedy was acted for one hundred consecutive nights, anticipating in a city of 600,000 inhabitants the later run of Mr. Henry Irving's *Hamlet* in London with 3,000,000 inhabitants. In 1866 Mr. Booth presented *Richelieu* with the same beauty of adornment, and in 1867 the *Merchant of Venice*, and then the theatre was burnt. It was on Feb. 3, 1869, that Mr. Booth opened Booth's Theatre, a playhouse magnificent in its proportions and noble in its structure. The first play was *Romeo and Juliet*, and the chief tragedies of Shakespeare followed. Mr. Edwin Adams and Mr. Lawrence Barrett were the chief actors who appeared with Mr. Booth, and as stars appeared Charlotte Cushman, Joseph Jefferson, W. J. Florence, J. S. Clarke, Adelaide Neilson, Miss "Lotta" Crabtree, and others of first-rate theatrical importance. But the house was very expensive, and Mr. Booth was not as good a manager as he was actor; and in time he found himself obliged to give the theatre up. It has since been leased by many managers, some of whom gave performances worthy of the house—notably a revival of *Julius Caesar*—while others merely tried to make as much money as might be. Changing hands in this way from year to year, and not served by a permanent stock company, Booth's Theatre was finally torn down in 1884. The Madison Square Theatre is a small but perfectly built and beautifully decorated house, erected by Mr. J. Steele Mackaye, and opened by him in 1880 with his own drama, *Hazel Kirke*. Mr. Mackaye had been a pupil of Delsarte, and an actor and a teacher of acting, and he had written several plays, one of which, *Won at Last*, had had an honorable career. For the Madison Square Theatre he devised a mechanical novelty of much future value; this is a double stage. There are two stages, one over the other, like two shelves in a dumb-waiter, so hung on wire-ropes, and so carefully counterbalanced, that they may change places in a few seconds. The advantage of this is that while one act is being played on one stage the scenery for the next act can be made ready on the other stage, which is then either above or below; and thus no time is lost between the acts, and much more elaborate scenes are possible. It is probable also that in time the double stage may be utilized in furthering the action of the drama. Among the other theatres in New York, hitherto passed over, are to be mentioned Niblo's Garden, where a spectacular piece called the *Black Crook* was acted several hundred times in 1867 and since; and the Standard, where the English comic opera of *H. M. S. Pinafore* made its long stay in 1879. At a theatre called the Olympic, and now torn down, a comic actor of much humor, George L. Fox, appeared in 1867 as Bottom in *A Midsummer Night's Dream*, and as Humpty Dumpty the clown in a pantomime of the same name. This last was a delightful performance, free and unforced in its fun.

Space fails to mention in detail even the names of all the American actors who have appeared in the chief towns, or of the English artists who have crossed the ocean from time to time to try their fortunes here. Among the first Mr. John McCulloch must not be omitted, nor Mr. Lawrence Barrett, a tragic actor with a constant desire to enrich the stage with new plays, including *Pendragon* of Mr. Wm. Young and *Francesca da Rimini* of Mr. G. H. Boker. Among the latter may be noted Mr. and Mrs. Keeley, Mr. and Mrs. Charles Kean, Mr. Barry Sullivan, Mr. Buckstone, Mr. Charles Coghlan, and Mrs. John Wood, one of the few actresses with a sense of broad humor. Besides these English-speaking performers there have been here many French, Italian, and German histrionic artists of renown—Rachel, Ristori, Seebach, Salvini, Fechter, Sarah Bernhardt, Rossi, Janauschek, and others of minor importance. Most of these actors brought with them full foreign com-

panies. Partly to these foreign companies, partly to the various operative troupes—Italian, French, and English; partly to the desire of the manager of an attractive spectacle, play, or player to make himself all he could of the possible profit; partly to other minor circumstances, is due the rise of the "combination" system, which throughout the United States has now superseded the system of stock companies. In the earlier days of the American stage, as we have seen, there were no stars, and the local company was all-sufficient. In time stars began to revolve, and the stock company became of secondary importance; now, except in four New York theatres, one in Boston, and perhaps two or three elsewhere in the United States, there are no more stock companies. The star now travels from town to town, accompanied by his own company. The new play is now acted throughout the country by one or more "combinations" of actors chosen specially for the purpose and sent out from New York. The local manager is now merely the janitor of his own theatre, and has to attend only to the lighting, the ushers, and the advertising, the manager of the travelling combination furnishing the play, the players, and more often than not the scenery also. This change has come since 1876, and it is too early to see exactly what its effects will be on the drama. The better opinion is that it is an unmixed evil, and that there must in time be a reaction. It is to be noted, however, that a similar change has taken place in England and is taking place in France; as yet Germany is not affected, and in Italy something very like the combination system has always obtained. One result of the new state of affairs is that the country town and the metropolis are put on an equality, the country town seeing the most of the combinations which appear in the metropolis.

In the course of this sketch of the history of the stage in the United States, references have been made to many of the native dramatists who have from time to time revealed themselves. Other than incidentally it is impossible to treat American dramatic literature, because, although there have been many American plays, there is not, of a truth, any American dramatic literature to treat, as there is an English or a French dramatic literature. Until very recently the English dramatist alone supplied our stage; of late he has received some little aid from the Frenchman and the German. The appearance of the American dramatist even now is only sporadic. Thus, any account of the American drama cannot be the continuous story of a steady growth; it can only be a list of individual names.

In 1837 was acted *Bianca Visconti*, written by N. P. Willis, in his well-known style of verse. In 1845 was acted Mrs. Mowatt's *Fashion*, a lively enough comedy, but pretentious, although it is the best of its author's plays. John Brougham's plays have already been referred to. Mr. Dion Boucicault, with whom Brougham had been associated in the authorship of *London Assurance*, was an English dramatist of Irish birth, who became an American by adoption. The best of his plays are Irish in subject—*The Colleen Bawn*, *Arrah-na-Pogue*, and *The Shaughraun*, all of which were first acted in America. Another play of his, *The Octoroon*, made a very skilful use of the slavery question. Mr. Charles Gayler wrote *The Magic Marriage*, a comedy of merit acted at Wallack's in 1861; and Mr. Lester Wallack himself has produced several plays, adapted from the French or dramatized from English novels; of these, the best is *Rosedale*. Mr. S. L. Clemens (Mark Twain) and Mr. Bret Harte have each written a play apiece, and another in collaboration.

Mr. Joaquin Miller is very widely known as the author of an effective melodrama of Western life and adventure called *The Danites*; and Mr. Bartley Campbell has written many plays, of which the best is also a drama of the West, called *My Partner*. *Conscience*,

by Messrs. Julian Magnus and A. E. Lancaster; *The False Friend*, by Mr. Edgar Fawcett; *Clouds*, by Mr. Frederic Marsden; *The Rajah*, by Mr. William Young; *Two Nights in Rome*, by Mr. A. C. Gunter; *May Blossom*, by Mr. D. Belasco, are the most successful plays of writers from whom good work may fairly be expected in the future. The newer school of novelists have also turned their attention to the stage: Mrs. Burnett saw her *Lass o' Lowrie's* dramatized three or four times, and has herself produced a comedy called *Esmeralda*; and Mr. W. D. Howells has written two or three original comedies, besides making for Mr. Lawrence Barrett a very strong version of a Spanish play acted here as *Yorick's Love*. Mr. Augustin Daly and Mr. Bronson Howard have already been mentioned; Mr. Howard's *Young Mrs. Winthrop* is a fine and noble play. For the first time in the history of the American stage is there a band of young men desirous of writing for the theatre—clever, ardent, capable of taking pains, and willing to take pattern by the best models. It is surely justifiable to hope that in the next twenty years there may be as great an advance in the quality and quantity of our plays as there has been in the past twenty years in our novels. (B. M.)

DRAPER, HENRY (1837–1882), an American scientist, was born in Prince Edward co., Va., March 7, 1837. Two years later, his father, Prof. J. W. Draper, removed to New York, to become professor of chemistry in the University of New York. Henry graduated from the medical department of this university in 1858, taking for thesis the *functions* of the spleen, and illustrating it by microscopic photography. After a year's practice in connection with the Bellevue Hospital, he was made professor of physiology in the academic department of his *alma mater*, and in 1866 was advanced to the same department in the medical school. Resigning this position in 1873, he taught analytical chemistry in the academic department, and on the death of his father in January, 1882, was appointed his successor as professor of chemistry. At the close of the term he withdrew from the university, and in the summer he made an excursion to the Rocky Mountains. Here he contracted a severe cold, which on his return to New York resulted in pneumonia, from which he died Nov. 20, 1882. Prof. Draper had inherited his father's skill and enthusiasm in the cause of natural science, and in his brief career made several important discoveries. He devoted much attention to photographing the heavenly bodies and their spectra, in which he attained remarkable success. He published a *Text-book of Chemistry* (1864), and valuable papers in the scientific periodicals.

DRAPER, JOHN WILLIAM, M. D., LL.D. (1811–1882), was born May 5, 1811, at St. Helens, near Liverpool, and received his early education mostly from private tutors; he studied chemistry under Dr. Turner at the University of London. In 1833 he came to America, having relatives in Virginia, and in 1836 he graduated in medicine at the University of Pennsylvania with so much distinction that his inaugural thesis received the unusual compliment of being published by the faculty. Shortly afterward he was made professor of chemistry in Hampden-Sidney College, Virginia, and in 1839 received the appointment to the chair of chemistry in the University of New York. He was one of the founders of the medical department of the University of New York, and eventually became its president. At a later date he was made president also of the scientific department. He died Jan. 4, 1882.

Dr. Draper's earliest chemical publications were on the chemical action of light, and many of his subsequent memoirs were on radiant energy. Altogether, he published nearly forty of these memoirs in the *American Journal of Science and Arts*, the *Franklin Institute Journal*, the *American Journal of Medical Sciences*, and the *London, Edinburgh, and Dublin Philosophical Magazine*, and for them he received the

Rumford medal of the American Academy of Science. Among the subjects treated of were an investigation of the temperature at which bodies become red hot, the nature of the light they emit at various degrees, the connection between their condition as to vibration and their heat. It was shown that incandescent solids yield a spectrum that is continuous, not interrupted. This has become one of the fundamental facts in astronomical spectroscopy. At this time (1847) no one in America had given attention to the spectroscope, and, except Fraunhofer, few in Europe. Draper showed that the fixed lines might be photographed, doubled their number, and found new ones at both the violet and red ends of the spectrum. The facts thus discovered were applied to an investigation of the nature of flame and the condition of the sun's surface. He proved that under certain circumstances rays antagonize each other, and that the diffraction spectrum has great advantages over the prismatic, which is necessarily distorted. He attempted to ascertain the distribution of heat in the diffraction spectrum, and pointed out that advantages arise if wave-lengths are used in describing photographic phenomena, publishing steel engravings of the spectrum so arranged. He made investigations on phosphorescence, and obtained phosphorescent pictures of the moon. Up to 1840 it had been supposed that the great natural phenomena of the decomposition of carbonic acid by plants was accomplished by the violet rays, but by performing that decomposition in the spectrum itself, he showed that it is mainly effected by the yellow.

Dr. Draper was the first person who succeeded in taking portraits of the human face by photography. This was in 1839. He published a minute account of the process at a time when in Europe it was regarded as altogether impracticable. He was also the first to take photographs of the moon in 1840. When Daguerre's process was published he gave it critical examination, and described the analogies existing between the phenomena of chemical radiations and those of heat. For the purpose of obtaining more accurate results in these various inquiries, he invented the chlor-hydrogen photometer and examined the allotropic modifications that chlorine undergoes. Since in such researches most delicate thermometers are required, he investigated the electro-motive power of heat and described improvements in the thermopile. He discovered the true cause of the movement of camphor toward the light. In a physiological digression respecting interstitial movements he examined the passage of gases through thin films, such as soap-bubbles, and the force with which these movements are accomplished, applying the facts so gathered to an explanation of the circulation of the sap in plants and the blood in animals. Returning to an inquiry as to the distribution of heat and chemical force in the spectrum, he found, in opposition to the current opinion, that all the colored spaces are equally warm and that chemical effects can be produced by every ray.

Though in his earlier years Draper was a skilful mathematical analyst, he published but few mathematical papers, the most important being an investigation of the electrical conducting-power of wires. This was undertaken at the request of Morse at the time he was inventing the electric telegraph.

The experimental investigations of Dr. Draper were collected together—once in 1844, in a volume *On the Forces that Produce the Organization of Plants*, and again in 1878, in a work entitled *Scientific Memoirs*. He also published an edition of Kane's *Chemistry*, a text-book on Chemistry, and a text-book on Natural Philosophy. In his work on *Physiology*, published in 1856, he showed the tone his mind had taken in regard to man in his social relations as under the dominion of law, and his subsequent works in this direction have given him worldwide celebrity. His *History of the Intellectual Development of Europe* was published in

1862. Few philosophical works have attained so quickly to fame. Many editions have been published in America and England, and it has been translated into almost every European language. The *Westminster Review* says: "It is one of the not least remarkable achievements in the progress of positive philosophy. A noble and even magnificent attempt to frame an induction from all the recorded phenomena of European, Asiatic, and North African history." This was followed by *Thoughts on the Civil Policy of America*, *A History of the American Civil War*, in 3 vols. 8vo, and a *History of the Conflict between Science and Religion*. This work has passed through many American and English editions, and has been translated into French, German, Spanish, Russian, Polish, Italian, Servian, etc. (H. D.)

DRAPER, LYMAN C., LL. D., an American antiquary, was born in Evans, N. Y., Sept. 4, 1815. After receiving an academic education, he became editor of a paper at Pontotoc, Miss., but since 1834 he has largely devoted his time to gathering original materials for the biography and history of the Ohio and Mississippi valleys. From the recollections of pioneers, Indian fighters, and frontier leaders, he has gathered the largest and most complete collection of this kind ever made. In 1852 Mr. Draper settled in Madison, Wis., where, as secretary of the Wisconsin State Historical Society, he has collected a library of 100,000 volumes and pamphlets, and issued 9 volumes of collections. Besides editing these volumes, Mr. Draper was State superintendent of public instruction in 1858-59, and with the assistance of W. S. Croffut prepared in 1869 a work on farming and domestic economy. In 1881 he published *King's Mountain and Its Heroes*. He is now engaged on a life of Gen. George Rogers Clark, for which he has a rich collection of materials. In 1871 the University of Wisconsin conferred on Mr. Draper the degree of LL. D. He is a member of the principal historical and antiquarian societies of the country.

DRAYTON, WILLIAM HENRY (1742-1779), an American statesman, was born at Drayton Hall, on Ashley River, S. C., September, 1742. He went to England in 1753, and was educated at Westminster School and Balliol College, Oxford. He returned to Carolina in 1764, and was an active writer on political affairs, taking the side of the government. Having revisited England, he was in 1771 appointed privy councillor for the province of South Carolina. He afterwards espoused the popular cause, and protested against the proceedings of his colleagues. In 1774 he was appointed judge of the province, and under the name of "Freeman" wrote a pamphlet addressed to the first Continental Congress, then in session, setting forth the grievances of the colonies and proposing a bill of rights. The line of conduct thus marked was substantially followed by the Congress. Being suspended from his office under the Crown, he was made a member of the popular committee of safety, and advised the seizure of the provincial arsenals. In 1775 he was president of the provincial congress, and was reinstated in his office under the State Constitution. In 1776 he was made chief-justice of the State, and a charge which he delivered to the grand-jury in April on the subject of independence being published, had great influence throughout the country. He was president of South Carolina in 1777, and a member of the Continental Congress in 1778-79. He died at Philadelphia, Sept. 3, 1779. He left a manuscript history of the revolution to the end of the year 1778, which was published by his son, Gov. John Drayton, in 1821.

DRED SCOTT CASE, THE. This case, one of the most important in American history, was originally one of assault and battery. Dred Scott was the slave of Dr. Emerson, of the regular army, who in 1834 took him to Illinois, and thence in 1836 to Wisconsin. In 1838 the owner brought Dred back to Missouri. The line of Missouri decisions had held that such a transfer

by the owner to free territory made the slave a free man, and that the conditions of servitude would not reattach on a return to slave soil. In 1848 Dred brought suit against his owner for assault and battery, and obtained a verdict in a State court. The case was appealed to the State Supreme Court, which in 1852 reversed the former line of decisions, and sent the case back to the lower court. Here it remained in abeyance, for the case had passed into the Federal Courts. Emerson had sold Dred and his family to John F. A. Sandford, of New York; and, as Dred and Sandford were "citizens of different States," Dred transferred the suit to the Federal Circuit Court for Missouri. Sandford pleaded to the jurisdiction of the court, asserting that Dred was not a citizen of Missouri, but "a negro of African descent; his ancestors were of pure African blood, and were brought into this country and sold as negro slaves." Dred answered this by a demurrer; that is, he claimed legal status as a citizen, even on defendant's own showing, and the demurrer was sustained. Sandford answered over, and pleaded in bar that Dred was his slave, and that he had only "gently laid hands" on him to restrain him, as he had a right to do. The court charged in Sandford's favor, and Dred carried the case, by exception, to the Supreme Court. (See *Dred Scott vs. Emerson*, 15 Missouri Rep., 682, and authorities cited at the end of this article.)

By this time circumstances had made the case a pivot of national importance. When the United States acquired the vast territory of Louisiana in 1803, no steps were taken to prevent the custom of slavery from spreading through it. Louisiana was admitted in 1812 as a slave State, and when Missouri applied for admission it also came as a slave State. Here Congress attempted to retrace its steps, and a struggle was begun for the purpose of compelling Missouri to come in as a free State. For the first time a united North and a united South were opposed on a question of slavery; but the South had the nine points of possession in its favor, and Missouri entered as a slave State in 1820, on a compromise. Slavery was thereafter forever prohibited in the province of Louisiana, north of latitude 36° 30', outside of Missouri. Now Fort Snelling, to which Dred had been taken by his owner in 1836, was in this part of Louisiana, in which Congress had prohibited slavery in 1820; and the Missouri Supreme Court had really only decided that Emerson had not intended to change his domicile, and that the local law of Missouri had reattached upon Dred when he returned to that State. This question of reattachment, then, would seem to have been the question before the United States Supreme Court, since the Federal Circuit Court was bound by the judiciary act of 1789 to follow State court constructions, when not in conflict with the Constitution. On this point the Supreme Court (Justices McLean and Curtis dissenting) sustained the State court, and directed the Federal Circuit Court to dismiss the case for want of jurisdiction.

Intervening events, however, had dove-tailed in so exactly with various features of the Dred Scott case that the individual justices were carried far beyond the main question in their opinions. During the years 1846-48 every attempt to vote money for the purchase of territory from Mexico had been met with the "Wilmot proviso," so called from David Wilmot, of Pennsylvania, who first introduced it, that slavery should be prohibited in any territory thus to be acquired. For two-and-a-half years after the acquisition of California and New Mexico in 1848, the organization of civil governments in those Territories had been prevented by a persistent attempt to add the Wilmot proviso. Finally, in 1850, this struggle ended in another compromise. California was admitted as a free State; Utah and New Mexico were organized as Territories without mention of slavery; the fugitive slave law was made far more stringent; and the sale of slaves in the District of Columbia was forbidden. The territorial

feature of the compromise seems to have meant all things to all men; some alleged, some denied, that it meant to give the territorial legislature complete control of slavery. It seems to have given such control in fact, in this way: Territorial legislatures have the power of legislation within their spheres, unless vetoed by act of Congress; this compromise gave them an initiative power which it would be difficult to unite both houses in vetoing; and, as a result, both Utah and New Mexico allowed slavery before 1860, while the United States Senate balked every attempt to veto their action. In so far, the Wilmot proviso was a failure, except in California.

Until 1854 the power of Congress to forbid slavery in the Territories seems to have been quite generally admitted. There was no plain denial of the power of Congress to forbid slavery in the north-west territory in 1787, or in Louisiana, north of 36° 30', in 1820. The special feeling of the South in 1850 seems to have been that the North had not favored the Mexican war, that the South had done most of the fighting to win the Mexican acquisitions, and that this was a special case in which positive prohibition of slavery would be unfair. The northern Democratic party, led by Cass and Douglas, sympathized with this feeling far enough to induce it simply to refrain from prohibiting slavery in Utah and New Mexico. It took but four years to carry this point of pure expediency up to a constitutional obligation to refrain from prohibiting slavery in any Territory whatever. And thus, when the Territories of Kansas and Nebraska came to be organized in 1854, although they lay within the limits where slavery had been prohibited in 1820, Douglas led his party in repudiating the compromise of 1820 as unconstitutional and void, and in formally handing over all powers of slavery legislation to the territorial legislature. The result was the inauguration of a desperate struggle, rising at times to a local civil war, between North and South, for the control of Kansas. (See KANSAS.)

Before the Kansas struggle had gone very far, it was apparent that the South was at a disadvantage so great as to be insuperable. Slavery could only obtain a secure foothold anywhere as a custom, fortifying itself slowly by the building up of vested interests until the mass became too great for interference. But the attempt to establish such a custom in Kansas was a hazarding of valuable property on the issue of a doubtful struggle. There were no border States between freedom and slavery in Kansas, and few slaves were sent there. As the result of the struggle became more evident, the influential Southerners drifted steadily to the ground which had been maintained by Calhoun from 1837 until his death, that slaves were property, that the Constitution was intended to protect property, and that Congress, the creature of the Constitution, was bound to protect the rights of property in the Territories. A negative refusal to suppress slavery in the Territories was no longer sufficient. Congress must actively protect slavery in the Territories.

On the main point, the denial of jurisdiction, the majority of the court was coherent. On the other points, dragged into the case by the peculiar state of political discussion, and by the wide sweep of the arguments on both sides, the majority was altogether incoherent, and it is not easy to say how far the various opinions have authority, and how far they are mere *obiter dicta*. The longest and most important opinion was that of Chief-Justice Taney. Its leading feature was its attempt to prove historically that, as negroes had not come to the United States voluntarily as persons, but involuntarily as merchandise and property, and as they had not been regarded as citizens when the Constitution was framed, they could never, even by emancipation, acquire the status of citizens. This point was so strongly made and supported that, after the ratification of the Thirteenth Amendment in 1865, it was felt to be necessary to ratify the Fourteenth

Amendment, to establish the status of the freedmen as citizens. It was in this part of the opinion that the chief-justice used the phrase, so often misquoted, that, for more than a century before the Declaration of Independence, negroes had been regarded as beings of an order "so far inferior that they had no rights which the white man was bound to respect."

On the other point, not directly involved in the case, if the main point as to jurisdiction was correctly held, the chief-justice was equally emphatic. He held that "the only power conferred" on Congress in regard to slavery in the Territories was "the power, coupled with the duty, of guarding and protecting the owner in his rights." The Calhoun doctrine could have asked no more definite indorsement than this; and, as a consequence, the opinion of the court went on to declare that "the act of Congress [of 1820] which prohibited a citizen from holding and owning property of this kind in the territory of the United States north of the line therein mentioned [lat. 36° 30'] is not warranted by the Constitution, and is therefore void; and that neither Dred Scott himself, nor any of his family, were made free by being carried into this territory, even if they had been carried there by the owner with the intention of becoming a permanent resident." To appreciate fully the violence with which this point was dragged into the opinion, the reader must remember that the court had already decided that it had no jurisdiction of the case in any event, even if Dred Scott had been freed, which meant in effect that the Missouri compromise had nothing to do with the case.

The case was argued finally before the court at December term, 1856, but judgment was deferred until March 6, 1857. From that time the South felt that its position in regard to slavery in the Territories was supported by the highest judicial authority in the United States. One great reason for secession was the fear that a Republican president and Congress, by new appointments or by an increase in the number of justices, would change the majority of the Supreme Court and overturn the Dred Scott decision.

See *Dred Scott vs. Sandford*, 19 Howard's Rep., 393; Tyler's *Life of R. B. Taney*, 373, 578; 2 B. R. Curtis's *Works*, 213; 9 Curtis's *Rep.*, 72; Benton's *Examination of the Dred Scott Decision*; Hurd's *Law of Freedom and Bondage*; 13 Benton's *Debates of Congress*, 577; 1 Draper's *Civil War*, 407; 2 A. H. Stephens's *War Between the States*, 260; Buchanan's *Administration*, 48; 2 Wilson's *Rise and Fall of the Slave Power*, 523. (A. J.)

DRILL. This is a tool or instrument for making round holes in hard substances. A drill for metal consists of three parts, the shank, the body, and the cutting-edges. The *shank* is that portion which serves as a means of attachment to the spindle of the apparatus used for rotating the drill, and through which the motion and force are imparted. A common form of shank, for rough work, is of square section, each side being tapered towards the end at the rate of about one in twelve, thus being in the shape of a frustum of a square pyramid. It enters into a corresponding cavity or mortise in the end of the spindle or chuck, and makes a strong and efficient means of imparting the force of rotation to the drill. An advantage of this form of shank is, that it can be readily forged from a square bar of steel and fitted to the chuck. The objection to it is the difficulty of making the mortise in the chuck correctly, either as to the equality of its sides or the coincidence of its axis with the axis of rotation.

Another common form of shank is cylindrical. The tool is fitted to a cylindrical hole in the chuck, and held there by means of a set-screw bearing against a flat place on the side of the cylindrical shank. This form is the most easily made, whether in the rough or turned. The objection to it is, that the shank cannot be made to fit the hole exactly, and consequently, when the set-screw is tightened, the axis of the former

will be forced away from that of the latter, and then, no matter how accurately the drill may have been made to have its cutting-edges of equal lengths and at equal angles with its axis, the latter cannot exactly correspond with the axis of rotation. Another objection is the continual bruising of the flat on the cylinder and the upsetting of the end of the set-screw. This form of shank is good if used in a clamping chuck, the jaws of which will always hold it concentrically with the spindle, but as such a chuck holds merely by friction, its use is confined to small drills.

An improvement on this form of shank was effected by tapering it, or making it the frustum of a cone instead of a cylinder, the flat on the side and the set-screw being the same as before. In this case the fit of the shank in the chuck can be made perfect, but, in tightening the set-screw, the shank is liable to be forced forward in the socket. The taper of this shank should be outside of the angle of friction, so that it will readily come out on releasing the set-screw.

Another form of shank, and the one most generally used with accurately made drills and for good work, is also in the form of a frustum of a cone, but with the sides more nearly parallel than in the preceding, the taper being such that the friction will hold it firmly in the chuck. From one-half to three-quarters of an inch taper to the foot is generally used. The small end of the shank is flattened on two opposite sides for a short distance, forming a tenon, which fits into a corresponding mortise in the bottom of the taper hole in the chuck. The force of rotation is imparted through this mortise and tenon. The mortise is extended entirely through the diameter of the chuck, and is made enough longer than the tenon to admit of a taper wedge being driven in behind the tenon in order to force the shank out of the hole whenever desired. An efficient system of shanks and chucks of this kind is very largely used for drills from one-quarter of an inch diameter up. A set of drills, say from one-quarter to two inches, are arranged in four divisions, all the drills of each division having one standard size of shank. If, now, the spindles of the drilling machines and lathes in an establishment have similar taper sockets, and the chucks for the drills have shanks to fit these spindles, an interchangeable system of great value is provided. Although this form of shank is good still it is open to the objection that the tenons frequently fail by being twisted off. To overcome this, one of the best engineering establishments omits the tenon, but cuts a key-seat the entire length of the taper shank, and inserts a corresponding key in the taper hole of the chuck. A mortise is cut through the chuck at the bottom of the hole as before, but only for the purpose of inserting a taper wedge to remove the drill.

Another excellent form of shank, particularly adapted to large drills and boring-bars, has a more obtuse taper with a short parallel screw-thread at one or the other end. The taper parts of shank and chuck are accurately fitted together to secure proper alignment, while the screw threads are loosely fitted, their functions being merely to draw the taper parts firmly together, and to receive the torsional strain.

The *body* of the drill is that portion between the shank and the cutting-edges. In *flat* drills or *fly* drills, which are forged to shape, the part next the shank is usually of the form of the original bar of steel for a short distance, then is gradually drawn down smaller than the size of the drill, and afterwards flattened and spread laterally until the size is slightly exceeded, the width of this flat being kept parallel for a short distance at the end of the drill, to prevent the size being diminished by the grinding away of the cutting-edges. The thickness of this flat at the point varies from one-fourth to one-eighth of its width, according to the size of the drill. The forging is not hardened, but is first centred at both ends, and the shank is turned and tenoned or key-seated to fit the chuck. The edges

of the flat part are filed or ground to size, and the drill is then rotated with the chuck and straightened until the axes of the two coincide. It is then hardened and tempered to the right degree for a short distance at the point, and is complete except the cutting-edges. Many modifications of this style of body are in use, depending on the purposes intended and the tastes of the makers; but such frequent re-dressings are required to maintain the standard size that it probably costs more in the end than the more complete and finished forms to be described hereafter. Forged drills are sometimes made by drawing down the body to a flat somewhat narrower than the size of the drill, and extending from the shank to the point, and then twisting this flat into a spiral for its entire length.

The best modern drills are entirely machine-made, and possess many advantages, among which may be mentioned: 1st, the straightness of the body and the coincidence of its axis and point with the axis of rotation, so that, on inserting the shank into the chuck, the drill will be sure to revolve concentrically; 2d, their adaptation to a system of standard sizes; 3d, their ultimate cheapness, due to the smaller number required in proportion to the aggregate work performed, the greater care with which they are used, and the much less attention they demand to maintain them in good condition and of standard size.

Machine-made drills.—In the *Flat* or *Fly-Drill*, the body is turned, for its whole length, slightly above the required size. Flats are milled on two opposite sides, leaving the thickness tapering from the point nearly to the shank, in order to increase the strength. It is then hardened, straightened, and tempered, and the body is ground accurately to size in a lathe, or preferably in a machine which gives a very slight clearance to the edges of the body. With proper facilities for grinding the cutting-edges such a drill will last a long time, will always be straight and true, and in condition for accurate work, and will drill holes of an approximately uniform size until it is almost entirely used up by the grinding of the cutting edges.

The *Straight-fluted Drill* is one whose body is turned as before, but has two grooves instead of flats, milled on the opposite sides. These grooves are of such shape as to make each cutting-edge a straight line, while the other edge at the end of the groove is a curve. It is claimed that these drills are stronger than flat drills, that they preserve their sizes better, cut more rapidly, make straighter holes, and possess many advantages; but opinions differ as to these claims. Both kinds make good drills, particularly for use in a horizontal position.

The *Twist Drill* is very largely used on account of its being adapted for almost any requirement. In this drill the body is turned and is fluted with two *spiral grooves*, the pitch of the spiral depending on the diameter of the drill. These grooves are also of such shape as to make each cutting-edge a straight line. The portion of the cylindrical surface which is left between the grooves is rather less than the width of the groove, so that the width of each groove at the circumference is more than one-fourth of this circumference. The spiral of the grooves gives the cutting-edges a slight under-cut or lip, which is not found in either the straight-fluted or flat drills, and which in many kinds of work is advantageous. In some twist-drills the spiral has an increasing pitch, being less at the point and increasing towards the shank; but no good reason can be given for this, and experience has shown no advantage arising from it. The bodies of these drills have a slight clearance on the cylindrical surface between the grooves, which is usually filed in them before hardening but should be ground by a machine after hardening, in order to insure its being uniform.

The *Cannon Drill* is used for very long holes, par-

ticularly in wrought-iron or steel. In this drill the body is cylindrical for a distance of from three to six diameters from the point, and has but one groove and one cutting-edge. The groove has straight sides at an angle of from 90° to 120° with each other, and is made by first drilling a hole of small diameter, but of considerable length, along the axis of the cylinder, and milling the groove to this hole. The end of the cylinder is turned conical, with the included angle about 140° , and, after the groove is made, is ground or filed with a clearance from the cutting-edge in the form of a spiral of an angle of from 3° to 5° . In using this drill a hole of slight depth, but of the exact size and central with the axis of rotation, is first made, and, the drill being started in this hole, will follow a remarkably straight path, being guided entirely by the fit of its short cylindrical body. Beyond this part of the body, with its groove, the remainder is of smaller diameter, to make room for the chips or cuttings, and to permit the ready introduction of lubricants.

There are several other special forms of bodies of drills, the limited use of which renders it unnecessary to enumerate them.

The *Cutting-edges* are the most important part of all drills, and the most difficult to make in a correct and accurate manner. To understand their requirements and to comprehend the principles involved it is best to analyze the work they perform or the surfaces they produce. If we examine the bottom of a hole which has been drilled partially through a piece of metal, we shall find its surface to have the form of the frustum of a cone. If we turn a bar of steel to fit this hole (that is, with a conical end and flat circle at the point), and then mill off two opposite sides, leaving the thickness equal to the circle at the point, we shall have advanced in the direction of a correct drill. The body will be of the correct size, and the end edges, or what are eventually to be the cutting-edges, will be of equal lengths, and will make the same angle with the axis. On revolving this in the hole and forcing it down the end will not cut, but merely rub, as it conforms exactly to the shape of the bottom of the hole. To make it cut the edges must be given a proper clearance, precisely as in a turning-tool or planing-tool for cutting metal. In the latter we make the face form an angle of from 3° to 5° with the work, while the included angle of the two faces of the tool itself ranges from 45° to 90° , according to its purposes. In the present case the surface to be cut is that of a hollow cone. If we make the face of the cutter with a similar conical surface, but with clearance—that is to say, if a normal to the conical surface of the cutter makes an angle of about 5° with a normal to the conical surface of the work, the face of the cutter will be in the best possible shape for drilling iron or steel. For drilling brass a greater angle should be used. If now we give to each end-face of the drill this conical shape, with the same eccentricity, their surfaces will intersect, forming a wedge-shaped point or what is called a *chisel-point*, which is the best disposition that can be made of the thickness of the drill at the point. This chisel-point does not cut, but merely scrapes, and in large drills, which have considerable thickness, it consumes quite an amount of the force required to rotate and to feed the drill. The shape of the front face of the drill, the intersection of which with the conical face just considered forms the cutting-edge, depends on the shape of the body. In flat drills this face makes an angle of more than 90° with the surface being cut. This form is good for brass and steel, but for general purposes a less angle is desirable; and this is obtained in flat drills by forging them with a lip at each cutting-edge, while in twist-drills the spiral groove accomplishes the same result, with the advantage that successive grindings do not alter it, as the angle of the spiral continues for almost the entire length of the body of the drill.

The requirements of correct cutting-edges for drills

are such as to make their production a difficult matter, particularly if ground by hand. Unless both cutting-edges are precisely the same, not only in length, but also in the angle made with the axis and in the kind and amount of clearance, the size and form of the hole drilled will not be reliable. The difficulty of correctly grinding twist-drills by hand is greater than that of flat drills, and this at one time threatened to be a serious obstacle to the general introduction of the former. The invention of drill-grinding machines has gradually and progressively overcome the difficulties of the case, until there is now a machine which will grind the cutting-edges of drills of any kind or size, within its capacity, in a theoretically perfect manner. In this machine the drill is held by the two opposite corners of the cutting-edges and by the centre at the end of the shank; so that, after grinding one edge, the drill can be turned over and the other edge ground of the same length, angle, and clearance, regardless of any crookedness or imperfection in the body. The mechanism which holds the drill is contained in a frame which can be partially rotated about an axis at an angle with the flat face of a grinding-wheel, so that the surface ground will be that of a cone about this axis. The axis of the drill does not coincide with this axis, but bears such a relationship to it that the conical surface has the proper eccentricity. The relationship between these two axes adjusts itself automatically to suit the diameter of the drill being ground. Drills ground on a machine of this kind can be depended on to make holes of uniform size with a minimum expenditure of power and waste of drill.

Drilling Machines, in which are used the drills already considered, are of various designs, the essential features being: a strong stiff spindle to hold the drill; a means of rotating this spindle at varying speeds to suit the different sizes of drills and with sufficient force to make the drill cut the metal; a means of traversing this spindle lengthwise, during the rotation, to maintain the proper amount of cut for each revolution; a means of varying this traverse or feed to suit the character of the material being drilled; and a means of firmly holding the work in the best manner to resist the thrust and the torsional strain of the cut, and to adjust it to the desired position. The various forms of drill used in boring stone are described in the article ROCK DRILL.

DROSERACEÆ. In this natural order of plants are found the remarkable "Venus's flytrap," *Dionæa muscipula*, and the no less curious and interesting genus *Drosera*, or the "sundew." The order has been a difficult one to understand in regard to its relation to other orders of plants. Dr. Lindley in his arrangement places it in his Berberidial alliance, and suggests a relationship with grapes and fumitories; Professor Asa Gray places it between violets and rock-roses on the one side and St. John's worts on the other. The order *Droseraceæ*, as defined by Prof. Gray, consists of bog-herbs, mostly glandular-haired, with regular hypogynous flowers, pentamerous and withering; persistent calyx, corolla, and stamens, the anthers fixed by their middle and turned outward; and a one-celled pod, with twice as many styles or stigmas as there are parietal placentæ. The leaves are circinate in the bud; that is, rolled up from the apex to the base, as in ferns. There are but seven genera in the order—*Drosera*, *Aldrovanda*, *Dionæa*, *Byblis*, *Drosophyllum*, *Roridula*, and *Sonchella*—found by some representative in North and South America, Europe, Cape of Good Hope, Madagascar, New Holland, China, and the East Indies, generally in bogs and morasses or in moist, sandy places. Of these, only the three first named have found a place in popular literature, but the history of *Drosera*, and *Dionæa* particularly, has been one of great interest.

The *Dionæa*, or Venus's flytrap, is found only in North Carolina, in one comparatively limited area. It is an acaulescent plant, sending up a flower-stalk of from two to four inches high, and having comparatively small and

by no means attractive white flowers. The leaves form a rosette around the base of the flower-stalks, and are about two inches long, formed of a narrow, flattened leaf-stalk, and with a broad, two-lobed lamina at the apex. This blade is somewhat thick and fleshy, and is furnished with long tapering ciliæ or teeth. When an insect or any substance falls on this fleshy face the lobes instantly close and capture whatever may have excited them. The name "flytrap" is derived from this behavior. It is singular that the history of the discovery of this remarkable plant should be unknown. Mr. William Canby, in an able paper contributed to the *Gardener's Monthly*, August, 1868, remarks: "It was discovered about one hundred years since, probably by John Bartram, as Ellis, the English naturalist, who first brought the plant into notice and gave it its botanical name, states in his letter to Linnæus that in 1765 his friend Peter Collinson had given him a dried specimen which he had received from Bartram." But Sir James Smith (*Selections of the Correspondence of Linnæus*, vols. i. and ii.) states that "the *Dionæa* was first brought to this country in the summer of 1768 by Mr. Young, gardener to the queen; and Mr. Ellis described it, and had a drawing and a plate engraved from a plant which flowered in his chambers the following August. It was from this plate and his characters of the plant that Linnæus's description was drawn up for his *Mantissa*." Little is known of Young's travels. From a note in *The American Handbook of Ornamental Trees*, p. 117, it appears he was known in America as the "king's botanist," that he was regarded as a sort of rival to John Bartram, and owned a place contiguous to Bartram's near Philadelphia, on which he planted a few trees, some of which survived to be referred to in the work cited. William Bartram, in his *Travels*, published in 1791, says, referring to *Dionæa*: "This wonderful plant seems to be distinguished in the creation by the Author of Nature with faculties eminently superior to every other vegetable production; specimens of it were first communicated to the curious of the Old World by John Bartram, the American botanist and traveller, who contributed as much if not more than any other man towards enriching the North American botanical nomenclature, as well as its natural history." It may be Bartram sent the dried, and Young carried the living, plants. It has been a question whether the plant derives any benefit from the insects caught. Kirby and Spence (*Introduction to Entomology* (1818), vol. i. p. 295) give the experiments of "a gardener, Mr. Knight," who put raw beef on the leaves, and the plant was more luxuriant than others not so treated. This Mr. Knight was afterwards the founder of the celebrated nurseries of Knight & Perry of Chelsea, often referred to in Mr. Loudon's works. The same experiment was tried by Mr. Wm. Canby in 1868, and reported in the magazine already cited, and with like results. Mr. Darwin (*Insectivorous Plants*, ch. xiii. p. 301, Am. ed.) tried a few experiments on *Dionæa*, which "were amply sufficient to prove that it [the leaf] digests." Mr. Peter Henderson, a well-known plant-grower of New York, published an account of some experiments differing from these conclusions, but the general belief is that the plant actually eats the insects it captures.

The sundews, species of *Drosera*, are also famous in connection with the history of insectivorous plants. They are small perennial plants, sometimes tufted, at other times branching, with the flowers ranged on one side of a short scape; and with the glands, which usually cover the whole plant, but especially the leaves, exuding drops of viscid liquid. It is from this fact that the name *Drosera* is derived, the Greek *droseros* signifying dewy. Unlike the other representative of the order *Dionæa*, which is limited to so small an area, droseras are found in most of the temperate regions of the earth, and some of the individual species are common alike to Europe and America. Over one hundred species have been described, but the genus is variable, and many species will probably be reduced to mere varieties. The species

of the United States are *D. Anglica*, *D. brevifolia*, *D. capillaris*, *D. filiformis*, *D. rotundifolia*, *D. linearis*, and *D. intermedia*. Of these, *D. Anglica* and *D. rotundifolia* not only grow in the Atlantic United States, as well as in Europe, but are also found on the Pacific coast; *D. brevifolia* and *D. capillaris* are confined to the South and South-west; *D. linearis* and *D. intermedia* are Northern species; and the curious *D. filiformis* is found only along the sea-coast from Massachusetts to Florida.

The chief interest attaches to their insect-catching and insect-eating proclivities, which have been so clearly made manifest by Charles Darwin's famous work on *Insectivorous Plants*. That the viscid glands are means by which the plant captures insects and uses them for food was suspected before Charles Darwin undertook the proof of it. His grandfather, Erasmus Darwin, supposed these glands were for the purpose of preventing small insects from infesting the leaves, but he adds, "Mr. Wheatley, an eminent surgeon in Cateaton Street, London, observed these leaves to bend upward when an insect settled on them, like the leaves of the *Muscipula veneris* (Venus's flytrap), and pointing all their globules of mucus to the centre—that they completely entangled and destroyed it" (*Botanic Garden*, canto i., note to line 230). It is remarkable that, so far as it appears from Mr. Charles Darwin's elaborate work on the *Drosera*, he had wholly overlooked this observation of his grandfather made three-quarters of a century before, which his own experiments tended so remarkably to confirm. The great practical value of Mr. Darwin's researches in *Drosera* is that he shows that the viscid glands of plants have a use never before suspected—namely, that of absorbing for the use of the plant nitrogen from the atmosphere, instead of by the roots solely, as had been the belief hitherto. Darwin's observations have been confirmed by observers in America, Mrs. Mary Treat of Vineland, N. J., having shown that the long, slender-leaved species of that section coils back over an insect when caught till it looks like the uncoiled frond of a fern. Dr. Hooker has found in an Australian species an attempt to form an appendage as in *Dionaea*, from which it may be inferred that the latter is a development from a Droseraceous parent. (T. M.)

DROYSEN, JOHANN GUSTAV (1808–1884), a German historian, was born at Treptow, July 6, 1808. He graduated at Berlin, and became in 1829 a teacher in a gymnasium, in 1833 a private lecturer, and in 1835 a professor extraordinarius. In 1840 he was appointed professor of history at Kiel, where he soon took an active part on the German side in the Schleswig-Holstein controversy. He assisted in composing the *Staats und Erbrecht des Herzogthums Schleswig* (Kiel, 1846), and the *Aktenmässige Geschichte der dänischen Politik* (Hamburg, 1850). He was a representative of the provisional government of the duchies in the German Diet at Frankfort, and was afterward elected to the National Assembly. In 1851 he accepted a call as professor in the University of Jena, and devoted himself to historical studies. In 1859 he became professor in the University of Berlin, where he remained till his death, June 19, 1884.

Droysen's literary career was remarkable for its variety and productiveness. His first work, a translation of Æschylus, was published in 1832, and reached its third edition in 1868, while his translation of Aristophanes, published in 1836, reached its second edition in 1871. They are the standard German translations of these authors. Continuing his labors in ancient literature, he prepared a *History of Alexander the Great* (1833), a *History of Hellenism* (1836–43), and several essays on Greek subjects. While at Kiel, besides some political works written in company with others, he published lectures on the *History of the War for Freedom* (1846). While at Jena he published an excellent *Life of Field-marshal York of Wartenburg* (Berlin, 1851; 8th ed., 1878), which obtained great

popularity. He also published several historical investigations and essays. These were chiefly preliminary to his great work, *Geschichte der preussischen Politik* (5 vols., 1855–81). In these, from original sources previously unused, he sets forth fully the development of Prussia which has resulted in the formation of the present German Empire. Among his other writings are—*Das Testament des Grossen Kurfürsten* (Leipsic, 1866), *Grundriss der Historik* (1868; 3d ed., 1882), and *Gustav Adolf* (1870). Under his editorial care many documents relating to the history of Frederick the Great were published. In his later years he resumed his investigations of Greek history, and issued some valuable dissertations. Throughout his career he was noted for his elegant style in speaking and writing, and for his persuasive and enthusiastic eloquence.

DRUPACEÆ. This is a name suggested by De Candolle, and adopted by Lindley, for a distinct natural order of plants to include the almond, peach, cherry, and plum, as distinct from the order *Rosaceæ*, defined by other botanists. In like manner he adopts *Pomaceæ* to cover the apple, pear, quince, and a few allied genera, while for *Rosaceæ* proper he reserves such plants as the rose, blackberry, raspberry, strawberry, cinquefoil, spiræa, and similar plants. A drupe is a fruit with one or two stones with kernels, which fruit, when ripening, has the outer portion of the pericarp fleshy; and it may be readily seen how the order *Drupaceæ* suggested itself for the plants named. The peach, however, not unfrequently has flowers with four, or even five, carpels, which they often will perfect. This is seen very often in the case of the semi-double flowered varieties. Again, the almond has a comparatively dry fruit. Dr. Asa Gray does not regard the distinction as of more than sectional value. He places all these plants under one order, *Rosaceæ*, subdividing it into *Amygdalæ*, *Rosaceæ*, and *Pomaceæ*. *Drupaceæ* of some authors will therefore come under Dr. Gray's sub-order *Amygdalæ*.

It is worthy of note that while the order *Rosaceæ* in general is wholly free from noxious qualities, the Drupaceous section is in many respects poisonous. The leaves and kernels yield large quantities of hydrocyanic acid. In a case known to the writer peach-leaves were fed one evening to several rabbits, which were all found dead the next morning. Oil of bitter almonds is a deadly poison, and prussic acid is abundant in peach-kernels. It is remarkable therefore that the flesh around the stones is always very wholesome. (T. M.)

DUALISM. Dualism may be viewed as either (1) an ontological principle, or (2) a psychological assumption, or (3) a moral theory in practical philosophy.

I. *Moral Dualism* is grounded in a metaphysical principle (unconsciously assumed,) but it is of so great antiquity, and through religious sects has exerted so marked an influence on the progress of thought, that it will be convenient to consider it in the first place.

Parseism is, perhaps, the most thorough practical dualism, of ethical and religious content, of which we have any record; through Gnosticism and Manicheism it may be traced into the Middle Ages (*e. g.*, the Albigenses; see Mosheim, 10th and 11th Cent.), if it be not even recognizable in sects and opinions of our own day.

The earliest distinct form of it is found in the Avesta, ascribed to Zoroaster (6th Cent. B. C.). In the first "Fargard," Ahura-Mazda (Ormuzd) speaks to holy Zarathustra (Zoroaster), recounting his creations, and opposing them to the creations of Angro-Mainyus (Ahriman) which he made through the Devas. The first created fertile lands, useful animals, summer, fire, light, and all good things; the other made deserts and winter, cattle-destroying wasps, injurious insects and devouring beasts, evil thoughts, unbelief, sloth, poverty, worship of idols, uncleanness, murder, the burning of the dead, and burying of corpses, plagues, war, pillage, snow, and earthquakes.

Here is already intimated that there are two eternal sources of good and of evil. Ormuzd is (figuratively) pure infinite light, creator of all that is good. His symbol is fire, and fire-worship is the ritual way of approaching and adoring him. Ahriman is the opposite of all this—impure darkness, the source of all evil. The dualism, as we observe, extends through all moral and physical nature, the soul, and the universe. Souls are created by Ormuzd, but, in leaving heaven, their native place, and entering earthly bodies, the struggle with Ahriman begins. This dualism is a simple and natural explanation of the existing and perplexing antinomies of the world and of human life. (See J. S. Mill, *Essays on Religion*, I.) If a subtle metaphysics attempted to reduce this dualism to monism, by the emanation of both Ormuzd and Ahriman from an undefinable first principle, or, the decline of Ahriman from good, this must be regarded as later, and it was of no permanent influence or value.

Persian influence may be recognized in early Christian sects, and most notably among the Manichees. The Gnostics, at Alexandria, Antioch, etc., in the time of Hadrian and succeeding emperors, show the results of a crude syncretism of Greek Philosophy, Christianity, and Persian dualism. Saturninus, Basilides, Marcion, Valentinus, etc., through all their fantastic forms of "Gnosis," agree in their practical, ethical dualism of God and Matter. The first-begotten emanation from Deity had only the semblance of humanity, and could not really suffer death upon a cross. For the material world is evil, and nature itself is the evil principle standing over against spirit and what is good in complete opposition. It follows that the flesh of man is the home of this evil, and hence comes a perpetual struggle between the spirit of man which is an emanation from the realm of light, and its corrupted material tabernacle. Emancipation by death, or by a stern asceticism, alone releases the soul from its bondage. Marriage is Satan's work. Only the souls of men are immortal; the body perishes forever.

Manicheism was a more consistent dualism, linked more directly with that of Persia, and of wider and more permanent influence. We know it best through the eloquent St. Augustine, at first a disciple, and then an earnest opponent, but extracting freely from Manichean documents, most of which are otherwise not extant. See especially in his works the book of Faustus the Manichean, with his refutation of it (Op. tom. viii.), and the *Epistola Fundamenti* of Manes himself, also quoted by St. Augustine in his reply to it. Manes appears to have belonged to the race of the Magi, and to have been skilled in their learning. We find him at the court of Sapor, highly successful in making converts, until jealousy on the part of the Magi seems to have brought about his death (about 278 A. D.).

The Lord of Light (God) and the Lord of Darkness (Hyle) are both eternal, self-existent, unchangeable. But the worlds of light and darkness, it would seem, were co-eternal with these principles. (Eternal emanations? If so, the dualism extends throughout all existences, as in Parseism.) The Lord of Light is called God, but it is evident that to the Manichees He cannot be infinite, for, on one side at least, He is limited by evil, by darkness. In fact we find this inference to have been accepted by them.

From both principles proceed emanations; the children of light, dwelling happily in the world of light; the offspring of darkness (demons) in perpetual discord and war. On this earth, and in men, continually goes on the great struggle between light and darkness. For man has a soul, the life of his body, derived from the evil, and a soul of light, which is an emanation from the good.

Man, then, is composed of matter from the world of darkness, in which dwell two souls, one being this evil animal principle; the other rational, immortal. The first man was descended from the Prince of Darkness,

who had captured a portion of the light, and marriage is his device for perpetuating his sway.

As the body, together with the irrational soul, is evil and the work of the spirit of darkness, it is plain that the law of a true life requires an extirpation of all appetites. Dropping the fantastic drapery which envelops the oriental thought and language, as we have done, it is not difficult to recognize popular ideas of our own age. The "*signaculum oris*" requires an abstinence from flesh and wine, and from the blasphemy which asserts one first cause for all things, and that the animal body is created by God, and that the Son of God was actually incarnate and died. The "*signaculum manuum*" requires abstinence from killing animals, and from acts of natural affection, and from labor for wealth. Finally, the "*signaculum sinûs*" enjoins perfect celibacy. For whoever procreates a body produces a new prison for a soul of light.

All this, however, belongs to the "*elect*." Souls thus perfect will return at death to the kingdom of light; but those not purified must pass into other bodies until they shall have expiated their guilt, and been thoroughly cleansed. As for the "*auditors*," they may hope in a future life to pass into the bodies of the elect, and reach perfect bliss the sooner. (See Mosheim, *Comment.*, cent. iii., §§ 39-56, who discusses at great length and with copious quotations the fantastic oriental fables through which Manes and his followers presented their ethical principle.)

From this dualism, whether metaphysical or moral, Christian philosophy escaped by the doctrine of creation, together with that of the essentially negative character of evil. The one, absolute, infinite, and eternal Being needed no pre-existent matter (against the Peripatetic dualism of form or intelligence, and matter), from which to produce the multiplicity of finite beings. Yet they are not emanations from Him, but products of His will, wisdom, and love; that is, of Himself, who is known to us as one under those different relations. An existing dualism, therefore, of the finite and the infinite is grounded on the absolute and eternal One. The finite and sensible finds its unity with the other in that it is made after the pattern of the eternal Logos, who is, in eternity, generated by the one eternal principle. (S. Aug., *Confess.*, b. xi.)

The dualism of practical philosophy, also, was denied. There is no evil substance, for God made all things by nature good. Moral evil is a voluntary deprivation of good on the part of a creature possessed of freedom of choice, as darkness is privation of light, cold of heat, blindness of the power of sight. (S. Aug., *Confess.*, b. vii.; *De Ordine*, i. 6, 7; ii. 4.) Consequently, there is no perfectly evil being. Such would be a mere negation of existence. How or why any creatures voluntarily deprived themselves of part of the good which they had by nature, reason cannot explain; but the result is a higher good for the universe considered as a whole.

Mediæval ethics, as a part of Christian philosophy, without extending these principles, reduced them to more systematic form; ethical dualism, in opposition to Manichean influences still prevalent, being avoided in the same manner.

Good and being are in essence one; the difference is relative to us, the good adding to the concept of being the attribute of desirableness (*rationem appetibilis*; Aquinas, *Sum. Theol.*, I., v. 1). Every entity, as entity, is good (3), and is called evil in being deprived of what it has by nature. A kingdom of darkness, ruled over by an absolutely evil being, is denied; for such would directly conflict with the principle of creation, and involve a concept contradictory to that of the Divine Infinity (I. 49, 3). There is no existing being evil by nature (I. 63, 4); and when Christian ethics speak of a devil, they simply indicate subordination among the ranks of corrupted (spiritual, intellectual) creatures called demons.

A metaphysical principle underlies these prop-

ositions (monism), but they are made a part of ethics.

In the moral sphere, indeed, is found an existing dualism; viz., in the voluntary exterior or interior acts of a rational creature. But these, if evil, are so through *deficiency*, (1) in being imperfect as actions (*Prim. Sec.*, xviii. 1); (2) in that the action itself (objectum) is not that which is due and proper (conveniens, not in itself, but) relatively to the agent; (3) in wanting due circumstances or accidents; (4) in being directed to an inferior good (relatively to the agent) in place of a higher.

Against Manichean dualism, also, the animal passions in themselves have no ethical character (xxiv. 1); and virtue is a habit (voluntary) directed to these as well as to the other parts of human nature (lv.). It follows that vice is contrary to nature (lxxi. 2).

Does moral evil, then, conflict with the unity of the first principle? Or do good and evil both proceed from God? Both are denied: the first, because evil is only deficiency; the second, because, although the act, as entity, is from God, the evil deficiency is not, but from the free choice of a rational creature. Further than this mediæval thought did not proceed. Neither can it be said that, following these lines, philosophy has since made any development. Our view of ethical dualism is, therefore, arrested at this point.

The problem still remains, viz., to bring the moral dualism of the empirical sphere into harmony with the fundamental monism founded on Being, one, infinite, perfect, absolute.

II. *Ontological Dualism.*—Metaphysical dualism rests upon the fundamental antithesis found in all thought, in all knowledge, etc., that if we know or think anything, in every judgment, even the most primary, the most elementary, there must be an object—thought or notion, which is distinguished, in the very act of thinking, from the subject thinker. Without this distinction of subject and object, of ego and non-ego, thought itself becomes impossible; for identification of the two, says the dualist, is the annihilation of all distinction, and in it, of knowledge and thought. Truth and falsehood are merged in the abyss of the indistinguishable and the unconscious. Even in denying this duality, we should still be asserting it; in trying to escape from it, shadowy though it be, like our own shadow it would still pursue us.

The final demand of reason, it may be admitted, is for unity. But dualism asserts that anything beyond its principles transcends our limited faculties, is simply unprovable assumption, difficult to be expressed, impossible to be defined. Proofs are out of the question, and the seeker after truth is offered only a collection of incoherent propositions, whose contradictories may often be predicated with equal probability, since there is no evidence of either, no logical sequence, and, sometimes, little, if any, clear sense.

Monism, however, replies that distinction belongs to the logical understanding with its discursive processes of thought; but only the higher intuitions of reason can satisfy the mind. It does not deny the practical distinctions of dualism, but seeks to explain their origin, rising on reason's wings into a higher sphere.

Taking up, then, the problem of knowledge by asking what we can know of permanent and substantial being, there seem to be three possible answers to the question:

(1) We can know nothing but appearances. If anything lie beyond them, it is also beyond all human power of knowledge. But a more critical investigation leads us to observe that appearances must be *appearances to some subject*, and, consequently, that our first statement must be modified thus: "All knowing and all that is known, all intelligence and all intelligible reality indifferently consist in a relation between subject and object" (Prof. Green, *Contemporary Review*, December, 1877). It is evident, then, that nothing but relativity can be known, and we are

limited to this fundamental dualism of subject and object. Anything beyond it will be purely transcendent hypothesis, however necessary this hypothesis may be.

(2) At the opposite extreme of thought monism asserts that we may know the substantial unity of all that is. Beneath all appearances is found one permanent, changeless reality, their ground, their unity, the fixed and only true being which reveals itself in and through all change. This may be ego or matter, God or the universe, or simply an inconceivable x , of which we can predicate nothing but that it is, even if existence itself do not unduly determine it.

(3) We find what Sir William Hamilton (*Met. Lect.*, xvi.) calls "natural dualism," or "natural realism." This recognizes the duality of ego and non-ego as given directly in consciousness, "in equal counterpoise and independence."

Realists, if also dualists, assume, in opposition to pure idealism, that we know the existence of substantial beings of two wholly different natures, in and through their phenomenal appearances, viz., spirit and matter (*Reid's Inquiry*, etc., cii. § 7; *Essay*, ii., passim). But, as this theory will lead us to "psychological dualism," it may, for the present, be deferred.

But the realist may be a monist. (a) His only (formal) dualism may be that of Bishop Berkeley (*Princ. Hum. Knowledge*, §§ 1, 7), viz., of ideas and a sentient spirit, the only substance which can be known. This, consequently, is a pure monism, substance being one only. The dualism of subject and object may still seem to be preserved as the Ultima Thule of knowledge, but the former, as substantial being, comprehends the latter as a modification of it. If, as Berkeley maintained (avoiding Fichte's later egoistic monism), ideas have, necessarily, an objective source, since they are not the product of simple spontaneity of thought, we shall reach an existing dualism once more, viz., that of finite and infinite spirit, the latter a being who stands over against the subject, and is distinguished, at least negatively, from the conscious mind which knows these ideas. But, of course, this present dualism is grounded in the absolute eternal One.

(b) The monistic realist may be found at the opposite extreme which the good bishop so earnestly opposed. The one substance is matter; and spirit, so called, is but a name for an aggregate of certain phenomena of this one reality.

This materialism was a natural form of thought when the early Ionian thinker looked out upon the world, entirely ignoring himself who was contemplating it. His only inquiry, then, could be, What is the primitive form of matter which underlies all appearances? Is it water, air, fire, or many material elements with permanent distinctions for us, though essentially one? But this childish speculation must, sooner or later, yield to the deeper thought of Anaxagoras; and Nous (intelligence), as a co-existing, co-eternal principle, directing and arranging eternal matter, supplies the other element of an objective dualism which emerges from the Ionian (empirical) school. Monism must find a surer support in purely ontological speculation; and Parmenides by identifying all thought and all being paved the way for the widespread, influential, and permanent monism of the Neo-Platonic thinkers.

(c) But the concept of matter itself will need definition. Is it extended substance? Is it passive force, resistance? Is it both? Is it (local) centres of action and passive force? And the result of this criticism will be that the one substance will be called indifferently mind or matter, since its phenomena are two-sided: and when, by a sort of mental squinting, or, rather, in avoiding this, by a one-eyed view, we regard the subjective side of the phenomena, we shall speak of mind; and when we regard the objective side, we shall speak of matter (H. Spencer's *Psychology*, § 63).

Such, in various forms, are the ordinary realist

dualisms and monisms of modern philosophy, until, at least, we reach those ontological speculations which endeavor to establish the fundamental unity of all being and all knowledge.

(a) The subject itself, the conscious ego, may be regarded as the only known substance, and the object as its product evolved from it. In which case an extreme idealism will end in egoistic monism (Fichte), the absolute antipodes of that theoretic materialism, now practically expelled from the most modern schools of thought, which regards mind as a function of extended substance.

(b) It is possible to maintain a direct intuition of the absolute as the unity of subject and object (*Philosophy of Identity*). These are only the differentiated revelations of the one only substance. Nature is the objective manifestation of God; thought in us the subjective manifestation (*Pantheistic Idealism*).

(c) Finally, we may try to avoid metaphysical dualism through the philosophy of the absolute (Hegel) in which thought = being, and the process and evolution of thought is the process and evolution of being. It is certainly possible to construct a highly logical and well-connected edifice of this ontological monism, for Hegel has done so, and it has proved wonderfully fertile in practical results. But if, unfortunately, it has been evolved out of a conscious mind, and, possessing logical truth, fails to establish itself by any other criterion of concrete reality—if, in Hegel's thought, as in all conscious acts of knowledge, the self and not-self are still mutually conditioning one another, even in his elaborate evolution of the all from the one, we shall not seem to have made much progress in actual knowledge, when we contemplate this ingenious edifice of dreamland. For we are still able to assume that the ego has built this logical edifice; or that this thought itself is but a manifestation of an absolute being, the only eternal reality, becoming conscious in man. However logically the parts of our scheme are dovetailed together, in transcending consciousness, we shall not only reach a sphere of contradictions between facts of experience and our ontology, but a sphere where fixed concepts and definitions have no place. Anything may be derived from anything, because we have no criterion of the certainty of our original assumption, or of the reality and validity of what we assume. Grant to Spinoza his primal notion of substance ("Id quod in se est, et per se concipitur; hoc est id cujus conceptus non indiget conceptu alterius rei a quo formari debeat." *Ethica*, I. Def. 3) as the only objective reality, and logic will carry him to the end. But one who wishes to know the truth will first compare the definition with his experience of an actual world, or else hold it as only a provisional hypothesis, whose results are to be tested and verified. So, also, if thought is being and being is thought, all thoughts may claim equal reality; and we may deny Hegel's assumptions with warrant equal to his.

III. *Psychological Dualism*.—It is possible to pursue a strictly psychological method in philosophy, endeavoring to examine with strict accuracy, and to analyze with impartial fidelity the facts given in consciousness, and on these as a basis to erect the final and harmonious structure of our knowledge. But empirical psychology, which we thus make our starting point in philosophy, like any other empirical science, will need its assumptions, not derived from the science itself, but assumed as the explanation of primary facts in the science. It may be maintained, indeed, that the object in every thought or feeling or act of will is only a modification of the subject itself which feels, thinks, or wills; and this idealism will thus be our primary assumption. Whether it will meet the demands of our science is another question. Or again we may assume that all these states or acts of the subject, viewed as it were objectively, are phenomena of brain; in which case our psychology will ignore the consciousness, which is the first warrant for

the facts out of which we are trying to construct a science, or, finally, we may accept a dualism based on the facts, which will serve the purposes of our science, whatever may be its metaphysical warrant.

Thus considering the phenomena of consciousness, we shall see that no one can help distinguishing between those which he can attribute wholly to himself and those which he must ascribe to another source; e. g., between the phenomena of anger in his conscious experience, and what he regards as signs of it in another. Paleness or redness, whatever may be its cause, he refers to another; pain, desire to injure, etc., to self. This is direct knowledge, if anything is. To distinguish these merely as "vivid" and "faint" feelings, as H. Spencer does (*Princ. Psych.*), is to nullify the primary interest of consciousness itself.

Psychology begins with this dualism in phenomena, proceeds from it to the dualism of ego and non-ego, by analogy infers other selves; and so reaches a universal dualism of mind and matter, which will probably prove to be the "Natural Dualism" before mentioned (See Dr. Porter's *Human Intellect*, §§ 644, et seq.).

Modern psychological dualism may be said to date from Des Cartes. Defining substance as "that which so exists that it needs nothing else in order to its existence," he finds, by his "Method," two kinds of substances, mind and matter, to each of which pertains a class of things, the one intellectual, the other corporeal. Each of these is distinguished by a peculiar quality, the one by (active and spontaneous) thinking, the other by (passive and inert) extension. The relation between the two, and their mutual influence, with the problem how spirit can affect matter, as body, spirit, is left wholly unexplained. In order to serve the useful purpose of a "deus ex machina," the unscientific hypothesis of Divine assistance, like Leibnitz's "pre-established harmony" (*concursus*), is introduced.

If Kant declined, the hopeless task of presenting a pure metaphysic, ontological dualism or monism was, of course, out of the question. He starts, however, from a dualistic theory of knowledge, viz., ideal forms *à priori* furnished by the ego, and real phenomena, as materials of knowledge, *à posteriori*, which are of objective origin, indeed, while their source is unknown. And so, if we must rest contented within the limits of our faculties, as he defined them, the problem after the various monistic theories, egoistic, pantheistic, absolute, still remains unsolved: Is it possible for our knowledge to go beyond the natural dualism of consciousness? (J. J. E.)

DUANE, WILLIAM (1760-1835), an American politician and journalist, was born in 1760 near Lake Champlain, in New York. His father, a native of Ireland, had settled there a short time before, and died soon after. His mother removed to Philadelphia, and in 1771 returned to Ireland, where she gave William, her only son, a liberal education. At the age of nineteen he lost her favor by marrying a Presbyterian, as she was a Roman Catholic. Having learned the art of printing to support his family he went to London, and afterwards to Calcutta, where he established a newspaper called *The World*, but after a brief success offended the Government, was seized, and sent back to England, while his property was confiscated. His attempt to obtain redress from Parliament and the East India Company having failed, he became a parliamentary reporter and writer for the *General Advertiser*, a paper which has since attained celebrity as the *London Times*. In 1795 Duane returned to Philadelphia, and engaged in literary and journalistic work, editing for a time the *True American*. In 1798, on the death of Benjamin Franklin Bache, he became editor of the *Aurora*, and by his vigorous management made it the leading organ of the Republican party. His violent attacks on Pres. Adams's administration roused the resentment of the Federalists, and in 1799 he was tried with others for sedi-

tious riot. His offence consisted in posting on the walls of a Roman Catholic Church notices requesting the members of the congregation to meet in the churchyard and sign petitions against the alien law. These notices were removed, then replaced, and a slight disturbance followed. On his trial he was ably defended by A. J. Dallas, and acquitted. In 1800 he was charged by the United States Senate with defamatory publication, but avoided arrest by the sergeant-at-arms. To the vigor with which Duane conducted his paper Jefferson ascribed his own election to the Presidency. In 1805 Duane, with others, organized a society called the "Friends of the People," to bring about radical democratic changes in the constitution of Pennsylvania, but they were defeated by the constitutional Republicans; and from this time his paper, more abusive than ever, declined in influence. In 1811 even Jefferson, in his retirement still watchful of politics, found it necessary to rebuke Duane for his attacks on Madison's administration. In the war of 1812 Duane was made adjutant-general for the district of Pennsylvania. In 1822 he sold out his paper, and went to South America as the representative of the creditors of the new republics established there. Though he had received the thanks of the congress of Colombia for aid in their struggle for independence, he was unable to collect the debts. On his return he was appointed prothonotary of the supreme court of Pennsylvania, and retained this position till his death, which occurred at Philadelphia, Nov. 24, 1835. Besides his newspaper writings he published a *Military Dictionary* (1810), and *A Visit to Colombia in 1822-1823*.

DUANE, WILLIAM JOHN (1780-1865), an American lawyer, son of the preceding, was born at Clonmel, Ireland, May 9, 1780. When his father went to India the family returned from London, where they had been residing, to Clonmel, where the son was taught for fifteen months by the Rev. Dr. Carey. He accompanied his father to America in 1796, and assisted him as clerk. In 1805 he married Deborah Bache, a granddaughter of Benjamin Franklin, with whom he lived happily for fifty-seven years. In 1809 he became a member of the Pennsylvania legislature, and was re-elected in 1813. Having studied law with Judge Joseph Hopkinson, he was admitted to the bar in 1815, and obtained extensive practice. In 1819 he was again elected to the legislature, and was afterwards attorney of the mayor's court in Philadelphia for three years. He ardently supported Jackson for the Presidency, and in 1831 was nominated commissioner under the treaty with Denmark. In his second term Jackson appointed Duane Secretary of the Treasury, but when the latter refused to remove the government deposits from the United States Bank without authority from Congress, he dismissed him, Sept. 21, 1833. From this time Mr. Duane held no public position, but having been Stephen Girard's lawyer, and having drawn up his will, he was made one of the executors. The last time he left his house was in order to vote at the presidential election in 1864. He died at Philadelphia, Sept. 26, 1865. He published *The Law of Nations Investigated in a Popular Manner* (1809), and *Internal Improvements of the Commonwealth* (1811).

DUBOIS, a borough of Clearfield co., Pennsylvania, is 127 miles N.E. of Pittsburg, on the Alleghany Valley Railroad, and another railroad is in construction. It has 7 hotels, 1 bank, a weekly newspaper, 5 churches, and 9 schools. Its industrial works comprise large iron-works, box-factories, saw-mills, grist-mills, and coke-works. It was settled in 1873, when the Alleghany Valley Railroad was opened, and was incorporated in 1881. Population, 2718.

DUBOIS, JOHN (1764-1842), the founder of Mt. St. Mary's College, Emmittsburg, Md., the first superior of the Sisters of Charity in the United States and second bishop of New York, was born in Paris, Aug. 24, 1764. His education was completed at the College of Louis

le Grand, the Alma Mater of so many distinguished men of France. Among his teachers was the Abbé Delille, the poet, and among his fellow-students were Camille Desmoulins and Robespierre. Young Dubois was a diligent student, and passed through college with great distinction. His father had destined him for the army, but he at an early age showed a preference for the ecclesiastical state, and after completing his college course he entered the seminary of St. Magloire. So admirable were his theses, which he sustained at the Sorbonne, that while yet a student he received a benefice in the neighborhood of Paris. Ordained in 1787, his first position was that of assistant priest of St. Sulpice. When the French Revolution broke out he firmly refused to yield to its requirements, and was obliged to fly from France, which he did in the disguise of a layman. He sailed from Havre in the summer of 1791, and arrived at Norfolk, Va., in August of that year. He brought with him letters from La Fayette, and was cordially received by Bishop Carroll, who had recently been appointed the first American Catholic prelate, with his see at Baltimore. Mr. Dubois was first stationed at Norfolk, but was soon removed to Richmond. His letters were addressed to some of the leading men of Virginia, among others to James Monroe, Patrick Henry, and to the Randolphs, Lees, etc. He was received most cordially, and resided for a time in the family of Mr. Monroe, and was taught English by Patrick Henry. There being no Catholic church at that time in Richmond, he was invited to use the Capitol as his chapel. The most distinguished citizens bestowed marked attentions upon the exiled priest, who was so poor that he was obliged to teach French for a support.

At the end of a few months Bishop Carroll called him to Frederick, Md. His mission included Emmittsburg and Frederick in Maryland and Winchester and Martinsburg in Virginia, and he was for several years the only priest between Baltimore and St. Louis. He occupied a room in a house in Frederick as his chapel, and when the increase in his flock required the building of a church the people thought him mad; even Roger B. Taney, the most prominent of his congregation, thought it was a hopeless undertaking. But Mr. Dubois persevered; the church was built, paid for, and filled. He was an indefatigable worker, and having an iron constitution he often did the work of three men; he swam rivers, climbed mountains, and rode sometimes fifty miles on a sick call; cheerfully he endured the greatest hardships and inconveniences. Accustomed to the most polished and refined society, he met the rude and illiterate mountaineers on an even footing, and made them feel at home in his presence. A man of exalted dignity, he did not hesitate to share the roughest toils of his people, "following the ponderous wains over difficult and dangerous roads, cheering the woodman as his axe made the forest ring, plying the spade with hands more fit to wield the crosier, and presiding at a rural feast in honor of a successful raising of a log building with manners that would have graced the salons of his native city."

In the spring of 1806, Mr. Dubois, having selected a spot of great beauty in the midst of the wild mountain-forest, erected there the first brick church that was ever seen in that region. In 1809 he founded the secular and ecclesiastical seminary so long known as Mt. St. Mary's College—an institution that has sent forth in three quarters of a century one cardinal, four archbishops, twenty bishops, and more than two hundred priests and three thousand youths to occupy the various walks of life. Mr. Dubois was president of the college, pastor of the mountain congregation and the church at Emmittsburg, superior of St. Joseph's Academy, professor of Latin and French at the college, and occasionally of theology in the seminary, superintendent of the farm attached to the college, and general manager of the out-door business of the institution. He was also the chaplain and director of the Sisters of Charity, who

were established at Emmitsburg under his auspices; he gave Mother Seton a home when she and her companions first arrived at the mountain, and furnished them with food when their necessities were so great that they were thinking of abandoning the foundation. It has been truly said that "the two institutions, the seminary and sisterhood, like brother and sister, have grown up together."

In 1826, Mr. Dubois was appointed bishop of New York. Although over sixty years old, he left his beloved mountain-home and repaired to the new field of labor. He was consecrated in the Baltimore cathedral on the 29th of October, 1826, the ceremony being performed by Archbishop Maréchal of Baltimore. The venerable Charles Carroll of Carrollton presented him with the episcopal ring and cross. On the 9th of November he was installed at St. Peter's cathedral, New York, in the presence of four thousand persons.

The diocese of New York at that time embraced the whole State of New York and a part of New Jersey, the entire Catholic population being one hundred and fifty thousand, with eight churches and eighteen priests. It was necessary for the bishop to perform not only the duties of the episcopal office, but also those of a missionary priest. Having made the visitation of his whole diocese, he discovered the need of more churches, educational establishments, and other institutions of learning and piety. Finding it impossible to raise the necessary funds in the United States, he went to Europe in quest of assistance, which he obtained, and returned to carry on the work of building up the Church in New York. In eight years eight churches were erected, and schools and colleges established and seminaries founded. In 1837, Bishop Dubois's health began to decline, and he asked for a coadjutor bishop, naming the Rev. John Hughes as his choice. Having consecrated Bishop Hughes in the New York cathedral, January 9, 1838, he was two weeks afterwards partially paralyzed, and was prevented from taking further part in the active government of his diocese. Bishop Dubois died Dec. 20, 1842. (E. L. D.)

DU BOIS-REYMOND, EMIL, a German physiologist, was born in Berlin, Nov. 7, 1818. His father, a native of Neuchâtel, Switzerland, was at that time in Government employ in Berlin, but afterwards returned to Neuchâtel, and Emil, who had attended the French college in his native city, was educated at the college of Neuchâtel. At the age of eighteen he went to the University of Berlin to study theology, but, attracted by the lectures of Mitscherlich on chemistry, he turned to the natural sciences and became a student of medicine. In 1841 his preceptor, Prof. John Müller, suggested to him the investigation of animal electricity, and he soon published a brief account of his experiments on frogs and electric fish, as well as a Latin essay on the references to such subjects in ancient authors. After seven years of patient labor he published his celebrated work, *Untersuchungen über thierische Elektrizität* (Berlin, 1848-49). The apparatus employed in his experiments was for the most part invented by himself, and was remarkable for its delicacy. When the correctness of some of his statements was called in question by French scientists, he went to Paris in 1850 with his apparatus and proved them satisfactorily. He was then elected a member of the Royal Academy of Sciences of Berlin, and in 1867 became its secretary. Having established a high reputation as a lecturer, and being well acquainted with the English language, he was frequently invited to lecture at the London Royal Institution. In 1858 he succeeded Prof. Müller as professor of physiology in the University of Berlin, and under his superintendence one of the finest physiological laboratories in the world has since been erected in connection with the university. He has continued to labor in the field in which he early achieved success, and has published several memoirs, addresses, and larger works. They include *Ueber thierische Bewegung* (1851), *Gedäch-*

nisrede auf Johannes Müller (1860), *De fibræ muscularis reactione ut chemicis visa est acida* (1859), *Ueber das Barrenturnen und über die rationelle Gymnastik* (1862), *Beschreibung einiger Vorrichtungen und Versuchsweisen zu elektrophysiologischen Zwecken* (1863), *Voltaire in seiner Beziehung zur Naturwissenschaft* (1868), *Ueber Universitätseinrichtungen* (1869), *Ueber den deutschen Krieg* (1870), *Leibnizische Gedanken in der neuern Naturwissenschaft* (1870), *Ueber die Grenzen des Naturerkennens* (1872), *Ueber eine Akademie der deutschen Sprache* (1874). Other writings have been collected in two volumes under the title *Gesammelte Abhandlungen zur allgemeinen Muskel und Nervenphysik* (Leipsic, 1877). From 1859 to 1877 he was one of the editors of the Berlin *Archiv für Anatomie und Physiologie*, and since that time he has been sole editor of a similar periodical at Leipsic.

DUBUQUE, a city of Iowa, the county-seat of Dubuque co., and after Des Moines the largest city in that State by the census of 1880. It is situated on the W. bank of the Mississippi River, about midway between St. Paul, Minn., and St. Louis, Mo., and 200 miles W. of Chicago. Dubuque was the first place permanently occupied by white men in the State of Iowa. It derives its name from Julien Dubuque, who in 1778 obtained an Indian grant to mine for lead ore within an area now included inside the corporate limits of the city. The first permanent settlement of Dubuque dates from 1833, when about five hundred miners located at that place and commenced a search for lead ore which abounded in that portion of Iowa and has since been its chief product. It was incorporated as a town in 1837, and became a city in 1841. The original corporate limits of Dubuque included only a single square mile. The limits were extended in 1852 and again in 1854, and now include eleven square miles, being about four miles on the river front, and an average of nearly three miles wide, including much picturesque scenery, arising from the variety and combination of bluffs, ravines, level places, and beautiful groves. Many of the gardens rise in terraces to the tops of the bluffs, on the summits of which are built handsome houses. The bluffs at an average of half a mile from the main channel of the river are about 250 feet high, and are intersected by ravines, out of which pass the seven thoroughfares leading to the larger area of corporate space and to the country beyond. Dubuque is one of the most important commercial centres in the north-west, and abounds in wholesale houses, manufactories, and other business enterprises. Its lumber interests are extensive, the sales from this branch aggregating in 1883 upwards of \$2,000,000. The river and railroad commerce of Dubuque exceeds that of any other city on the Mississippi between St. Louis and St. Paul, and is annually increasing. Dubuque has now 20 organized churches and several religious societies. There are 16 houses of public worship, many of them large, elegant, and commodious. The most costly is St. Mary's (Roman Catholic) Cathedral, which was completed in 1867. Dubuque has also a custom-house and post-office, built by the United States at a cost of \$200,000, a fine three-story brick city-hall, 12 hotels, an opera-house, and several public halls, 7 large public-school buildings, the aggregate cost of which was \$200,000; a theological seminary, commercial college, institute of science and arts, United States Marine Hospital, home for the friendless, orphan asylum, Catholic convent, and several other institutions of importance. It has 6 Masonic bodies, 4 of Odd-fellowship, and a number of other benevolent orders. Its railroads are the Illinois Central, which crosses the Mississippi at Dubuque on its own bridge; the Chicago, Milwaukee, and St. Paul, whose machine-shops are located in the city; and the Dubuque and North-western, now under construction. The population of Dubuque in 1880 was 22,254, of which 16,107 were native- and 6147 foreign-born. Its present (1884) estimated population is 29,000.

DU CHAILLU, PAUL BELLONI, a French traveler, naturalized as a citizen of the United States under the name of Chaylion, was born in Paris, July 31, 1835. He is the son of a French merchant of Equatorial Africa, trading near the mouth of the river Gaboon, where he was educated in a Jesuit mission. Having become familiar in his youth with the neighboring tribes, he undertook an exploring expedition in 1855 into the interior of the country. For four years he explored the equatorial region of the African continent, and discovered, in a thickly wooded region, a chain of high mountains extending east and west, with one peak 12,000 feet in height. He was one of the first travellers to describe the gorilla, of which he killed and brought back some specimens. He also collected many previously unknown birds. He has since then made long journeys of exploration in Sweden, Lapland, and Finland. He has published the following works: *Explorations and Adventures in Equatorial Africa* (1861), with a chart of the country explored; *A Journey to Ashango Land* (1867); *Stories of the Gorilla Country* (1868); *Wild Life under the Equator* (1869); *Lost in the Jungle* (1869); *My Apingi Kingdom* (1870); *The Country of the Dwarfs* (1871); and *Western Africa* (1874); and *The Land of the Midnight Sun* (1881), descriptive of his travels in the north of Europe.

DUCHÉ, JACOB, D. D. (1738–1798), an American Episcopalian clergyman, first chaplain of Congress, was born at Philadelphia, Jan. 31, 1738. His grandfather, Anthony Duché, was a French Huguenot refugee and one of the early settlers of Philadelphia. In 1757 Jacob was the first graduate of the College of Philadelphia, since known as the University of Pennsylvania. He went to England to study theology, and after spending some time at Clare Hall, Cambridge, was ordained in 1759 by the bishop of London and licensed as assistant minister of Christ Church, Philadelphia. He was also appointed professor of oratory in the College of Philadelphia, and in 1768 was made a trustee of the institution while still holding his professorship. He was an earnest preacher, good orator, and ready versifier, though somewhat mystical, being a follower of Jacob Boehmen and William Law. He contributed to a Philadelphia newspaper a series of letters, which he afterwards collected and published in 1771 under the title of *The Letters of Tamoc Caspina*, this name being formed from the initials of his official designation as "the assistant minister of Christ Church and St. Peter's in Philadelphia in North America." These letters were reprinted in England in 1787, and also appeared in a German translation at Leipsic in 1778. During the political agitation which preceded the Revolution, Duché favored the cause of the colonists, and when, in 1774, the first continental congress met in Carpenter's Hall, Philadelphia, he was invited, on the motion of Samuel Adams, to open its session with prayer. For this purpose he came with his clerk Sept. 7, and, after reading several prayers and the thirty-fifth Psalm, prescribed for the day, he suddenly offered a fervent extemporary prayer for America and the congress. The whole service made a profound impression, and the psalm was regarded as especially appropriate to the time. In the next year Duché, having succeeded Rev. Richard Peters as rector of Christ Church, opened the second Congress with prayer, and published a sermon preached before Congress on "The American Vine," the text being Psalm lxxx. 14. As soon as the Declaration of Independence was resolved upon the vestry of Christ Church agreed to omit the petition in the liturgy for the king of Great Britain, and on July 8, 1776, Duché was appointed chaplain of Congress. This position he resigned in October, and directed that the salary which had been offered to him should be given to the families of Pennsylvania officers who had fallen in battle. When the British army under Lord Howe occupied Philadelphia in 1777, Duché resolved to remain at his post in the city, and resumed the estab-

lished form of worship, praying for the king. Naturally timid and oppressed with the gloomy aspect of American affairs, he wrote to Gen. Washington (Oct. 8, 1777) urging him to abandon the cause of independence as hopeless. The letter was immediately transmitted by Washington to Congress, and Francis Hopkinson, Duché's brother-in-law, replied to it with great spirit. In December Duché sailed to England, and when the British evacuated Philadelphia the next year his property was confiscated by the Pennsylvania assembly. In 1780 his wife joined him in England, where he had been well received, and was honored with the degree of D. D. He published two volumes of *Discourses on Various Subjects* (London, 1779), which were highly praised for their eloquent style. He served for a time as secretary and chaplain of a female orphan asylum in London, but on the conclusion of peace he desired to return to Philadelphia, where his father was still living. He wrote to Washington, disclaiming any intention of giving him pain in his unfortunate letter, and asking his influence with the authorities in Pennsylvania. Duché's friends, however, opposed his return, and he then sent for his aged father, who joined him and died in England. In 1787 Duché was present in Lambeth at the consecration of Bishop William White, who had succeeded him in his rectorate. As time passed on he became still more a mystic, and was deeply interested in the visions of Swedenborg. He relinquished all church preferment and would accept no pay for preaching. His wife and two daughters were devoted Christian women; his only son, Thomas Spence Duché, was a pupil of Benjamin West and painted the portraits of Bishops Seabury and Provoost. Thomas died in London, March 31, 1789, at the age of twenty-six. In May, 1792, Duché returned to Philadelphia and lived there in retirement until his death, Jan. 3, 1798.

DUCHOBORTZI ("Spirit-wrestlers"), a Russian mystical sect, which originated in the eighteenth century. Their doctrines are stated at some length by Kravinski. They say that in the Divine Trinity the Father is light, the Son is life, and the Holy Ghost is peace, and in the human soul, which is the image of God, there is a corresponding trinity of the memory, reason, and will. The human soul had existed and fallen before the creation of the visible world. It was then enclosed in the body, partly for punishment and partly that it might in this new state seek purification. Aid is given by the Spirit of God to those that strive for it but there is no need to seek outer help. To this part of their belief the sect owes its name. They say that Christ, the Son of God, is in the Old Testament the Heavenly Wisdom, and in the New the incarnate Spirit. He descends into each believer, being spiritually received, and lives a spiritual life as in the Gospels a natural one. His miracles are again performed in the believer's spirit.

Ilarion Pobirochin is said to have led the sect to separate from the more numerous Malakans (milk-eaters), and, representing himself as a son of God, to have chosen twelve archangels to rule the society and twelve death-angels to dispose of backsliders. As the members of the sect refused to serve in the army they were much persecuted under Catharine II. Alexander I. granted them a settlement near the sea of Azof in the early part of this century, and here they were afterwards joined by Kapustin, a discharged military officer, who introduced many changes into their doctrines and practices. He claimed to be in a special sense the representative of Christ, or, indeed, Christ returned to earth. Under his rule they practised community of goods and had flourishing manufactures. In 1839 the government declared that a secret tribunal had been discovered among them, and ordered them to be transported beyond the Caucasus. About 2500 were allowed to remain, having conformed to the Greek Church. Those among the Caucasus are said to be decreasing in numbers.

DUCKWEED, usually *Lemna*, though, according to Dr. Peyre Porcher, *Podophyllum peltatum*, the May-apple of the northern portion of the United States, is sometimes called duckweed in the southern part of the country. In many respects the duckweeds are among the best known, as well as among the most interesting, of all plants. In still and somewhat stagnant waters they thickly cover the whole surface, giving the water a velvety-green appearance, which has often excited poetic admiration. When this green mass is examined it is found to be composed of very minute fronds little more than a line wide, from the under surface of which a single root, or in some species more than one root, will appear. Occasionally the little frond makes no root at all. The flowers are very minute and rarely seen. They are almost imbedded in the green surface of the frond, but under a microscope are seen to be composed of a small membranous spathe, as if they were small arum-flowers, only, instead of a spadix in each spathe, there are but two small flowers, one of which is male and the other female. The manner of growth and fructification of these minute plants has been the theme of many learned treatises; one of the latest and most clear is by Prof. Wm. Barbeck in the *Proceedings of the Academy of Natural Sciences of Philadelphia* for 1880. It is there stated that the plant does not flower until just before it finishes its season's work at the end of summer. When the seed matures it falls into the mud beneath. In April these seeds either absorb some heat, exude gelatine, or in some other way are enabled to float to the surface, where they germinate. After the first plant is formed it continues to make new ones in successive generations by a sort of bulblet which proceeds from a cleft in the parent frond. Prof. Asa Gray does not mention that the seed sinks in the autumn, but states that "the bulblets sink to the bottom of the water, but rise and vegetate in the spring." There are about a dozen species, some of which are found in almost all parts of the world. (T. M.)

DUDLEY, BENJAMIN WINSLOW, LL.D. (1785-1870), an American surgeon, was born in Spottsylvania co., Va., April 12, 1785. He was educated at Transylvania University, and received the degree of M.D. at the University of Pennsylvania in 1806. In 1810 he went to Europe, where he studied in London under Sir Astley Cooper and other eminent surgeons, and in Paris under Larrey, Dubois, and Boyer. In 1814 he returned to America with an established reputation. He settled at Lexington, Ky., and remained there, in active practice, till 1854, being regarded as the ablest surgeon west of the Alleghanies. He was the first professor of surgery in Transylvania University, was highly distinguished as an instructor, and published a number of medical essays. He died at Lexington, Ky., Jan. 20, 1870. He was especially eminent as a lithotomist.

DUER, JOHN, LL.D. (1782-1858), an American jurist and author, was born at Albany, N. Y., Oct. 7, 1782. His father was Col. William Duer, of the American Revolutionary army, and his mother was a daughter of Gen. William Alexander, titular Lord Stirling. After two years' service in the army he studied law, and commenced practice at Goshen, N. Y. In 1820 he removed to New York, where he acquired high reputation and extensive practice. In 1821 he was a delegate to the State constitutional convention. In 1825 he was appointed one of the commissioners to revise the statute law of the State, but resigned before the work was completed. In 1849 he was elected an associate justice of the superior court of New York city, and in 1857 became the presiding justice. He died on Staten Island, Aug. 8, 1858. His principal works are—*The Law of Representations in Marine Insurance* (1845), *The Law and Practice of Marine Insurance* (1846), and *Duer's Reports of the Decisions of the Superior Court*, the sixth volume of which he left incomplete.

DUFF, ALEXANDER, D.D. (1806-1878), an eminent Scotch Presbyterian missionary, was born at Moulin, Perthshire, April 25, 1806. He studied at the University of St. Andrew's, and, being licensed to preach in 1829, was appointed the first missionary of the Church of Scotland to India. He was shipwrecked on his voyage near the Cape of Good Hope, but persevered in his mission. As an essential part of his plan of operations he established a school of a high order in Calcutta, but encountered much opposition from the East India Company and its friends, who wished not to disturb the Hindoo traditions, while he required the Bible to be read in every class sufficiently advanced, and modern science to be taught in the English language. His school was very successful and popular with the natives, and a number of the scholars became Christians. In 1834 he was obliged to relinquish his work for a time, but, returning to Scotland, made a tour through the country, which greatly stimulated missionary efforts. He returned to his work, but when the Scotch Church was divided in 1843 he and his fellow-missionaries all went with the Free Church, though they thereby lost the use of the mission property, which legally belonged to the Established Church. Starting afresh they were enabled by the liberality of the church at home to found and equip new institutions equal to the old. Their labors were also remarkably successful in overthrowing Hindoo superstitions and producing conversions to Christianity. In 1850 he returned to Scotland to arouse the Free Church to yet greater efforts on behalf of the India mission, and in the general assembly of 1851 he was elected moderator. He was also induced to visit the United States and Canada, and by his eloquence and earnestness increased the missionary zeal of the Presbyterian churches. He again went to India and continued his labors with self-sacrificing zeal until 1864, when his failing health compelled him to return to Scotland. The chief direction of the foreign missions of the Free Church was then intrusted to him, and he showed deep interest in the work in South Africa. In 1867 he was made professor of evangelistic theology in the Free Church, the endowment of which chair had been raised by his personal efforts, and during his incumbency the proceeds were devoted to special missionary objects. In all his labors he displayed a truly catholic spirit, and in his later years especially aimed to secure a union of the various branches of the Presbyterian Church of Scotland. He died in Edinburgh, Feb. 12, 1878. Among his published works are *New Era for the English Language and Literature in India* (1837); *India and India Missions* (1839); *Missions the Chief End of the Christian Church* (1854); *The Qualifications, Duties, and Trials of an Indian Missionary* (1839); *Letters on the Indian Rebellion* (1858). He was for many years editor of the *Calcutta Review*, and wrote several pamphlets on miscellaneous subjects.

DUFFERIN, FREDERICK TEMPLE BLACKWOOD, EARL OF, an English statesman, diplomatist, and author, was born at Florence, Italy, June 21, 1826. He is the only son of Price, fourth baron Dufferin, and Helen Selina, grand-daughter of the famous wit, orator, and dramatist, Richard Brinsley Sheridan. His mother was noted for her beauty and accomplishments, though perhaps not so beautiful as her sister, the duchess of Somerset, nor so highly gifted intellectually as her other sister, the Hon. Mrs. Norton. She was the author of some favorite Irish songs. After twenty-one years of widowhood she became the countess of Gifford in 1862; she died in 1867. Lord Dufferin was educated at Eton and Christ Church, Oxford, but did not take a degree. On July 21, 1841, he had succeeded to his father's title, and in 1850 he was created peer of the united kingdom by the title of Lord Clandeboyne. In 1846 he visited the south of Ireland, and on his return to England published his *Narrative of a Journey from Oxford to Skibbereen during the*

Year of the Irish Famine (1847). Under Lord John Russell's administration in 1849 he was made one of the lords-in-waiting. His speeches and writings on the Irish question early attracted much attention. Among these writings was a valuable work entitled *Irish Emigration and the Tenure of Land in Ireland*. In 1855 he was appointed special *attaché* to the Vienna mission of Lord John Russell. In 1856 he visited Iceland and Jan Mayen in his yacht, and in 1860 published his well-known *Letters from High Latitudes*. In 1860 he was appointed British commissioner to inquire into the massacres (1858-60) of Christians in Syria, and succeeded in securing a great improvement in the government of Mount Lebanon. In 1862 he married the accomplished Harriet Georgina Hamilton, known as a writer of much humor and talent. In 1864 he became lord-lieutenant and *custos rotulorum* for the county Down; was under-secretary for India, 1864-66; under-secretary for war, 1866; was chancellor of the duchy of Lancaster, 1868-72, under Mr. Gladstone; was sworn of the privy council and made paymaster-general in 1868. He was raised to the earldom in 1871. From 1872 to 1878 Lord Dufferin held the important office of governor-general of the Dominion of Canada. In 1879 (though classed as a Liberal) he was sent by Beaconsfield as ambassador to St. Petersburg, and in 1881 he was transferred to Constantinople as ambassador extraordinary.

In each successive position his diplomatic ability became more conspicuous; the greater the difficulty of the situation the more his genius shone forth. In a troublous time he guarded skilfully the interests of Great Britain in the East, and when Egypt became the scene of an exciting and important struggle, Earl Dufferin was despatched as a special commissioner to Cairo. In a few months general tranquillity was restored, and an elaborate system of administrative reform inaugurated. But the disasters in the Soudan prevented full benefit being received from Earl Dufferin's wise measures. He resumed his place at Constantinople, and remained there till October, 1884, when he was appointed viceroy of India.

DUFFIELD, GEORGE (1732-90), an American Presbyterian minister, was born in Lancaster co., Pa., Oct. 7, 1732. He graduated at Princeton College, and, after studying theology, became a tutor there for two years. In 1756 he was licensed to preach, and in 1761 he was settled as pastor of the congregations of Carlisle, Big Spring, and Monahan, Pa. He was a zealous promoter of revivals of religion, and went on missionary journeys through neglected districts. In 1770 he became pastor of the Second Presbyterian Church, Philadelphia, and he was afterwards for a short time chaplain of the Colonial Congress. He was noted for his devotion to the cause of American independence, and in 1777 he ministered to the soldiers of the Revolutionary army. He died at Philadelphia Feb. 2, 1790. His sons and grandsons have also held honorable positions as ministers of the same denomination.

DUFFY, SIR CHARLES GAVAN, an Irish journalist, lawyer, and statesman was born in Monaghan, in 1816. He is descended from an eminent native family, and is the son of a farmer. He entered the field of journalism at the age of eighteen, being first connected with a Dublin paper, and afterwards editor of the *Belfast Vindicator*, an ultra Roman Catholic paper. Returning to Dublin, he joined with Thomas Davis and John Dillon in establishing the *Nation*, the first number of which was issued Oct. 15, 1842. The Young Ireland party which it represented sprang from the movement which Daniel O'Connell had started, but aimed to secure in a different way the repeal of the union between England and Ireland. The new party, consisting of young men of ability and culture, urged a united action on the part of Protestants and Catholics, and in political matters ignored religious differences. From poetical contributions to the *Nation*, Duffy com-

plied the *Ballad Poetry of Ireland*, a volume which has had a remarkable success, having passed through nearly fifty editions. The powerful effect which the constant succession of able articles in the *Nation* had in encouraging and stimulating the people to resist the domination of the party in power led the Government to include its editors in the indictment for treason brought against O'Connell in 1844. They were tried, convicted, and sent to jail, but there were such serious faults in the indictment and in the method of trial that when appeal was taken to the House of Lords the judgment was reversed. Some time after the deliverance from jail thus brought about the more violent Catholics induced O'Connell to quarrel with the Young Ireland party, on the ground that they were seeking to subvert religion. The latter then reorganized under the name of the Irish Confederation, but soon divided into two factions, one under William Smith O'Brien, and the other under John Mitchel. The latter advocated insurrection as the only policy to secure redress of grievances, and the *United Irishman* was established to advocate that policy. The prevalence and temporary triumphs of the revolutionary spirit throughout Europe induced the Government to take prompt and stern measures to prevent any outbreak in Ireland. Within two months Mitchel was seized, tried, convicted, and transported. Then the Habeas Corpus Act was suspended, Duffy was arrested in Dublin, and the police broke into the office of the *Nation*. The chief leaders of the intended insurrection were either arrested and transported or went into voluntary exile. Duffy was tried thrice, but, being ably defended by Mr. Isaac Butt, it was found impossible to secure conviction. He then revived the *Nation* and advocated the movement for "tenant right." For this purpose the Irish Tenant League was formed, and when the Irish Liberal members of Parliament showed little inclination to favor the movement, others were elected in their place. Mr. Duffy thus became the member for New Ross in July, 1852, and with a few friends established the Independent Irish party in the House of Commons. On account, however, of dissensions caused by the ultra Catholics, Mr. Duffy resigned in 1856, and emigrated to Australia with the intention of practising law, as he had been admitted to the bar in 1846. In a short time he was drawn into a new political career and made minister of public works in the first administration under "responsible government" in Victoria. In the next year he became minister of lands. When a parliamentary commission was appointed on the subject of federation of the Australian colonies, Mr. Duffy was made chairman, and also served in the same capacity on the royal commission which followed. Both of these reported in favor of the federation of all the states of Australia and New Zealand, a project not yet accomplished. Mr. Duffy then spent two years in Europe, and on his return entered Parliament in Victoria. He became prime minister in 1871, and in the following year, being defeated on an important measure, wished to dissolve Parliament, but Viscount Canterbury, the royal governor, having refused to allow this, he resigned. Afterward, upon repeated request, he accepted the offer of knighthood, May 31, 1873. He then visited Europe, spending two years in travel. In 1876 he again became a member of the legislature of Victoria, and at the beginning of the next session he was unanimously elected Speaker of the legislative assembly. He has taken great interest in promoting art, literature, and industrial enterprises in Victoria. He has been twice married, and now resides in the south of France. He has published a volume containing the history of *Young Ireland* (1881).

DÜHRING, EUGEN KARL, a German philosopher and political economist, was born at Berlin, Jan. 12, 1833. He was educated in the gymnasium and university of that city, and studied jurisprudence from 1853 to 1856. He was then appointed referendary in the court of justice, but in consequence of a disease of

the eyes, which eventually resulted in total blindness, he resigned this office and turned to the study of philosophy and national economy. In 1864 he became a privat docent in both branches in the Berlin University. After holding this position for some years, he engaged in a serious conflict with the university authorities, whom he accused of nepotism, and in 1877 withdrew from connection with that institution. He is the foremost German disciple of Henry C. Carey, and has endeavored to connect political economy with the exact sciences. In philosophy he inclines to materialism. His economical works include *Kapital und Arbeit* (1865); *Der Werth des Lebens* (1865; 3d ed., Leipsic, 1881); *Natürliche Dialektik* (1865); *Kritische Grundlegung der Volkswirtschaftslehre* (1866); *Die Verkleinerer Careys und die Krisis der Nationalökonomie* (1867). But the most important is *Kritische Geschichte der Nationalökonomie und des Sozialismus* (3d ed., 1879). He has also published *Kursus der National und Sozialökonomie* (2d ed., 1876). Among his works on philosophical and scientific subjects are *Kritische Geschichte der Philosophie* (1869; 3d ed., Leipsic, 1878); *Kritische Geschichte der Allgemeinen Prinzipien der Mechanik* (1872; 2d ed., Leipsic, 1877); *Kursus der Philosophie als streng wissenschaftlicher Weltanschauung* (Leipsic, 1874); *Neue Grundsätze zur rationellen Physik und Chemie* (1878); *Logik und Wissenschafts theorie* (1878). Prof. Dühring has taken an active part in discussing the social questions of the day, especially the higher education of women, and the Jewish question. On these he has published *Der Weg zur höhern Berufsbildung der Frauen und die Lehrweise der Universitäten* (1877); *Die Judenfrage als Racen Sitten und Culturfrage* (1881). Finally, as a key to all his other works, he has published an autobiography under the title *Sache, Leben und Feinde* (Karlsruhe, 1882).

DUKE CENTRE. A borough of McKean co., Penna., near the New York line, and 63 miles S.S.E. of Buffalo. It has a bank, a weekly newspaper, 4 churches, saw-mill, machine-shops, and other industries connected with the petroleum business. It was settled in 1868, and when petroleum was discovered in the neighborhood in 1877 it grew rapidly. In 1880 it was incorporated. Population, 2068.

DULSE, called also **DILLISH** by the Irish, is the dried frond or leaf of a seaweed known to botanists as *Rhodymenia palmata*, which is found on both sides of the Northern Atlantic ocean, and which extends on our coast as far south as Long Island Sound; though our market supply comes mostly from the British provinces. In appearance the fronds are "purplish-red, broadly wedge-shaped, six to twelve inches long and four to eight broad, irregularly cleft, palmate or dichotomous, sometimes repeatedly lacinate, the margin often winged with leaflets" (Farlow).

It grows on other seaweeds, extending from high water-mark out into deep water. Only the non-sexual fruit appears to be known. As a food dulse is eaten from choice mostly by the sailors and the Irish; though it is eaten thankfully enough by all in the marine districts where it is found, during times of scarcity. The flavor is decidedly of the sea; so much so as to make it unpleasant to the palate unaccustomed to its use; but for the Irish peasant it is the chief and often only relish to his potatoes. Ordinarily it is taken raw, sometimes fried, but it is said that even the genius of Soyer failed during famine years to render it popular in Ireland as a soup. The cooking probably rendered the unpleasant sea-taste more decided. The dulse most prized is that which grows among the mussels near low-water mark and hence is known as shell dillish.

Besides the above plant, *Iridæa edulis* is known as dulse in Scotland and is eaten raw there. It does not grow on our coast. Neither indeed does the so-called pepper dulse, which is the *Laurencia pinnatifida* of botanists.

(J. T. R.)

DULUTH, a city of Minnesota, county-seat of St. Louis co., situated near the W. end of Lake Superior, 156 miles N. N. E. of St. Paul, lat. 46° 48' N., long. 92° 6' W. It is one of the eastern termini of the Northern Pacific Railroad. It stands on a hill-side picturesquely overlooking Duluth Bay, a fine natural harbor, enclosed by Minnesota Point; and on the outside of this point is the outer harbor, protected by a breakwater. The access of vessels to the inner port has been rendered more feasible by costly improvements. The Northern Pacific and other railways have also terminal facilities at Superior, Wis., a town on the S. side of Superior Bay, an extension of Duluth Bay, seven miles S. E. of Duluth; and the St. Paul and Duluth Railway connects with the Northern Pacific at a point twenty-four miles W. of Duluth. The town is named for Jean du Luth, a French gentleman who in 1679 travelled in this region. In 1860 it was chosen as the lake terminus of the Northern Pacific Railroad, there being already a few inhabitants on and near its site. Since that time the fortunes of the town have risen, fallen, and again risen with those of the Northern Pacific Railway. It is a port of entry, and has a custom-house, good docks and wharves, 12 churches, grain-elevators, a national bank, a savings bank, a high-school, railway-shops, machine-shops, foundries, and 2 weekly newspapers, an emigrant's home, a United States land-office, a library association, a theatre, an opera-house, and a large trade by lake, wheat and lumber being shipped extensively. Population, 3483.

DUMAS, ALEXANDRE, fils, a French dramatist, was born in Paris, July 26, 1824. He was the illegitimate son of Alexandre Dumas, the novelist and dramatist, who died in 1870. In his boyhood the elder Dumas recognized his son and gave him the legal right to bear his father's name. The younger Dumas was brought up partly by his mother and partly at a school kept by Goubaux, one of the authors of *Thirty Years; or, A Gambler's Life*, and of other plays less known to the American public. When he left school he mingled at once in the very mixed society which surrounded his prodigal father. At seventeen he wrote a volume of poems published in 1847 as *Péchés de jeunesse*; they are of very slight importance. He went with his father to Spain and Africa, and on his return he began to write novels in imitation of his father's; they are of almost as little importance as the early poems. He soon saw that he had not the inexhaustible imagination which made his father's success possible, and he gave up fantasy for fact, and thereafter relied on his observation to furnish forth his fictions. He studied the questionable life around him, and in 1848 published a novel called the *Dame aux Camélias*, partly founded on personal experience. This story succeeded at once, and it was followed by others. The popularity of the *Dame aux Camélias* as a novel suggested its dramatization, and by a very few days of hard labor the author turned it into a play, only to find its performance forbidden by the censors. When the duke of Morny came into power under Napoleon III. in 1852, it was acted at the Vaudeville Theatre, and was instantly successful; after thirty years it still holds its popularity and is frequently seen on the French stage. It has been used as the basis of the libretto of Verdi's *Traviata*, and as a deodorized English adaptation was prepared by Miss Jean Davenport (afterwards the wife of Gen. Lander) under the name of *Camille*, and in a modification of this adapted adaptation the late Matilda Heron made her first great hit; since which time the play has been a favorite with American actresses. The *Dame aux Camélias* is not a wholesome piece, and its artistic quality is not of the highest order, but it is vigorous and affecting. It was followed on the stage by another hasty dramatization of a novel, *Diane de Lys*, acted at the Gymnase Theatre in 1853. Like the earlier play, *Diane de Lys* was in part at least the result of a personal experience, fortunately not so fatal in life as that which befell the hero on the stage. It was not as strong a play as the

Dame aux Camélias, and its attraction has not endured. Yet by these two plays M. Dumas had made money enough to pay off the debts he had contracted in the reckless life of his youth, and so was enabled to take time and pains with his third piece, the *Demi-Monde*, acted two years later, in 1855. This is a comedy of manners in five acts, and it is not only the best play of its author, but one of the best French comedies of this century. It depicted a stratum of society which M. Dumas was the first to discover. By the phrase *demi-monde* he meant not the class of courtesans (to whom it is now generally applied), but the class of exiles from society. The half-world he discovered is peopled not by those who have always been outcasts and sinners, but by those who have fallen from grace. It is for the most part an association of repudiated wives, who have admitted to fellowship a few brevet widows and wives by courtesy only. There is a distinct boundary-line between these women once in society, but now fallen from it while still keeping up a semblance of its usages,—there is a sharp line between these and the venal courtesans who now call themselves members of the *demi-monde*. The play in which these people were first set on the stage is not altogether pleasing, but it is powerful and brilliant beyond all question. It is now in the repertory of the Comédie Française. In 1857, M. Dumas brought out the *Question d'Argent*, in 1858 the *Fils Naturel*, and in 1859 the *Père Prodigue*, three serious comedies in which he studied social questions. There is no denying the distinct want of taste shown in his choice of such titles as the *Natural Son* and the *Prodigal Father*, but M. Dumas is not greatly gifted with good taste; and no further evidence of this deficiency may be asked than his next play, the *Ami des Femmes*, acted in 1864, the subject of which is singularly indelicate. In 1868 he brought out the *Idées de Madame Aubray*, an exceedingly clever plea for the rehabilitation of the woman who has fallen once and through ignorance. In 1871 he produced the *Visite de Noces*, a psychologic and physiologic study in one act—a repulsive play, and yet probably not untrue to nature. In the same year he put on the stage the *Princesse Georges*, a comedy-drama in three acts. In these later plays it could be seen that the dramatist was slowly yielding place to the theorist, and that the comedy was becoming a sermon. In the next play, the *Femme de Claude*, this tendency was even more marked, and though greatly talked about the drama failed to attract. In the same year, however, he brought out *Monsieur Alphonse*, one of his simplest and strongest plays, acted in America with much success. In 1878 his *Etrangère* was performed at the Théâtre Français for many nights, and in 1881 his *Princesse de Bagdad* was acted there for very few nights; neither play is on the line of progress. Besides these pieces signed with M. Dumas's name he has had a hand in the writing of half a dozen others. Among them were the *Supplice d'une Femme* (1865), with Émile de Girardin; *Héloïse Parquet* (1866), with M. Armand Durantin; and the *Danicheff* (1876), with M. Corvin. He has revised with success his father's *Jeunesse de Louis XIV.* (1874), and without success his father's *Joseph Balsamo* (1878). He tried one play anonymously; this was the *Filleul de Pompignac*. He began to collect his plays into a *Théâtre Complet* in 1868, prefixing to each piece a preface in which he discussed either the drama itself or the theories it suggested: six volumes of this collected edition have now appeared. Having begun to write critically and didactically in these prefaces, M. Dumas developed a great fondness for preaching. In 1872 he published *L'Homme-Femme*, a discussion of the woman question (translated into English, with an introduction, by Mr. George Vandenhoff); in 1880 a plea for *Divorce*; in 1881 *Les Femmes qui tuent et les femmes qui votent*, another woman's rights argument; and in 1882 a letter to M. Naquet, in which he declared his hostility to the Republic. He has also written a number of prefaces and essays and letters of one kind or another, all of which he is

gathering into volumes with the apt title of *Entr'Actes*. Three volumes of these have already appeared. Mention should also be made of *L'Affaire Clémenceau*, a novel, in part autobiographic, published in 1867; it is a study of modern Parisian life, or rather a dissection of a French career, identical in manner and method with his later plays. When the chair of M. Joseph Lebrun became vacant in the French Academy, M. Dumas presented himself, and was elected Jan. 30, 1874, by twenty-two votes against eleven, Victor Hugo being present for the first time in years to vote for the son of his old adversary. M. Dumas took his seat in February, 1875, and in his speech declared that he felt that the honor of an election among the Forty Immortals had been conferred on him only because his father was no longer alive to receive it. M. d'Haussonville in his reply courteously but keenly criticised the works and theories of M. Dumas.

And these works and theories are of a truth strange. M. Dumas is a bundle of contradictions. Brought up amid vice, he has discovered the value of virtue, and he proclaims it abroad from the housetop in the language he heard in his unregenerate days. Uneducated, he sees the future of science and fills his prefaces with a parade of scientific erudition. As a moralist he is queer, as a theorist he is cranky, and as a sociologist he is wholly untrustworthy and erratic. But as a dramatist, as a mere maker of plays, he is marvellous. His skill in handling a delicate question on the stage, his tact in anticipating the objections to an unpalatable solution of a dramatic difficulty, his faculty of developing a situation of tense emotion in the briefest dialogue and with the utmost effect, his gift of epigram, and his power of being even eloquent for a moment if need be,—in all these things he is incomparable, in all these he has no rival on the French stage. His influence on the drama of the day has been very marked. After the production of Hugo's *Hernani* in 1830 the Romantics had run riot on the French stage for five or ten years, until they began rapidly to go to seed. The production of the *Dame aux Camélias* in 1852 changed the whole front of the contemporary drama: it revealed to the many competent and clever dramatists of the day the possibilities of modern life, and it suggested the best method of treating the problems of modern life in the theatre. M. Emile Augier, for instance, was writing pretty and poetic plays before 1852, but it was after 1852 that he wrote the fine series of social satires, scorching and severe, which have made him the first dramatist of our day. And on others, on the late Théodore Barrière, on M. Victorien Sardou, on MM. Meilhac and Halévy, his influence has not been less marked. M. Dumas has been called immoral, but unjustly. To the innocent and ignorant his works are no doubt demoralizing. To the audience for which he writes, to Parisian playgoers, he appears as a stern moralist. He is sincere and earnest in his exhortations to quit evil and cleave to the good; and if his views as to evil and good in morals may at times seem confused to an English or American spectator, it must be remembered that M. Dumas is a recent convert to morality—that he only began to go to Sunday-school when he was thirty, and that some of his early and earthly notions cling to him still.

(B. M.)

DUMAS, JEAN BAPTISTE ANDRÉ (1800–1884), the most prominent French chemist during the last half century, was born at Alais in the department of the Gard, July 14, 1800. His father came of an ancient family, which at the revocation of the Edict of Nantes had separated into two branches, of which the Protestant branch emigrated, while the Catholic, to which his immediate ancestors belonged, remained in France. The father was clerk to the municipality of Alais. The son pursued the study of the classics as the foundation of his education, the numerous monuments of the Roman period in the vicinity of Alais contributing to the interest of such studies. At the same time the numerous industrial establishments in the neighbor-

hood, such as glass-works, coal and antimony mines, tile- and earthenware-manufactories, became familiar to him in his early youth. He was preparing for an examination for entrance into the navy when the political events of 1814-15 obliged the family to select another career for him. He was therefore entered as an apprentice to an apothecary in Alais, but in 1816 left for Geneva, where he hoped for a wider field for his activities. He obtained the superintendency of a large laboratory belonging to the Le Royer pharmacy, and at the same time was enabled to hear lectures on botany by De Candolle, on physics by Pictet, and on chemistry by Gaspard De la Rive. His attention was first turned to chemical study and research by the appearance of Biot's work on physics and the papers of Berzelius, Davy, Gay Lussac, and Thenard. His first individual research was upon the presence of water of crystallization in salts. When he showed his results to De la Rive he was told that Berzelius had anticipated him. He next worked out a method for determining experimentally the density of simple and compound bodies. De la Rive did not think much of it. Dumas said "the first time my experiments were good but they were not new; this time they are new but they do not appear to be good. I shall have to try again." Nevertheless, the method of vapor-density determination, whereby the varying weight of a constant volume of vapor is ascertained, still in current use under the name of Dumas' method, is practically the same with that originated by him at this early age. He next carried out several researches in physiological chemistry with Prevost, which were published and became widely known. An event which had a deciding influence upon his life was his meeting at this date with Alexander von Humboldt, the great naturalist and traveller. Humboldt's account of the scientific life in Paris and of the great advantages of constant intercourse and association with the leaders in chemical research led Dumas to give up his idea of settling in Geneva and brought him to Paris in 1821. Here he was kindly received by Thenard, Ampère, Gay Lussac, and others. His marriage in 1826 with the daughter of Alexander Brogniart, the geologist, also aided in his advancement in scientific circles. Through the efforts of Ampère, the great physicist, he was appointed to two lectureships in succession, and soon became known as one of the most original and active workers in the domain of chemistry. His name will always be linked in the history of chemistry with what is known as the substitution theory, which he opposed to Berzelius' dualistic hypothesis. The views then accepted had been founded upon the relatively simple study of mineral compounds. All compounds were supposed to be formed of two proximate elements, which might be either simple bodies or combinations of a low order. The illustrious Swedish chemist, Berzelius, exercised at this time an uncontested authority, and to doubt his explanations of chemical phenomena implied great temerity. Nevertheless Dumas found that chlorine "possessed the singular power of combining with the hydrogen of organic bodies and at the same time of replacing it, atom for atom." This was the first announcement of a law, which is now proved by thousands of analogous facts, and which is the keystone of the theory of substitution. While Laurent and Gerhardt ably assisted in the elaboration of the new doctrine, Berzelius opposed it from the first with the weight of his ability and widespread influence. It may be of interest to note, on the authority of Prof. A. W. Hofmann, what a trivial circumstance led Dumas into his study of these substitution phenomena. At a soiree of Charles X., the wax candles in burning not only gave a smoky flame but developed fumes of hydrochloric acid gas. Brogniart, as the director of the government porcelain manufactory at Sevres, was asked to investigate the matter and he intrusted it to his son-in-law, Dumas, who found that the wax of the candles had been bleached with chlorine, and that some

of this element had combined chemically with the wax and was only liberated in the burning of the wax as hydrochloric acid. Dumas' interpretation of his results in the study of new organic compounds not only led him into antagonism with Berzelius, but also with Liebig, who occupied the foremost position in Germany as authority in the domain of organic chemistry. Liebig's theory of the part which compound radicals or groups of elements played in organic chemistry was only a modification of the dualistic theory of Berzelius, and could not be reconciled with Dumas' substitution results, so the two great leaders carried on for years a controversy, which was sharp, indeed almost acrimonious. Dumas gradually built up from his first views the great theory of chemical types or family groups as found among organic compounds. This theory, which allows of the widest substitution change and yet preserves a unity and class resemblance among the groups, somewhat modified in its modes of application, is still largely used in the classification of organic compounds. In the end Dumas may be said to have triumphed. Long after both Liebig and he had outlived the heat and ardor of their youthful contests, this was virtually acknowledged by Liebig, when at the Paris Exposition of 1867, at a dinner given by French chemists to their foreign brethren, he was asked by Dumas, who was presiding, why he had given so large a portion of his later years to agricultural chemistry instead of pure chemistry. Liebig replied that "since the theory of substitution was accepted, masters were no longer necessary, that workmen could build the edifice as well."

In later years Dumas withdrew from active research and teaching and occupied himself with his duties at the academy of sciences and in serving on numerous scientific commissions. In the early part of the past winter he went to Cannes in the south of France by the advice of his physician, and there he died on the 11th of April of this year. Dumas had received the highest scientific honors both of his own and of foreign countries. Entering the academy of sciences in his thirty-second year, on the death of Flourens, he was elected one of its permanent secretaries. On the decease of Guizot, he succeeded to his vacant chair at the Académie Française. He received from the Emperor Napoleon, in 1863, the grand cross of the Legion of Honor, and under the present republic became a life-senator. From England he received the Copley medal of the Royal Society in 1843, and the Faraday medal of the Chemical Society in 1869. (S. P. S.)

DÜMICHEN, JOHANNES, a German Egyptologist, was born Oct. 15, 1833, at Weissholz, near Grossglogau, Silesia, where his father was pastor of the church. He was educated at home, and afterwards in the gymnasium at Glogau. By his father's wish he studied theology and philology at the universities of Berlin and Breslau from 1852 to 1855, and then resolved to devote himself to the study of Egyptian antiquities. For this purpose he attended the University of Berlin from 1859 to 1862, where he enjoyed the instruction of Lepsius and Brugsch. Thus prepared for his life-work, he set out in Oct., 1862, on his first Egyptian journey, intending to spend six months in the examination of monuments in the valley of the Nile, but when in the country extended the time to three years, during which he visited not only Egypt proper and the adjoining desert, but also Lower and Upper Nubia, and even the plains of Soudan. The city El Efun in the province of Sennaar, on the banks of the Bahr-el-Azrak, beyond Soba, where are the ruins of the capital of the ancient Christian kingdom of Aloa, was the southern limit of his travels. Dümichen and his master, Lepsius, are the only Egyptologists of modern times who have travelled throughout the wide dominions of the ancient kingdom of Ethiopia. From this journey, Dümichen returned in the summer of 1865 with a valuable collection of hieroglyphic inscriptions, drawings of monuments, and notes. In 1868 the photographic corps of the Prussian expedition sent to Aden to ob-

serve the solar eclipse was ordered on its return in August to visit Egypt and take views of the temples and tombs, under the direction of Herr Dümichen. Although the work was thus performed in a season generally unfavorable in Egypt for such purposes, the results were of great value. In 1869, at the request of the khedive, Ismail Pacha, Dümichen attended the ceremonies at the opening of the Suez Canal, and sailed up the Nile as far as Nubia. On the re-establishment of the University of Strassburg in 1872, Dümichen was made professor extraordinarius of Egyptology, and in 1879 he became, by imperial order, a professor in the philosophical faculty of that university. In August, 1875, he made his fifth visit to Egypt, returning in the following April. Four months were spent in removing the rubbish in which the great temple of Dendera had been buried to the pediment, and thus a large number of inscriptions was uncovered; two months more were spent in work among the tombs at Thebes. Since that time Dümichen has remained in Germany, actively engaged in the duties of his professorship and in authorship. He has published the results of his investigations not only in the *Zeitschrift für Ägyptische Sprache* and other journals, but in a long series of valuable works. Among these are *Bauwerkunde des Tempelanlagen von Dendera* (Leipsic, 1865); *Geographische Inschriften Altägypter Denkmäler* (2 vols. of plates, with another of explanation (Leipsic, 1865); *Altägypt. Kalenderinschr.* (Leipsic, 1866); *Historische Inschriften* (Leipsic, 1869); *Altägypt. Tempelinschr. Edfu und Dendera* (Leipsic, 2 vols., 1867); *Die Flotte einer Ägypt. Königin aus dem 17 Jahr. v. Ch.* (Leipsic, 1868); *Der Felsentempel von Abu-Simbel* (Berlin, 1869); *Resultate der archäolog-photographischen Expedition* (2 vols., Leipsic, 1870, and Berlin, 1871). The first volume of this work contains the hieroglyphic plates, with preface and explanation by the author, besides an essay on *The Ancient Egyptian Naval Affairs*, by Graser, and another on *The Pictures of Animals*, by R. Hartmann. The second volume contains 57 photographs with descriptions. Later works by Dümichen are, *Ueber der Tempel und Gräber im alten Ägypten* (Leipsic, 1872); *Ueber die Regierungszeit einer Ägypt. Königs* (Leipsic, 1874); *Baugeschichte der Dendera tempels* (Strassburg, 1877); *Die Oasen des libyschen Wüste* (Strassburg, 1877); *Der grosse Thebanische Fest Kalender* (Leipsic, 1881); *Geschichte des alten Ägyptens* (Berlin, 1880).

DUMMER, JEREMIAH (1680–1739), an American scholar and author, was born at Boston in 1680. He graduated at Harvard College in 1699, studied theology, and began to preach, but was not popular. He spent some years at the University of Utrecht, and obtained there the doctor's degree. After his return to America he was sent to England as agent of the colony of Massachusetts, and remained there from 1710 to 1721. When the charters of the New England colonies were threatened in 1721 he wrote an eloquent defence of them, which was published in London (1728). He also published some Latin philosophical and theological treatises at Utrecht. He procured for the library of Yale College a donation of 800 volumes. He died at Plaiston, England, May 19, 1739.

DUNCAN, JOHN, LL. D. (1796–1870), a Scotch Presbyterian clergyman and Orientalist, was born at Gilcomston, near Aberdeen, in 1796. He graduated at the University of Aberdeen in 1814, and after studying theology at Edinburgh was licensed to preach in 1825. In the next year he came under the influence of Cesar Malan, and afterwards, though subject to periods of depression and even skepticism, was truly pious. In 1831 he became pastor of a church in Glasgow, but in 1841 he went to Pesth, Hungary, as a missionary to the Jews. He returned to Scotland in 1843, and was made professor of Hebrew and Oriental languages in New College, Edinburgh, which position he held till his death, Feb. 26, 1870. He was not only an eminently learned man, but was a profound thinker

on the most abstruse problems of philosophy and theology, yet was noted for his simple piety. Many of his sayings have been collected in W. Knight's *Colloquia Peripatetica by the late John Duncan* (Edin., 1870), in his *Life*, by David Brown (1872), in *Recollections of Dr. John Duncan*, by Rev. A. Moody Stuart, and in another volume, *John Duncan in the Pulpit and at the Communion Table* (Edin., 1874).

DUNCKER, MAXIMILIAN WOLFGANG THEODOR, a German historian, was born at Berlin, Oct. 15, 1811. He is a son of the celebrated book publisher, Karl Duncker, and studied at Bonn and Berlin from 1830 to 1834. By his essay on *Origines Germanicæ* (1840) he became a candidate for a professorship and in 1842 he was appointed to a position in the University at Halle. Here he engaged in literary work also, editing a journal and publishing an essay on *The Crisis of the Reformation* (1846). In 1848 he was elected a delegate to the National Parliament and acted with the party which favored the union of Germany under the leadership of Prussia. His pamphlet on the history of that parliament (1849) set forth the principles of his party; and these were farther illustrated in his biographical sketch of Heinrich von Gagern (1850). He took part in the revision of the constitution of 1848, and in the German diet at Erfurt in 1850 acted with the national constitutional party. In a pamphlet called *Four Months of Foreign Politics* he criticised severely the policy of the Prussian minister Manteuffel, charging on him the loss of Olmütz. Withdrawing from state affairs he devoted himself to his great historical work, *Geschichte des Alterthums*, which appeared in four volumes from 1852 to 1857, and has in its fifth edition been enlarged to seven volumes. In 1857 he accepted a professorship in Tübingen University, but two years later was called to Berlin as a member of the council of Prince von Hohenzollern. In 1861 he was made a councillor of the Crown Prince, and from 1867 to 1874 had charge of the Prussian State-archives. In this position he labored diligently, establishing depositories for the archives in various cities and erecting new buildings for the purpose in Berlin, Düsseldorf, and Breslau. In 1874 he retired from office and he has since devoted himself to historical labors, the chief result of which is *Aus der Zeit Friedrichs II. und Friedrich Wilhelms III.*, though he has also treated of the times of Friedrich Wilhelm II., the ministry of Count Haugwitz and of Prince Hardenberg. As a member of the Berlin Academy since 1873 he has contributed to its proceedings several discussions of difficult questions in Greek history.

DUNGLISON, ROBLEY (1798–1869), an American physician and author, was born at Keswick, Cumberland, England, Jan. 4, 1798. His mother, a woman of remarkable intellectual power, bestowed unusual care on his education. At the age of seventeen he commenced the study of medicine, and afterwards pursued it in London, Edinburgh, and in Paris. He was admitted to practice by the Royal College of Surgeons in 1819, and established himself in London, at the same time lecturing on obstetrics and contributing to medical journals. He became editor of the *London Medical Repository* and the *Medical Intelligencer*. Having visited Germany to complete his medical education, he graduated at Erlangen in 1823. His reputation attracted the attention of F. W. Walker, who had been sent to England by ex-Pres. Jefferson to select professors for the newly founded University of Virginia. Dr. Dunglison accepted the professorship in that institution, and removed to Virginia in October of that year. During the nine years he spent there he delivered lectures on every branch of medical science and published a large number of treatises. He became the professional adviser of Jefferson and Madison, and his house at Charlottesville, Va., was the centre of a refined circle. In 1833 he accepted the professorship of therapeutics and materia medica in the University of Maryland, and removed to Balti-

more. After spending three years there he removed to Philadelphia to become professor of the institutes of medicine in the Jefferson Medical College. Owing to his talents, reputation, and personal influence this college had an unprecedented career of success, his class in 1860 numbering 630 students. Dr. Dunglison remained in this position until June, 1868, when he resigned on account of ill-health. He died at Philadelphia, April 1, 1869. He received in 1825, from Yale College, the honorary degree of M.D., and in 1852, from Jefferson College, that of LL.D. He was also the recipient of numerous testimonials and marks of respect from medical, scientific, and literary institutions in Europe and America. Dr. Dunglison was a member of many literary societies and vice-president of the American Philosophical Society. He was also vice-president of the Philadelphia Institution for the Blind, and besides devoting much time and attention to that class of unfortunates published a large dictionary specially prepared for their use. He was noted for his liberal spirit and freedom from prejudice. He was a frequent contributor to the leading medical, surgical, and scientific journals of the United States and Great Britain. His most important work is his *Dictionary of Medical Science and Literature*, which was first issued in 1833, and attained a success almost unparalleled in that department of literature. Among his other publications are: *Diseases of the Stomach and Bowels of Children* (London, 1824), *The Principles of Human Physiology* (1832), *General Therapeutics and Materia Medica* (1836), *The Medical Student* (1837), *New Remedies* (1839), *Human Health* (1844). He also edited new editions of *Magendie's Formulary*, *The Cyclopædia of Practical Medicine*, *Roget's Physiology*, *Traill's Medical Jurisprudence*, and other works. In 1870 his son, Dr. R. J. Dunglison, published a *Memoir of Dr. Robley Dunglison*, and in 1872 he edited the *History of Medicine*, left incomplete by his father.

DUNHAM, CARROLL (1828-1877), an American homœopathic physician, was born in New York city, Oct. 29, 1828. He graduated in 1847 at Columbia College, and received the degree of M.D. from the College of Physicians and Surgeons of New York in 1850. Having been cured of a dangerous illness by a homœopathic physician, he began to investigate the "new system." He next went abroad seeking instruction from the most eminent teachers in Dublin, Paris, Berlin, and Vienna. Under Bornninghausen at Münster he studied the "new method" of prescribing drugs. On his return to America in 1852 he began the practice of homœopathy in Brooklyn. In 1858 a severe attack of illness caused him to remove to Newburg, N. Y., where his patients followed him, and he was soon again professionally busy. In 1864 he removed to Irvington-on-the-Hudson, making his home there until his death. He was professor of materia medica in the New York Homœopathic Medical College for several years, and was dean of the faculty. During his last visit to Europe in 1874 he conceived the idea of a world's convention of homœopathy, and secured the co-operation of foreign physicians. In 1875 the American Institute of Homœopathy elected him to preside at this convention in Philadelphia in 1876. He also edited its *Transactions*, but overwork in behalf of the convention exhausted his strength. He died Feb. 18, 1877. Dr. Dunham contributed frequently to American and foreign journals, and since his death his lectures have been published under the titles *Lectures on Materia Medica* and *Homœopathy the Science of Therapeutics*.

DUNKERS. The rise of this denomination, which has been variously known as "Dunkards," "Dunkers," "Tunkers" (derived from the German *Tunken*, to dip), "Tumblers," "German Baptists," and "Brethren," was in Schwarzenau, on the Edder, in Witgenstein, Germany, in 1708, in a meeting of a

number of Pietists to whom the teaching and practices of the Lutheran and Reformed Churches had become unsatisfactory. Seven of them met privately to read and study the Bible, and resolved to be guided by the light which they received from it. Believing that it taught baptism by immersion, government by the congregation, and separation from the world, they made these principles the basis of their system. Their minister, Alexander Mack, having first been baptized by a member of the company, immersed in turn the brethren and sisters in the Edder. This congregation increased and soon gave rise to others. Severe persecutions scattered the members widely, and in 1719 the original congregation, which had migrated to Friesland, sailed for America, whither the others came ten years later. Four years after the arrival of the first party at Germantown, Pa., the Brethren held their first love-feast. There had been differences among them which had prevented them from instituting a church with authority to administer the sacraments. These differences being settled, new converts were baptized and received into fellowship, and a love-feast was held. It is supposed that a church council, according to the usual course, was held the day before the love-feast; and that during the first thirty or forty years this plan was adhered to. In that period the congregations were all within the territory lying between the Delaware and the Schuylkill. Gradually this territory extended to the Susquehanna and beyond, and into New Jersey and Maryland. As the churches multiplied and became farther apart, it was found impracticable to have them all represented at every ordinary love-feast, so a "big meeting" or council was appointed to be held annually. The first of these councils was held between 1750 and 1760. The Annual Meeting, the most important of the gatherings of the Brethren, assembles on the anniversary of Pentecost. At first it was held alternately east and west of the Susquehanna; next the Allegheny mountains were regarded as the dividing line, and finally the Ohio River was chosen. One year the council meets somewhere east of the Ohio; the next year west of it. This indicates the westward march of the denomination.

They made no effort to number their churches or members until 1877, when a census was taken which showed that there were between 300 and 400 churches and about 60,000 members. Many of the churches are small, but each has two or more ministers, the average being about four, according to the statistics. A fourth or more of the total membership is in Pennsylvania. About 8000 are in Indiana, 6000 in Illinois, and upwards of 7000 in Virginia and West Virginia. The earlier converts were Germans, and all the congregations used the German language. Though that tongue is still extensively employed, the English congregations are multiplying. The list of over 1500 ministers is composed chiefly of names of German origin. It is said that some of the earlier immigrants among the Brethren were men of education; but the denomination has given little or no attention to the training of their children beyond the rudimentary branches. It is only within a few years that they have successfully established a high school. Thirty years ago the annual council in reply to the question whether Brethren might patronize high schools, advised them to be "very cautious and not mind high things, but condescend to men of low estate." They generally send their children to public schools, but do not think college life is wholesome for them. They have a normal school at Huntingdon, Pa., of some years' standing, in which the English branches and drawing and music are taught; also seminaries at Ashland, O., and Mount Morris, Ill.

The Brethren, like other denominations, have had several divisions. Before their first congregation had been in Pennsylvania a decade there was a schism in it, Conrad Peysel (or Beissel) and six other members

withdrawing and forming the branch known as the Seventh Day German Baptists, a monastic institution at Ephrata being one of the features of the movement which is now nearly if not quite extinct. In 1790 occurred another secession, led by John Ham, who held Universalist ideas. This division, which was never very strong in members, has died out. The most important separation, amounting, indeed, almost to a disruption of the communion, took place a few years ago, the result being three distinct branches. The cause of this division, or divisions, was chiefly, if not wholly, differences concerning the treatment of disciplinary questions and the character of the decisions of the annual council. In order to understand these questions it will be necessary to state as briefly as possible some of the principles of the Brethren. They have held quite strictly until recent years to the principle of nonconformity to the world. Simplicity in dress has been so strenuously insisted on that a kind of uniform for men and women has always been distinctive of the denomination. Decisions have been promulgated by the council against various articles of apparel, against the shaving of the beard, the parting of the hair on one side, "fashionable hats" for the sisters, etc. Many a council has wrestled with the question whether the "old order" required a "standing" or a "rolling" collar to the coat, which as commonly worn by the Brethren was wont to be fastened with hooks and eyes, instead of buttons, whence they came to be nicknamed "Hookers." The principle of simplicity in dress was applied to other things, and new ideas and appliances, such as carpets, pianos, and costly articles in households, were discouraged, at least until they became common. Insurance, the taking of interest, serving on juries, voting or accepting public office, legal oaths, have all been prohibited to the Brethren. In recent years a more liberal feeling respecting these and kindred matters has obtained place in the denomination. Sunday-schools, high schools, missions, and other features not countenanced in former times have been introduced. These evidences of conformity to the spirit of the age alarmed the more conservative Brethren, and they demanded that those refusing to observe the "old order" strictly, not only in matters of conduct and dress but in questions of religious teaching and discipline, should be rigorously dealt with. On the one side there was the extreme conservative party, on the other the progressives, who while holding to the principle of plainness contended that a particular form need not be enjoined. Between these two parties was the great majority of the Brethren, who tried but unsuccessfully to bring the two wings together on the middle ground. The conservatives, as this middle party may be called, defend themselves against the attacks of the "old order" Brethren, first by charging that the latter are more rigorous in their requirements than were the fathers of the church, and secondly by contending that in the introduction of Sunday-schools they have only made a new application of the principle held by the fathers, namely, that the youth should be religiously educated, and assert that if the fathers were living now they would approve the educational enterprises which have grown out of the needs of the Brethren. They claim to have made progress with the age and rejoice in it as salutary, but they believe they are going as rapidly in this direction as the best interests of the church will permit. The progressives wished to get on faster, but they specially protested against the act of the annual council of 1882, by which the decisions of that body, which had always been regarded as simply advisory, were made mandatory.

The progressives hold no regular annual council, but they meet occasionally in convention. They are more strictly congregational than the other bodies. They believe in an educated ministry, and hold that ministers should be supported by the congregations. They have about seventy congregations and 5000 members.

Their organ is the *Brethren's Evangelist*, of Ashland, Ohio.

The "old order" Brethren number, it is estimated, 3000 or 4000 members. They held their yearly meeting in 1884, in June, at Beaverdam, Md., where several deliverances, indicating their position on disputed questions, were adopted. These deliverances were against holding prayer-meetings except in cases of peril or persecution or famine; against revival meetings, bells in churches, school exhibitions, lyceums, against investing in government bonds, against lightning-rods.

The conservatives, or middle party, held their annual council in 1884 in Stillwater, near Dayton, O. Their chief organ is *The Gospel Messenger*, published at Mount Morris, Ill., and at Huntingdon, Pa.

The creed of the Brethren is in substance that held by all evangelical denominations. They have, however, peculiar usages. They baptize by trine immersion, and they observe the communion after the Lord's Supper, which is always held in the evening, and in connection with which the ordinance of feet-washing is celebrated and the holy kiss given. In discipline they use the "ban." In polity they are congregational. The churches are gathered into district meetings, which are represented in the annual meeting, or council.

Their ministers are selected by vote of the male and female members of churches, and are of three degrees, the third and highest being that of elder or bishop. Those of the first degree are on probation; those of the second have authority to hold meetings, administer baptism, and solemnize marriages. It is only those of the third degree who are ordained. They are the highest officers of the church, and are called overseers or householders. Women have equal rights with the men except in conducting church services. A ritual has in late years been observed in the administration of baptism. The order of worship resembles that of other non-ritualistic denominations. Singing, exhortation, and prayer, all brief, open the services, and after sermons from two or more preachers the meetings close with the same exercises, no benediction being given.

The Brethren have always been strong anti-slavery men and consistent teetotalers. (H. K. C.)

DUNKIRK, a city of New York, in Chautauqua co., is on Dunkirk harbor, Lake Erie. See Vol. VI. It is the western terminus of the main line p. 469 Am. of the New York, Lake Erie, and Western ed. (p. 544 Railway, and the northern terminus of the Edin. ed.) Dunkirk, Allegheny Valley, and Pittsburgh Railway. It is 40 miles from Buffalo and 130 from Cleveland. The New York, Chicago, and St. Louis, the Buffalo, New York, and Philadelphia (Pittsburg Division), and the Lake Shore Railways also pass through the city. The town was first settled in 1805, and was originally called Chadwick's Bay. It was first incorporated as a village in 1837, under its present name, and as a city in 1880. When the Erie Railway was first built much of the lake traffic for New York came by boat to Dunkirk, where freight was transferred to the cars. The Brooks Locomotive Works here have a capacity of 18 locomotives per month, and employ 1100 men. The other manufactures are machinery, boilers, knit-goods, flour, plaster, springs, cigars, beer-barrels, tanks, and agricultural implements. There are 10 churches in the city, 10 public schools and 2 church schools, a fire and a police department. There are 15 hotels, 2 national banks and 1 private, 1 daily newspaper and 4 weeklies. The city has gas-works, Holly water-works, two parks, a street-railway, and a good system of sewerage. The harbor is artificial, and is protected by a pier 1650 feet long. There are 2 light-houses and 4 docks. The total valuation of property is \$1,609,470. The public debt is about \$212,000. Population, 7248.

DUNMORE, a borough of Pennsylvania, in Lack-

awanna co., is on the Delaware, Lackawanna, and Western Railroad and the Pennsylvania Coal Company's Railroad, 1½ miles east of Scranton, the county-seat, with which it is connected by a horse-car railway. It has 5 churches, 8 schools, large machine-shops, and a good trade. It is mainly supported by the coal-mining of Lackawanna Valley. It was incorporated as a borough in 1851, and is free from debt. Its water supply is furnished by the Dunmore Gas and Water Company, which has a reservoir with a capacity of 1,000,000 gallons. Population, 5151.

DÜNTZER, JOHANN HEINRICH JOSEPH, a German philologist and literary historian, was born at Cologne, July 12, 1813. He studied in the gymnasium at Cologne and in the Universities of Bonn and Berlin, devoting himself in the latter to the study of Sanskrit. His first publication was *Die Lehre von der Lateinischen Wortbildung* (1836), but in the same year he issued the first of his critical essays, *Goethes Faust in seiner Einheit und Ganzheit*. He graduated as doctor of philosophy in 1836, and became a privat-docent in Bonn, but afterwards, disagreeing with the faculty there, he went to Cologne in 1846 to take charge of the library of the Catholic gymnasium. His philological works include *Homer und der epische Cyklus* (1839); *Kritik und Erklärung der Horazischen Gedichte* (5 vols., 1840-44); *Die Römische Satiriker* (1846); *Aristarch* (1862); *Homerische Abhandlungen* (1872); *Die Homerischen Fragen* (1874); with school-editions of Homer and Horace. Düntzer has also written a long series on works of Goethe, among which are *Goethe als Dramatiker* (1837); *Goethes Prometheus und Pandora* (1850); *Goethes Faust* (2 vols., 1850-51); *Frauenbilder aus Goethes Jugendzeit* (1852); *Freundesbilder aus Goethes Leben* (1853); *Schiller und Goethe* (1859); *Neue Goethe-Studien* (1861); *Aus Goethes Freundeskreise* (1868); *Zwei Bekerte, Zacharias Werner und Sophie von Schardt* (1873); *Charlotte von Stein* (1874). Düntzer has also published *Erläuterungen zu den deutschen Klassikern* (1855-82), and has assisted in a complete edition of Goethe's works. He has also edited collections of letters of Goethe, Schiller, Herder, and others eminent in literature.

DUPANLOUP, FÉLIX ANTOINE PHILIBERT (1802-1878), a French bishop, born at St. Félix, Savoy, Jan. 3, 1802. In early childhood he chose the clerical profession, and when seven years old was sent to Paris to be educated. He was ordained priest in 1825, and in 1827 became chaplain to the Count de Chambord, in 1828 a catechist of the Orleans princes, and afterwards was a chaplain and almoner in the dauphin's household. In 1837 he became vicar-general to the archbishop of Paris and head of the diocesan seminary. He was a superb pulpit orator, austere in private life, and towards the poor he was charitable to a fault. In 1838 he attended the death-bed of Talleyrand, who had entertained a warm affection for him and predicted his rise to eminence. In 1841 he took a theological professorship in the Sorbonne, but his lectures at the Sorbonne were unpopular in all parts of the Latin quarter, and he did not long retain that place. In 1849 the Abbé Dupanloup was consecrated bishop of Orléans. Here, as elsewhere throughout his life, he took an active part in the work of education, both opposing the government plan of sustaining schools not distinctly religious in their tone and at the same time combating those who, with the Abbé Gaume, wished to exclude from the schools the writings of pagan or non-Christian writers. In May, 1854, he was admitted to the French Academy and wielded considerable influence, but in 1871, when Littré, whose admission he had strongly opposed, at last gained an entrance, the bishop withdrew. In the National Assembly he was for years one of the most prominent and influential of the deputies, taking a chief part in all educational questions and acting as the leader of the clerical party. He was an active defender of the temporal power of the pope, but at

the Vatican Council, as well as before it, he opposed the decree of papal infallibility, which, however, he at once accepted when it was officially proclaimed.

During the German occupation of Orléans in 1870 he did much to soften the rigor of the invaders. At the same time he warmly welcomed the English ladies who came under the red cross flag to assist in caring for the wounded. He was a man of noble presence and generous nature. In politics he was regarded as a moderate legitimist. Under the third republic he was a member of the superior council of public instruction. He died at Laincey, Oct. 11, 1878. Among his works are an *Exposition of the Principal Truths of the Faith* (1832); *Elements of Sacred Rhetoric* (1841); a *Treatise on Education* (3 vols., 1855-57); and another *On the Higher Education*; ten volumes of pastoral, ecclesiastical, and oratorical studies; a treatise *On Pontifical Sovereignty*; *Souvenirs of Rome*; an *Essay on Popular Preaching*; a *Defence of the Liberty of the Church*; a pamphlet on Freemasonry; and many minor essays and papers. Sketches of his life have been published by Pelletier (1876), by Clerc, and by Hairdet (1878).

DUPONCEAU, PETER STEPHEN, LL.D. (1760-1844), an American jurist and philologist, was born June 3, 1760, on the Isle of Rhé, France, where his father held a military command. He studied at colleges St. Jean d'Angély and Bressuire, and after the death of his father went to Paris in December, 1775, where he was employed by Count de Gébeline in translating English and Italian books. In 1777 he came to the United States as private secretary to Baron Steuben, and on Feb. 18, 1778, was made captain by brevet in the Revolutionary army. His first military experience was at Valley Forge, where he assisted Steuben in preparing his system of army discipline. At the close of the campaign of 1779 a disease of the lungs obliged him to remain inactive for some months, but in 1780 he went with Steuben to the South. Returning to Philadelphia, he was employed by Robert R. Livingstone, Secretary of Foreign Affairs, from October, 1781, till June 4, 1783. Having become a citizen of Pennsylvania, he studied law, and was admitted to the Philadelphia bar in 1785. He soon rose to eminence in his profession, being especially skilful in questions of civil and foreign law, and was frequently employed in the Supreme Court of the United States. When the Federal Constitution was under discussion in Pennsylvania in 1788, he opposed it, but afterwards confessed that subsequent events had proved him wrong in this. When the United States acquired Louisiana in 1803, President Jefferson offered him the position of chief-justice of that Territory, but he declined it.

Duponceau was an ardent admirer of the political and social institutions of his adopted country, and delighted to show his reverence for William Penn. He established a society to commemorate Penn's landing, and wished that event to be celebrated annually. He was president of the American Philosophical Society, of the Athenæum, and of the Pennsylvania Historical Society, and was a member of many other literary and scientific societies. Besides general labors in connection with these, he especially devoted himself to philology. In 1819 he published an essay on the *Structure of the Indian Languages*, and in 1835 the French Institute awarded him the Volney prize for a *Memoir on the Indian Languages of North America*, and elected him a corresponding member of the Institute. In 1838 he published a *Dissertation on the Nature and Character of the Chinese System of Writing*, in which he maintained that the written characters represented sounds and not ideas. Believing that this country affords great facilities for the culture of the silkworm and of the mulberry tree, he induced M. d'Homergue of Nismes, France, to establish the manufacture of silk in Philadelphia, and spent much labor and money in the effort to make it successful. He died at Philadelphia, April 1, 1844.

Among his numerous publications are a translation of Bynkershoek's *Laws of War* (1810); a treatise on *The Nature and Extent of the Jurisdiction of the Courts of the United States* (1824); a *Brief View of the Constitution of the United States* (1834); and a translation of *A Description of New Sweden*, by Thomas Campanius Holm.

DUPONT, SAMUEL FRANCIS (1803-1865), an American naval officer, was born at Bergen Point, N. J., Sept. 27, 1803. His father, who was the son of the distinguished French publicist and statesman, Pierre Samuel DuPont de Nemours, had left France in 1799, and for a time resided in New Jersey, at Bergen Point—before undertaking in Delaware the establishment of the great gunpowder works with which various members of his family have since been connected. Samuel Francis was appointed a midshipman in the United States navy Dec. 19, 1815, and his service was continuous from that time until near the close of his life. In 1826 he reached the grade of lieutenant, and in 1842 that of commander. In 1845 he was sent to the Pacific in command of the frigate Congress, the flag-ship of Commodore Stockton's squadron, and he reached Monterey, in California, in 1846, just at the beginning of the war with Mexico. Placed in command of the sloop-of-war Cyane, he helped to clear the Gulf of California of Mexican armed vessels. In November, 1847, when Com. Shubrick took Mazatlan, DuPont headed the line of boats which made the attack, and in the following February he landed a force of sailors and marines and relieved Lieut. Heywood, who had been surrounded by a large number of Mexicans. DuPont reached the grade of captain in 1855, and in 1857 was sent on special duty to China in command of the steam-frigate Minnesota, returning two years later, after a cruise to Japan, India, and Arabia.

At the outbreak of the civil war in 1861 he was in command of the navy-yard at Philadelphia, and he rendered valuable service to the Government in the organization and equipment of its naval force. In September he was appointed flag-officer, and assigned to the command of the South Atlantic squadron. He proceeded at once to this important station, and on October 29 moved from Hampton Roads with a fleet of 75 vessels of all sorts, carrying a land-force of about 10,000 men, commanded by Gen. W. T. Sherman. The object of the expedition was the capture of Port Royal, S. C., and after encountering severe storms the force gathered off the harbor, November 4-6. On the 7th DuPont attacked the two defensive works—Fort Walker on Hilton Head and Fort Beauregard on the point opposite. Leading himself in the flag-ship Wabash, his ships passed three times around between the forts in an elliptic course, firing in turn as they passed; by keeping them thus in motion he avoided serious damage from the guns of the enemy. After a severe engagement, lasting over four hours, the forts were evacuated. This signal success at an important juncture served to maintain the courage of the national Government and of the friends of the Union, as well as to inspire confidence in the efficiency of the navy and the skill and courage of its officers. In February and March following, with his flag-ship and some other armed vessels, DuPont moved down the coast, taking Fort Clinch on Amelia Island and the town of Fernandina, St. Mary's, Brunswick, Darien, Jacksonville, and St. Augustine, thus regaining nearly the whole of this part of the coast. He was subsequently engaged in movements designed to effect the reduction of Charleston by moving through the waters in its rear, but there, though entirely successful so far as the naval part was concerned, he failed for want of effective co-operation by the land-force. In August, 1862, he was appointed a rear-admiral upon the creation of that rank by act of Congress. In March, 1863, his iron-clads made a demonstration upon Fort McAllister in the Ogeechee

River, Ga., but were unable, on account of obstructions, to take a position from which they could effectually attack the work. Preparations were also made for a combined land and naval attack upon Charleston, and after an unseemly dispute over etiquette among the army officers concerned, the expedition under DuPont's command gathered in the mouth of the North Edisto River on April 3, and on the 5th proceeded to Charleston harbor with nine iron-clad vessels, besides five gunboats placed in reserve. On the 7th, shortly after noon, he advanced to the attack, the iron-clad Weehawken leading, and the other eight following in single file. At 4 o'clock the fire of the heavy barbette guns of Fort Sumter was encountered. The plan of DuPont had been to disregard the fire of the batteries, and to move into the harbor far enough to fire upon the left or north-west face of Sumter, that side being the weakest; but it was found impossible to get the desired position on account of torpedoes and obstructions, which detained the assailants and exposed them to the heaviest fire of the Confederates. The contest was thus altogether to the advantage of the latter, and at 5 o'clock Admiral DuPont signalled the withdrawal of his squadron, one of them, the Keokuk, being so disabled that she sank after leaving the scene of action. The failure of this brave endeavor convinced DuPont that any similar naval attempt would accomplish no better result, the enemy's works and obstructions being too strong to be overcome by such means. In July, 1863, he was relieved by Admiral Dahlgren, and returned to Wilmington, Del. He died while on a visit to Philadelphia, June 23, 1865, from disease incurred by his cruise in the East Indies seventeen years before. In the intervals of his service at sea he was engaged in various professional duties. In 1855 he was appointed a member of the naval retiring board. He was the author of a treatise on the use of floating batteries for coast defence, which has been republished with commendation in other countries. (H. M. J.)

DU QUOIN, a city of Perry co., Ill., is at the junction of the Illinois Central Railroad, Cairo Short Line Railroad, and Eldorado division of the Belleville and Southern Illinois Railroad, 71 miles S. E. of St. Louis, and 77 north of Cairo. It has a bank, a park, a public library, a weekly newspaper, 6 churches, a graded school. Its industries comprise 3 grist-mills, a foundry, and machine-shop. It is surrounded by rich fields of bituminous coal, and the salt-, coal-, and coke-works of St. Johns, a manufacturing suburb, contribute to its prosperity. Population, 2807.

DURBIN, JOHN PRICE, D. D. (1800-1876), an American Methodist preacher and author, was born in Bourbon co., Ky., in 1800. Trained by pious parents, he was converted at the age of eighteen and joined the Methodist Church. He was forthwith licensed to preach, but, being too vehement, his voice failed, and he was obliged to desist from public work. However, he still labored in private, and after six months again entered the pulpit, though he henceforth used a more conversational style. In 1820 he joined the Ohio conference and travelled on a circuit of 200 miles. While still preaching regularly he attended Miami University in 1822, and afterwards graduated at Cincinnati College. In 1826 he was made professor of languages in Augusta College, Ky., and was for a time employed as agent in securing funds for that institution. Becoming widely known for eloquence, he was chosen chaplain of the United States Senate in 1831, and on the centennial anniversary of the birthday of Washington preached a sermon which was regarded as a masterpiece. The next year he removed to New York to become editor of the *Christian Advocate*, the leading paper of his denomination. In 1834 the Philadelphia and Baltimore conferences of the Methodist Episcopal Church obtained control of Dickinson College at Carlisle, Pa., which, after an honorable career of fifty years, had fallen into

difficulties. Mr. Durbin was elected president of the college, and for eleven years devoted himself zealously to the task of placing it on a firm basis, and by wise and prudent management succeeded in so doing. In 1842 he made an extensive tour abroad, the results of which were afterwards published under the title *Observations in Europe and Observations in the East*. In 1844 he was a member of the General Conference, and took part in the discussion of the slavery question then agitating the church. He was a member of six succeeding conferences, and was prominent in all matters pertaining to the welfare and prosperity of the church. In 1845 he resigned the presidency of Dickinson College and became pastor of a church in Philadelphia. He was afterwards, for one year, presiding elder in that city, and in 1850 he was appointed missionary secretary to fill a vacancy. The General Conference of 1852 elected him to that position, and he continued to hold it by successive elections till 1872, when he declined on account of his age. All the foreign missions of the church except those to Liberia and China grew up under his administration. By his executive ability, his rare tact, great popularity, and stirring eloquence he aroused the church to liberality and energy in the mission cause. The annual receipts rose from \$100,000 to \$700,000. After resigning his position he lived in retirement in Philadelphia, and died there Oct. 18, 1876. Besides his work for the cause of education and of missions in his own denomination, he raised Methodism to a higher place in general esteem among American people.

DURESS, in law, restraint or compulsion whereby a person is forced to commit some act or to omit the doing thereof contrary to his own wishes and free will in the premises.

Duress is either by imprisonment or *per minas*. Duress by imprisonment exists where a man has in any manner lost his personal liberty. A legal imprisonment for the purpose of obliging a party to sign a deed or enter into a contract will not, however, be considered as duress, unless, indeed, the legal proceedings be a mere pretext.

Duress *per minas* consists of any line of conduct calculated to put a person in reasonable fear of loss of life, limb, liberty, health, reputation, or property. It may be either by actions or by words. Such actions or words must, however, in order to constitute duress, be of such a character as are calculated to inspire with just fear a person of ordinary firmness. By the ancient law they were required to be of such a kind as might reasonably be expected thus to affect an average man, but the strictness of this rule is now somewhat laid aside. The age, sex, state of health, temper, and disposition of the party, together with other circumstances calculated to give greater or less effect to the violence or threats, are in every case taken into consideration.

By the common law, a deed or contract made under duress is not void, but voidable only. The person upon whom the duress has been practised may avail himself thereof as a defence, but the person who has employed the force or threats cannot set them up as a defence if the performance of the contract be insisted on by the other party.

Courts of equity are invariably peculiarly careful to guard the rights of persons who have acted, or who are supposed to have acted, under duress. If there be the slightest ground to suspect oppression or imposition in such cases, they will afford instant relief. Circumstances also of extreme necessity and distress of the party, although unaccompanied by any direct restraint or compulsion, will in some cases be held so entirely to have overcome a party's free agency as to justify the court in granting relief.

Duress *per minas* is also an excuse for the commission of some crimes. Where, for example, a man is violently assaulted, and has no way of escaping death save killing his adversary, he will be held justified in so doing.

(L. L., JR.)

DURFEE, JOB, LL.D. (1790–1847), an American jurist and philosopher, was born at Tiverton, R. I., Sept. 20, 1790. His father, Thomas Durfee (1759–1829), had gained some knowledge of law, and for the last nine years of his life was judge of Newport county. The son graduated at Brown University in 1813, and at his graduation delivered a poem on "The Powers of Fancy." He studied law, and was admitted to the bar in 1817. A year previous, however, he had been elected a member of the State assembly, in which he continued till he was elected in 1820, almost unanimously, to Congress, where he served two terms. While in the assembly he had succeeded in securing the abolition of the special privileges formerly allowed to banks as creditors. In Congress he delivered an able speech in 1822 against the new Apportionment Bill, which would have reduced his State to a single Representative. He was again a member of the State assembly from 1826 to 1829, and was Speaker of the House most of the time. He then declined a re-election, but in 1833 he was chosen a judge of the supreme court of the State, and in 1835 became chief-justice. While in the assembly he had favored the extension of the right of suffrage, which had been unduly restricted in Rhode Island by the colonial charter, but when, in 1840, an attempt was made, under the leadership of Thomas W. Dorr, to form a new constitution without regarding the requirements of the old law, he joined with his associates on the bench in declaring the "people's constitution" void, and warned all citizens against taking any part in the treasonable movement. In his charge to the grand-jury, and afterwards on the trial of Dorr for treason against the State, Chief-Justice Durfee laid down the principles which were on appeal sustained by the United States Supreme Court. In 1845 he received the degree of LL.D. from Brown University. He died at Quaket, R. I., July 26, 1847. He always took great interest in aboriginal and colonial history, and in 1832 published a poem, *What Cheer, or Roger Williams in Banishment*. Though not of lofty style, it was favorably received, and was republished in England. He also delivered some lectures on the history and beliefs of the Indians. His most remarkable publication was *The Panidea, or an Omnipresent Reason considered as the Creative and Sustaining Logos* (1846). He seems to have been indebted to Swedenborg for some of the ideas set forth in this treatise, and he acknowledged that a Swedenborgian saying, "The Divine fills all things without space," first started him on some of his subtlest speculations. He also studied Cousin and Coleridge, and was affected by the Transcendental movement in New England. His complete works, with a memoir by his son, were published at Providence, R. I., in 1849.

DURHAM, an incorporated town in Durham co., N. C., is 26 miles N. W. of Raleigh, on the North Carolina Railroad. It has a bank, a hotel, 3 weekly newspapers, 7 churches, 3 schools, and a Methodist female seminary. It has a machine-shop, planing-, saw-, and grist-mills, carriage-factories, cotton-gins, and especially large tobacco-works. At this place Gen. W. T. Sherman and Gen. J. E. Johnston made a treaty at the close of the civil war, but the terms were afterwards rejected by the President. In 1869 tobacco manufacture was commenced here on an extensive scale. The property of the town is valued at \$1,600,000; its public debt is \$1500. Population, 2041.

DURUY, VICTOR, a French historian and educator, was born at Paris, Sept. 11, 1811. He belonged to a family of artists employed at the Gobelins, and at first was intended to pursue the same career, but in 1823 he commenced a course of classical study at the college Sainte Barbe, and in 1830 passed to the normal school. Three years later he began his work as an instructor in history in the college Henri IV. at Paris, and assisted in preparing historical text-books. In 1853 he received

the degree of doctor in letters, taking for his thesis "The State of the Roman World at the foundation of the Empire." In 1861 his work, hitherto confined to secondary instruction, was enlarged; he became, in turn, inspector of the academy of Paris, master of conferences at the normal school, inspector-general of secondary education, professor of history in the polytechnic school, and in June, 1863, was made minister of public instruction, which department was then separated from that of worship. He had already prepared some historical works, and brought to his new duties a rare professional competence. The measures instituted by him tended to improve the position of professors, to enlarge the scope of public instruction, and to extend to a greater number the advantages of education. In July, 1869, he was removed from his position as minister and was made a senator. He had been a member of the Legion of Honor since 1845, and by successive promotions had arisen to the rank of a grand officer in 1867. In 1873 he was chosen a member of the Academy of Inscriptions, and in 1879 a member of the Academy of Sciences, Moral and Political. His publications have been chiefly text-books on geography and history. Beginning with the geography of the Roman Empire (1839), he next treated that of the Middle Ages (1839), then France (1840), then published a universal historical atlas (1841). In history proper, his first work was an *Histoire des Romains* (2 vols., 1843-44), followed by an *Histoire de France* (1852), and an *Histoire de la Grèce Ancienne* (1862), which was crowned by the Academy. He has also written a popular history of France (1863), and an introduction to the history of France (1865). A new edition of his Roman history, in four volumes, has been issued (1870-79), and another handsomely illustrated edition appeared in 1882.

DUYCKINCK, EVERT AUGUSTUS (1816-1878), an American author, was born in New York, Nov. 23, 1816. The family had resided in that city since the time of Dutch rule, and his father, Evert Duyckinck (1765-1833), had been a prominent book publisher for thirty years. His son graduated at Columbia College in 1835, studied law, and was admitted to the bar in 1837. He had already entered upon a literary career by contributing to the *New York Review*, and after spending a year in Europe joined with Cornelius Matthews in 1840 in editing a monthly magazine called *Arcturus, a Journal of Books and Opinions*, which closed in May, 1842. The *Literary World*, a weekly paper, was established by Mr. Duyckinck in 1847, but after the issue of a few numbers it was transferred to Charles F. Hoffman, who conducted it for eighteen months. Evert and his brother George then took charge of it until the close of 1853, when they were induced to undertake the preparation of the *Cyclopædia of American Literature*. This valuable work was first issued in 1856. The conscientious spirit and diligent labor manifested in its preparation were rewarded by the approval of the best critics as well as of the general public. In 1865 a *Supplement* was added by Evert A. Duyckinck, and in 1875 a new edition, by M. Laird Simons, was published. Mr. Duyckinck also edited, in 1856, *The Wit and Wisdom of Rev. Sydney Smith*, with a memoir. During the progress of the Civil War he edited a *History of the War for the Union*, which was completed in three quarto volumes (1861-65). He was also engaged at the same time in the preparation of the *National Portrait Gallery of Eminent Americans* (1865). He edited, with a memoir and notes, *Poems Relating to the American Revolution*, by Philip Freneau (1865). He compiled a *History of the World* (1870), in four volumes. In 1874 he published two large volumes of biographical sketches of *Eminent Men and Women of Europe and America*. All of his writings are marked by careful statement of facts and a liberal spirit. He died at New York, Aug. 13, 1878.

DUYCKINCK, GEORGE LONG (1823-1863), an American author, brother of the preceding, was

born in New York, Oct. 17, 1823. He was educated partly at Geneva College, New York, and graduated at the University of the City of New York in 1843. Like his brother, he studied law and was admitted to the bar, but his tastes and associations inclined him to a literary career. After an extended tour in Europe in 1847 and 1848 he joined with his brother Evert in editing the *Literary World*, and when it was discontinued in 1853 they united in preparing the *Cyclopædia of American Literature*. After its publication in 1856 he visited Europe, and upon his return became treasurer of the Church Book Society, in connection with which he prepared a series of biographies of worthies of the Church of England, including Bishop Ken, George Herbert, Jeremy Taylor, and Latimer. Though brief, these memoirs are characterized by good sense, piety, and careful statement of facts. He also contributed to various periodicals and had projected other biographies. He died at New York, March 30, 1863.

DWIGHT, HARRISON GRAY OTIS, D.D. (1803-1862), an American missionary and author, was born at Conway, Mass., Nov. 22, 1803. He graduated at Hamilton College, N. Y., in 1825, and studied theology at Andover, Mass. In 1830 he was sent by the American Board of Commissioners of Foreign Missions to labor among the Armenians, making Constantinople his headquarters. He was eminently successful in his work, not only preaching, but establishing schools and editing a religious paper. Besides books and tracts in oriental languages he published *Researches of Smith and Dwight in Armenia*, *Christianity Revived in the East*, *Memoir of Mrs. Elizabeth O. Dwight* (1840), *A Complete Catalogue of the Literature of Armenia*, *Christianity brought Home from the East*. Having returned to his native land for a brief visit, he was accidentally killed on the Northern Vermont Railroad Jan. 25, 1862.

DWIGHT, JOHN SULLIVAN, an American musical critic, was born at Boston, Mass., May 13, 1813. After graduating at Harvard College, he prepared himself for the ministry in the Cambridge Theological School. After six years' church work, however, he determined to make the study of literature and music his chief occupation for life. In 1842 he joined the "Brook Farm" community. In 1852 he established and edited the periodical called *Dwight's Journal of Music*, which during the twenty-nine years of its existence was uniformly respected in both Europe and America.

Mr. Dwight drew around him some of the most accomplished musicians of the country, and induced them to contribute papers on interesting subjects connected with their art in its varied phases; and exercised great discrimination in reprinting from time to time articles of value to students, and caused many of these in the German, French, and Italian languages to be translated for the benefit of English-speaking peoples. The general excellence of the *Journal* led musicians of the first rank in Europe to the belief and knowledge that America was ready to receive them and appreciate whatever they could accomplish. It may, therefore, be said that this periodical not only helped to form public opinion in the United States, and led persons to perceive the high artistic aims of the best musicians who came hither, but was to some extent the means of inducing the latter to come. With reference to compositions, it is noteworthy that the critic occupies a position similar to that of an orchestral conductor; he stands midway between the composer and the public, rendering equal service to both. In this respect Mr. Dwight accomplished much. He worked hard and unceasingly to gain for Beethoven, among the symphony writers, and Handel, among the oratorio composers, the respect due to their exalted genius.

As presiding officer of the Harvard Musical Association, he also exercised an influence over local musical

affairs which was highly salutary. He had a noteworthy poetical talent. (S. A. P.)

DWIGHT, NATHANIEL (1770–1831), an American author, was born at Northampton, Mass., Jan. 31, 1770. He was a brother of Pres. Timothy Dwight, of Yale College. Nathaniel published the first school geography issued in America. It was in the form of question and answer, and was extensively used. He also published *The Great Question Answered* and a *Compendious History of the Signers of the Declaration of Independence*. He died at Oswego, N. Y., June 11, 1831.

DWIGHT, SERENO EDWARDS, D.D. (1786–1850), an American Congregationalist minister and author, was born at Greenfield Hill, Conn., May 18, 1786. He was a son of Pres. Timothy Dwight, of Yale College. He graduated at Yale in 1803, and was tutor there from 1806 to 1810. Having studied law, he was admitted to the bar in 1810 and practised for five years. He then studied theology, and, having been licensed as a preacher in October, 1816, was elected chaplain of the United States Senate. In September, 1817, he was ordained pastor of the Park Street Congregationalist Church, Boston, but was obliged to resign in 1826 on account of ill-health. He then took up his residence in New Haven, and in 1828 opened a school there on the plan of the German gymnasium. In 1833 he became president of Hamilton College, N. Y., but resigned in 1835. He resided for a time in New York, and died in Philadelphia, Nov. 13, 1850, having gone there for medical advice. He published *The Life of David Brainerd, Missionary to the Indians* (1822), a treatise on *The Atonement* (1826), *Life of Jonathan Edwards* (1830), and *The Hebrew Wife* (1836). He also edited *The Works of President Edwards*, in ten volumes (1829), and published several sermons. A volume of his *Select Discourses*, with a memoir by his brother, Rev. Dr. W. T. Dwight, was published in 1851.

DWIGHT, THEODORE, I. (1764–1846), an American lawyer and journalist, was born at Northampton, Mass., Dec. 15, 1764. He was a brother of Pres. Timothy Dwight, of Yale College, and studied law with his uncle, Judge Pierpont Edwards, at Hartford, Conn. He became eminent in his profession, and engaged in the political controversies of the time as a Federalist. He was for several years a State senator, and in 1806 was elected to Congress. During the war of 1812 he was editor of the *Hartford Mirror*, the leading organ of the Federal party, and was secretary of the famous but unfortunate Hartford Convention in 1814. In the next year he became editor of the *Albany Daily Advertiser*, and in 1817 removed to New York, where he founded the *New York Daily Advertiser*, of which he remained editor till 1836. He then retired to Hartford, but subsequently returned to New York, where he died July 12, 1846. He published a *History of the Hartford Convention* (1833), and the *Character of Thomas Jefferson as Exhibited in his Own Writings* (1839), both books being of a partisan political character.

DWIGHT, THEODORE, II. (1796–1866), an American author, son of the preceding, was born at Hartford, Conn., March 3, 1796. He graduated at Yale College in 1814, went to Europe, and spent some years in travel. After his return he published *A Tour in Italy* (1824). In 1833 he removed to Brooklyn, and assisted his father in editing the *New York Daily Advertiser*. He also published the *New York Presbyterian*, and prepared a large number of educational and popular books. He was a good linguist, and at the time of his death was preparing a series of educational works in Spanish to be used in Mexico and South America. He died at Brooklyn, N. Y., Oct. 16, 1866. His principal works were—*A Dictionary of Roots and Derivatives*, *History of Connecticut* (1841), *The Roman Republic of 1849*, *Life of Garibaldi* (1859), *a Tour of New England*, *The Kansas War*.

DYEING. Before the discovery of America the principal articles used in dyeing were indigo and kermes, and the colors produced were much less brilliant than those obtained to-day from aniline dyes. The New World furnished two important additions to the dyer's resources—cochineal and logwood—the latter of which continues indispensable in spite of the advance made through chemical research. During the eighteenth century chemical dyes were introduced, and in the present century they have reached great prominence, gradually supplanting indigo, madder, and other natural dye-stuffs.

The first important product within recent times was picric acid, then "Perkins' mauve," next magenta, otherwise called roseine and fuchsine, and then came violet and blue dyes, which eclipsed the brilliancy of all ancient art. Madder has been compelled to give way before alizarine, and cochineal before azo scarlet, articles dyed with the latter having the advantage that they will not oxidize when worn next the body.

We shall now consider some inventions of marked value for the various colors.

Blue.—*Nicholson's Blue* produces the purest colors imaginable, from the lightest azure to the darkest Guernsey blue. It requires to be worked in at least the same weight of alkali (soda or borax) as of color; with acid the surface only of the goods is dyed, the color not penetrating into the fibre. After being boiled for half an hour in the alkaline they should be washed in cold water, and are then of a pale-gray color. They are then placed in an acidulated bath, in which they are well opened, and the color is regulated by using from 4 to 6 B. Blue for light shades, and from 4 to 1 B. (Guernsey) for dark shades. The goods are then faster than others, yet they can be further improved by being washed, then passed through a soap-bath and again placed in the acid-bath. This dye is used chiefly for silk and wool. If cotton is present it should be laid in a tannin-bath, then in muriate of tin, and then in cold blue.

Acid Blues are so called because they impart their color clearly and evenly upon silk or wool in an acid bath. The lighter shades are night, pure and soluble blue; the darker shades are distinguished as No. 2 of the same, and include also serge, navy, and several others.

Neutral Blues include methyl, methylene, and Victoria blue. They will fix upon silk and wool in hot water solutions. Glauber salts are sometimes used to make them even. Cotton can also be dyed with them, if prepared with tannin mordant.

Cotton Blues are specially adapted for cotton or mixed goods, producing in many cases as bright colors as in silk or wool, and requiring but little acid. Thus 4 pounds of alum, 8 pounds of glauber salts, and 1 pound of soda to 8 ounces of color will dye 100 pounds of carpet yarn. Tannin, acetate of tin, sugar of lead, and "red liquor" are sometimes used as mordants. They can be dyed at very moderate heat, or even boiled without injury, and require no washing from the dye.

Violet.—Methyl and Hoffman are both neutral, and will dye any material, either animal or vegetable; the latter, however, requiring a mordant, for which tannin, acetate of tin, red liquor, stannat soda, oil, starch, etc., are used. *Alkali Violet* is used in the same way as alkali blue, and can be used in conjunction with the deep shades of these blues to darken them. *Acid Violet* is worked on with sulphuric acid used with cardinals, garnets, etc., to darken and produce bluer shades. *Humboldt Violet* will also work on in the presence of sulphuric acid, and stand exposure better than any other. *Mauve* is a distinct shade from any of the violets, being only about one-half as dark, yet can be obtained from any of them, but in that case will not be really so fast as when *Perkins' Genuine Mauve* is used.

Green.—For this Iodine was formerly used, although

its use was somewhat circumscribed from the cost of the color. Then followed *Methyl Green*, which was made from methyl violet. It was a good color and much cheaper than the former, but on the application of too much heat a reaction set in, changing it into the violet shade. Next in importance was *Malachite Green*, which is worked in the same way as methyl and produces nearly the same shade. It has this highly important characteristic: it stands boiling without change. Some grades of silk and wool will take up the color without any assistance, while borax is needed with others. Most other materials require a little assistance in the shape of a preparation, not only to enable it to take up a full color, but to permanently fix it. For this purpose tannin and sometimes an addition of muriate of tin is used, and after this a washing is required, since otherwise the color would not only precipitate in part, but the dyed work would in time turn dark by oxydation. This is true also in every case where tin salts are used on cotton goods, whatever the color may be. *Acid Green* dyes with sulphuric acid and with pure blue will form any shade of peacock. *Alkali Green* works like alkali blue, and with it will produce shades of peacock.

Pink and Rose Color were chiefly produced by the use of safflower. A carmine made from this and cochineal had largely the preference over all attempts to produce the same from Brazil wood, cudbear, archil, etc., as the shades were not only much brighter but faster. Considerable expense and time however was required for the preparation of them, so that the introduction of saffranine was hailed with considerable satisfaction, as it is both economical and gives good results. Eosine was also introduced about the same time, which gives a yellower tone than saffranine, so that in its fullest tone it produces a fine scarlet and in its lowest form flesh color. For delicacy of shade eosine has never been surpassed. From the first no difficulty was found in fixing the color on silk and wool, but it had three serious drawbacks—its expansiveness, its tendency to crock, and its inability to stand the light. In spite of these defects, however, considerable quantities are still used because of its beauty. Cotton has no affinity for it and difficulty was experienced in getting a proper mordant. Now good results are obtained by first giving the cotton a good bath of soap, drying it off, then running it through acetate of lead. Besides these we have erythrosin, a shade approaching eosine, and phloxine, a shade approaching to saffranine, and Bengalic pink, a shade bluer than saffranine, all very bright colors, capable of fixing on all materials of vegetable and animal fibres.

*Cotton Scarlet*s have also been put upon the market. Those made from 5 parts saffranine, 3 parts chrysodine, or 4 parts cotton orange are as bright and fast as any. The mordant is tannin and tin salts. Azo, or, as it is commonly called, "wool scarlet," can be successfully applied to cotton, by using first a good soap-bath and drying up, then passing it through red liquor, from which it is taken directly to a bath of color, at any temperature from 120° to 200° Fahr., in which 3 pounds of color are given at the start to 100 pounds goods; from this it is wrung and dried. By this process a very bright color is obtained that does not crock much, but which sheds if washed in soap. Several patents have been taken out in England, by Thomas Holiday, for the fixing of fast washable scarlets with the azo color, by the use of stannit of soda, an alkaline bath, etc., for which see *Chemical Review* (London, May and June, 1882). Fast Reds, Maroons, Clarets, etc., called acid colors, dye with sulphuric acid and glauher salts on silk and wool, and on cotton with the preparations as described for azo scarlet.

Yellows.—*Fast Yellow* or naphthaline yellow is a bright canary color. It is worked with acid on silk and wool. It is liable, like picric acid, to stain other light goods it may come in pressure contact with. *Acid Yellow* is worked on in the same manner, but produces

a shade more inclined to amber, and is used also to mix with acid green to produce apple green and with indigo to produce dark greens or bronze. *Acid Amber* is a full rich amber color worked the same as acid yellow. Chrysodine and tropæoline are other forms of yellow which have to a great extent displaced the previous ingredients used for producing these different shades. *Orange* is a magnificent color, worked in the same manner as azo scarlet, and with archil and indigo for heavy shades of bronze and with indigotine, induline, or indigo for clarets and browns.

Brown.—Bismarck is a shade midway between orange and cinnamon brown. It will take on silk and wool in a neutral bath and on cotton after a tannin preparation. Acid or naphthaline brown is a later invention, and is worked either in a neutral or acid bath. It has the decided advantages that it contains much less insoluble matter than Bismarck, and can be used to give tone to other acid colors, as with acid green and yellow to produce olive.

Seal is generally made with say 3 parts of induline, 1 part orange, and for redder shades inclining to garnet with 1 part fast red. It has been little used on account of its costliness, as it takes about 6 pounds of color for 100 pounds of wool to color seal-brown. F. J. Bird, of Brooklyn, has succeeded in manufacturing seal browns from aniline commercially practicable, as his acid color for wool will only take 2 pounds for a good shade and 3 pounds for a deep seal, and a cotton brown neutral that requires a tannin mordant only. One pound will dye 100 pounds twice as dark as Bismarck, 2 pounds a full shade, and 3 pounds a seal-brown. This neutral color will take on silk without a mordant and color it much quicker than any other means. It will also dye woollens or mixed goods full seal-brown, so as to bear soaping.

Black, as a direct color from aniline, has not been a commercial success, except in the printing of cotton goods.

An important fact in the tinctorial art is that all colors and shades are capable of being produced from red, blue, and yellow, yet the writer has met with but one dyer who knew enough of his art to keep but three colors in anilines, and from them produced everything required. Under ordinary circumstances it is at least convenient to be able to procure ready at hand just what is required, especially if it can always be accurately repeated at the same standard.

The direct colors obtained from aniline dyes are fairly understood, and the secondary colors are also moderately understood; as, for instance, that red and blue make purple, yellow and red orange, blue and yellow green; but they can go a step farther to-day and say, violet and green will make blue, brown and violet slate, magenta and violet claret, scarlet and acid magenta, cardinal red and acid magenta, and orange maroon induline and orange, brown orange and violet, claret, or garnet, etc. The only difficulties with these last are to be able to choose the colors that unite, and what proportions are relatively required for a given shade. A spirit-lamp with experiments would soon determine this, but for a guide the writer advises the order given above. It must be remembered, however, that more of one and less of the other anilines will change the balance of any shade.

Blue.—Take 2 parts of strongest malachite crystal green, and 1 part of 4 to 6 B. methyl violet, powder them well, and the mixture will dye a fine blue on silk or wool. Glauber salts may be used to even it; with a slight tannin mordant, cotton will take the color well. Methyl violet 3 parts, and Bismarck brown 1 part, will make slate, or reverse the order and you will get a shade redder, but much darker in brown than Bismarck.

Maroon.—4 parts magenta and 1 part 4 B. violet will make a good neutral claret, and it will take on cotton with tannin as in case of the blue. Acid cardinal, 4 parts 3 B. scarlet, and 1 part acid magenta will make the shade called fast red or B. cardinal; for blue shades reverse the order.

Acid Maroon.—Take equal parts of acid magenta and

orange. Acid Brown.—Take equal parts of naphthaline or acid brown and induline.

Acid Claret.—Equal parts of acid violet and orange, or for darker shades 1 part violet, 2 parts naphthaline brown.

Acid Garnet.—3 parts violet, 1 part orange, or 1 part orange and 1 part violet if wanted fiery.

It will be seen by the above that acid colors should be taken to unite with other acid colors, and on the same principle neutral colors with neutral; there should be as few exceptions to this rule as possible. It is undesirable to attempt the use of alkali colors with either the acid or neutral colors, as the elements of adhesion and assimilation are wanting. The result is a precipitation of the colors, it may be to the bottom of the vessel, or if on to the surface of the goods, it is at best but a loose color.

Compound colors, properly speaking, are those which contain at least three kinds of colors, and these are necessarily more difficult to produce from aniline dyes, but, though difficult, it is not impossible except in the case of black, which has not yet been thus obtained. In 1879 considerable attention was drawn to this subject by the publication of patterns and articles upon dark colors and compound shades by F. J. Bird, of Brooklyn, who was the first to systematize this particular branch of aniline development, making it possible to compound the ordinary shades so as to produce very much deeper results than could otherwise be obtained except by the use of woods, roots, chemicals, etc., as in the old methods. It is not claimed that dyeing with anilines thus compounded is any cheaper than the old method, but that much time is saved. Two distinct classes of colors were thus made, the first called "acid colors," because they would take up the color and fix the same comparatively fast upon silk and wool, the others "neutral colors," because they will color wool, silk, or cotton in a bath in which the color was simply dissolved, in which glauber salts may be used to even it, the cotton requiring a slight mordant of tannin.

These discoveries awakened considerable solicitude amongst the various color-houses to be able to produce the like results, and in many cases they have succeeded. It also stimulated effort amongst dyers to learn how to mix their own colors, so that many to-day at the largest works do this, or else a color-mixer is employed.

Some illustrations will here be given, commencing with the acid colors. Bismarck had been the darkest aniline brown; much darker was now made with acid orange and induline, for redder shades adding dark acid claret, for darker shades on a flat hue some acid green, which gives darker shades than acid yellow, although this can be used.

Dark Green.—Take, according to shade, acid green, and add to it acid yellow for light and fast yellow, for dark shades use serge blue to shade. **Bottle Green.**—2 parts acid green, 1 part fast yellow, 1 part acid brown and induline to shade. **Plum.**—2 parts acid violet, 1 part acid claret, 1 part acid brown. **Prune.**—2 parts acid violet, 1 part acid green, 1 part acid brown. **Claret.**—Fast red and violet to shade. **Bronze and Olive.**—Acid green, acid brown, and fast yellow. **Heavy Bronze.**—Acid orange, green, and 4 B. or serge blue. **Cardinal.**—All light shades with fast red and acid magenta. **Cardinal.**—All dark shades by adding acid claret or Bordeaux. **Navy Blue.**—3 parts induline, 1 part serge blue, etc.

Neutral Colors.—**Dark Brown.**—2 parts strongest crystal malachite green, 4 parts of 4 B. violet, 12 parts Bismarck. **Maroon.**—3 parts magenta, 1 part Bismarck. **Claret.**—3 parts magenta, 1 part violet. **Dark Bronze.**—Bismarck, violet, and green, in about the proportions of 2 parts brown, 2 parts green, 1 part violet. **Light Bronze.**—Equal parts Bismarck and green, or otherwise as to shade. **Drab.**—8 brown, 2 green, 1 violet, 1 cotton blue, to be worked with alum. **Plum.**—4 Bismarck, 2 violet, 1 green. **Prune.**—2 violet, 1 green, 1 Bismarck. **Cinnamon.**—4 Bismarck, 1 green. **Chestnut.**—10 parts Bismarck, 1 violet, 1 green, 1 magenta. **Slate.**—2 Bismarck, 2 violet, 1 green, 1 cotton blue, worked with alum. **Peacock.**—12 parts green, 1 part violet, or regulate to shade.

Alkaline Colors.—Of these there are only three. (1.) *Alkaline or Nicholson blues*, which are worked on silk or wool only, in an alkaline bath made so with soda or borax to 1 lb. of color, from 1 to 6 lbs., according to the hardness or softness of the water. (2.) *Alkaline Green.*—This can be worked in

the same manner as alkali blue, and is intended for goods in wool or silk requiring to be washed. Peacocks of any shade are obtained by using parts of the alkali blue and green together, and are doubtless faster than any other peacock dyed with anilines. (3.) *Alkali Violet.*—This is worked in the same manner as alkali blue, and may be used on woollen goods that will require washing, or mixed with the deep shades of alkali blue to darken them, or with the blue and green to darken peacock colors. These three are called alkaline, not because they will bear washing in alkaline soap-baths, but because they are dyed in alkaline bath.

The improvements in machinery have nearly, if not quite, equalled the improvements in dyeing. If goods can be dyed faster they require to be finished faster to keep the manufacture running. It is a fact that improvements always pinch somewhere; in this case it has affected the finishing department, as old machinery has had to be turned out for new, which, though expensive, nevertheless pays, as it brings quicker returns and enables the manufacturer to place a much larger outcome upon the market and with increased profit to him, and at the same time a considerable advantage to the consumer.

Two questions arise: (1) Are the colors as fast, bright, and permanent, by these rapid methods as by the former ones, with woods, chemicals, etc.? It cannot be said that they are as fast, having reference to exposure (sunlight), but in the other sense with reference to smutting or crocking many of them are as fast. For examples, prussiate blue and aniline blues are equally fast.

Then, again, compared with violets dyed with tin and logwood, aniline violet is as fast and much brighter; and most others, if properly finished from the dye, should be equally good. If the color, even in neutral anilines, is allowed to boil for a few minutes, when the color is full enough it will be fixed very fairly. Many acid colors are absolutely fast, while "union" goods, that is, mixture of wool and cotton, should, after dyeing, be run through thin-boiled starch and finished from this, which will help to fix them. The starch, if not too thick, will not hurt any color.

(2) Are they as bright? In most cases they are brighter. Especially is this the case with "union" goods, in which the cotton will take at the same time as the wool, if mordanted first with tannin, and in especially bright colors, then put through a tin liquor, from which it is washed; and, in the case of dark colors, after a stronger tannin preparation then through nitrate of iron liquor, from which it is also well washed. It is by this time a dark drab, or slate, according to the amount of mordant received, which must be regulated by the depth of shade required. The cotton is somewhat darker than the wool, which is an advantage, inasmuch as the wool takes the color more freely.

All neutral anilines will follow this preparation, and, if proper attention is given to start at 150° Fahr., and gradually raise to boiling, the cotton and wool should be a more perfect match than most of the shots or union goods dyed in the old way, that required the wool to be colored first and the cotton after, thus often making the wool dull.

The question of "permanency" has been partly answered in what has been said on fastness, but it also follows that if the warp and weft are more uniformly dyed than was the case by the old process, that the cotton part at least will stand better, being more fully dyed, and, as a consequence, will not so soon present a shabby appearance, as when the color had left the cotton through being thinly dyed it soon presented an impoverished appearance. As the acid colors, or alkaline, can be used on all woollen goods, they ought to be fairly fast, and in the case of reds ought to be perfectly so. It must, however, be candidly admitted that the question of permanency does not count nearly so much as it ought, as the tropical heat of this country in the summer-time demands all the unfadable colors we have to be used;

and to the honor of some firms be it said they say, "Give us the very best colors, even if they are dearer." But the most say, "Give us a bright color, that will take easily and not cost much."

This leads to so many blues being dyed with logwood in place of indigo, or its fast substitutes, as the former costs from two to three cents and the latter about forty cents per pound to color; the former looks quite as good, and is as fast, if not faster, as regards smutting, than the latter, but, as is well known, the indigo will last to its last thread, while logwood in one season will become half blue and half red, caused by the tin salts used in the mordant having acted upon the hematine (coloring-matter of the logwood), and, possessing more vitality, raised it from its assumed dark to its natural red shade.

(F. J. B.)

DYER, THOMAS HENRY, an English historian, was born in London, May 4, 1804. He became a partner in an important commercial house in the West India trade. But the emancipation of the slaves so affected the business of the house that it was closed, and Mr. Dyer employed his leisure in a journey to Athens, Rome, and Pompeii, and in the study of the ancient topography of these cities. His publications consist of a *Life of Calvin* (1850); *History of Modern Europe* (5 vols. 1865-1877); *History of the City of Rome* (1867); *Pompeii* (1849); *Ancient Athens* (1873); *History of the Kings of Rome* (1868); *Roma Regalis* (1872); *A Plea for Livy* (1873); to which may be added articles in Smith's Dictionaries of Biography and Geography, and in other works.

DYNAMITE. See EXPLOSIVES.

E.

EADS, JAMES BUCHANAN, an American engineer, was born at Lawrenceburg, Ind., May 23, 1820. At the age of thirteen he went with his parents to St. Louis, where he has since resided. Leaving school at an early age, he was employed in a store and afterwards became a clerk on a Mississippi steamboat. Here he devoted his leisure to the study of engineering, and in 1842 he constructed a diving-bell boat for the recovery of cargoes of sunken steamers. He next designed other vessels with powerful machinery for removing sand from sunken boats and raising the entire hull and cargo. In 1845 he erected at St. Louis the first glass-works west of the Mississippi. He afterwards formed a plan for the improvement of navigation on western rivers, but failing to get the necessary support from the government it was not put in operation. In 1861, being consulted by Pres. Lincoln as to the best means for opening up the navigation of the Mississippi, he designed and completed for the government a squadron of eight light-draught iron-clad vessels for service on that river. These, the first iron-clads constructed by the United States, were completed and made ready for their guns within 100 days. They were first employed in the capture of Fort Henry, on the Tennessee River, Feb. 6, 1862. During that year and the next Capt. Eads designed and constructed six iron-clad vessels, heavily plated and having turrets worked by steam. This was the first application of steam to the manipulation of heavy guns. In 1867-74 Capt. Eads designed and constructed the famous steel bridge crossing the Mississippi at St. Louis. (See BRIDGES, vol. I., p. 632.) Many ingenious devices were invented and used in constructing the foundation for the piers and throughout the entire work. About this time the national government had begun to give special attention to the improvement of the channel of the Mississippi below New Orleans, which was seriously obstructed, especially by the bars at its mouth. A commission of army engineers had recommended that a canal be built from Fort St. Philip to Breton Bay, by which the bar would be avoided. Capt. Eads vigorously opposed this plan and undertook to increase the depth of the channel in the southwest pass (then only fourteen feet) to thirty feet, and thus to maintain an open mouth for the river. This he proposed to do by the jetty system, and he further engaged not to demand any pay for the services of himself and his associates until a stable depth of twenty feet should have been secured. By persistent effort he obtained a partial approval of his plans, first from a new commission of engineers and afterwards from Congress at different times. He was required by the bill which finally passed to apply his system to the South pass, which had two bars, one with a depth

of eight feet, and the other of fourteen feet. In the course of five years he here secured to commerce a channel 200 feet wide and 26 feet deep, with a central depth of not less than 30 feet. This channel has since been maintained at a moderate expense in excellent condition, as testified by the government inspectors. Capt. Eads has also advocated the application of the jetty system to the improvement of the channel of the Mississippi as far north as St. Louis, believing that by making a uniformity of width a uniformity of depth could also be maintained. This plan has been approved by the Mississippi River Commission, composed of civil and military engineers appointed by the government, and work has been commenced in accordance with it. Another important project which has been urged by Capt. Eads is the construction of a ship-railway across the Isthmus of Tehuantepec. He argues that this will be cheaper in construction and maintenance and more convenient for commerce than the Panama canal. In 1884 Capt. Eads resigned his position in connection with the improvement of the Mississippi.

EAR. In this article we present only some considerations in regard to the relation of music to the ear in addition to, or in modification of, those given in the *ENCYCLOPEDIA BRITANNICA* under EAR and ACOUSTICS. The powers of the human ear to discriminate between concord and discord, etc., are rarely properly estimated. The conclusions arrived at by Helmholtz and other great physicists, though apparently satisfactory, being borne out by experiment or mathematically demonstrated, are not really so, certain factors being left out of consideration. For this reason organ-builders and musical-instrument-makers generally find it next to impossible to follow the teachings of scientists; while practical musicians in their compositions and performances have learned by experience to recognize many modifying conditions that are unnoticed in books. The powers of the human ear are greater than usually believed, and may be increased by training to a degree scarcely credible or imaginable; yet at the same time the sense of hearing has limitations and also defects. It is the special province of the musician to decide how far he may hope to be appreciated in introducing complexities, and how far he may deceive the ear by causing it to accept, as consonant, intervals that are really dissonant.

Beat Theory.—The theory of beats, though satisfactory as far as it goes, does not (in deciding what the measurements of intervals should be to affect the ear as consonant) account for the whole musical world being content to employ "equal temperament," and listen complacently to the myriads of dissonances that

thereby attend all performances. Physicists study one or two intervals at a time and decide on their characteristics, leaving for the most part unnoticed the combined effect of many such intervals (as in the massive chords of an organ, etc.), the quality of the tones, the temperament (causing conflicting overtones), the mental effect, the condition of the ear after listening for some minutes, etc.

Residual sensation.—One theory, for example, makes consonance and dissonance depend on pitch; whereas it is well known to organists that quality of tone is a factor that must not be disregarded. A chord of four notes playable with one hand will be accepted as completely satisfactory on a sweet-toned flute stop at a much higher pitch than it would on trumpet stops at the same altitude; and a similar chord which if played low in the bass will be too dull and muffled, to be accepted as harmony, will, on this flute stop, be perfectly satisfactory if played even in the lowest octave of the keyboard on a delicately voiced oboe.

Quality of time.—The organ in the church of St. Leo in New York, which has remarkably good acoustic qualities, is made to speak on a very low pressure of wind ($2\frac{1}{2}$ inches), and is "voiced" very smoothly and delicately, the resonance of the building adding additional power. The unpleasant effect of the beats, due to "equal temperament" in this instrument, is so slight as to be scarcely perceptible, or to resemble agreeable undulations or waves similar to those that are peculiar to the tones of instruments swung, as the bell harp, or those in which sympathetic vibrations are set up, as in the viola d'amore, or the undulations peculiar to the human voice, very slightly trembling with emotion; whereas an organ that from being placed in a church that is defective acoustically, or put away in a recess, or from whatever cause, must have the tone forced out of it by high wind-pressure, is distressingly unpleasant to tune or scrutinize as regards perfect consonance.

Beats due to overtones.—An organ has a number of compound stops that are intended to build up the typical or space-filling tone of the instrument. These are Nature's harmonies or overtones, reinforced by actual speaking-pipes, that are operated on the same clavier-key as the fundamental tone, and are tuned "in tune;" while the notes obtained by the different clavier-keys are all tuned "out of tune." Yet all this apparently horrible discord is accepted without protest by both musicians and audiences. These are some few instances in which the ear accepts as consonant, dissonant intervals, and consonant intervals, at extremely high and low pitches, both of which science teaches are not endurable.

Mental influence.—If this were a treatise on art it would be competent to show that the mental or psychologic effect of music renders the ear able to bear most distressing dissonances and enjoy them as much as consonances, certainly to take greater interest in them, for they are exciting rather than cloying and create expectation. It would also be in order to show that the musician, by cultivating a "polyphonic ear," is enabled to follow the many simultaneous streams of melody that are intertwined to form the plexus of a symphony for full orchestra, or other highly developed composition; to say nothing of his ability to detect the slightest errors in such a work proceeding at a high speed, whether of a technical and mechanical nature, or due to a want of sympathy in the performers with themselves, or the work or the conductor's direction of it, as shown by an indifferent quality of tone, proper adjustment of the relative degrees of power, etc. All such facts are astounding and defy explanation. They puzzle the psychologist when contending that the human mind really entertains but one thought at a time. Yet strange to say our modern music is rendered possible by a systematic deception of the ear. That the great physicist Helmholtz is himself deceived in this is known from the argument sustained in his elaborate

work "*On the Sensations of Tone as a Physiological Basis for the Theory of Music*," which has the following passage: "We often hear four musical amateurs, who have practised much together, singing quartets in perfectly just intonation." This error has led Ellis, Bosanquet, and others (who though professing to work scientifically allow their senses to mislead them) to try to construct instruments on "duodenal" and other systems, in the belief that our modern music may be rendered in tune. They are attempting the impossible. If musicians adopt an extremely complex system, based upon the laws of absolute truth, they must be content with very simple music. If they devise a very simple system they may produce most elaborate music. The great oriental nations of antiquity adopted the former, and all Christendom has accepted the latter alternative. Yet a composer's mind is not more biased or warped by his working habitually with a tempered intonation than our notions of a straight line are by living on a globe. If the Greek architects had not known the defects of the eye, and learned to deceive it, their works would not have been so entirely satisfactory. If modern musicians had not learned to deceive the ear, their marvellous productions would have been impossible. As in the Parthenon there are everywhere visible most subtle convex curves lying in vertical planes and no dead levels except in the subbasement which was unnoticed, so in modern music there is little slavish adherence to so-called truth except in the interval of the octave, which is so nearly like a unison as to be similarly unobserved. And even this is not always perfect; for tuners of piano-fortes make the octaves too large in the seven or eight highest notes when they extend to high C to enhance the brilliancy of the instrument and remove the insipidity of the tones at this pitch.

It was discovered in 1837 that not only were there certain irregularities and optical illusions in the greatest works of the greatest Greek architects, but that these were a source of expression as well as tending to correct the appearances of hollowiness, chiaroscuro, etc. They knew well that a long horizontal line viewed from below would appear to be curved and many similar peculiarities. The fact of deviations, the determinations of their exact nature, the theories on which they were founded, and the consequent proofs of optical refinements of which the modern world had hitherto been in ignorance being set forth by Mr. Penrose, were published by the Society of Dilettanti, in London, in 1852. In the arts of Greece generally may be particularly noted limited aim and perfect achievement. In Christendom an ideal of impossible attainment is striven after in religion and morality, as in the imitation of the life of the Founder of Christianity, and also in the fine arts. Hence the apparent simplicity of Grecian as compared with Gothic architecture, of the Classic drama as compared with the Shakespearian, of the homophonic music of the Orient as compared with the polyphony of the West. The Greeks preferred delicacy of treatment to powerful effects and variety of range. Their music formed no exception. It was not limited in scope from want of invention but by design. The public singers did not force their voices to produce very loud or very high notes, to give the thrilling effects that opera-goers now applaud. All was artistically restrained. Vitruvius was taught by the Greek architects, but the modernizing spirit of Plutarch's time (one hundred years later) led to all such delicacy or subtlety of proportions being regarded as old-fashioned, pedantic, and even unintelligible. In the general decadence of all Greek art, loss of sensibility is similarly perceived. The indifference with which the imitations of Greek architecture in London, Paris, and Berlin were regarded was not simply because there were no sculptures or imitations of animal forms to impart life, but because all was stiff, cold, hard, and merely geometrically true.

Whereas the keen artistic perceptions, the fine sense

of discrimination, of delicate variations of the best Greek architects, and the length of time during which they worked out their ideas, concentrating their highest intellects upon the various problems that arose and the appreciation of their labors by observers, led to results far different from our contract work. The being made conscious of this is an important event in the artistic experience of the modern world. It is now seen that in the Parthenon and Theseum, the absence of perfectly straight lines which do not return into themselves, lead to the sense of unity or completion as well as that of security or permanence.

It must be specially noted here that the works were to be contemplated as wholes and not studied by a relic or single column. For in this musicians find the chief point on which to base the analogy and show the impossibility of following the advice of Helmholtz. They are compelled to produce compositions as complete wholes, and not as a series of chords detached by silences.

The harmonies must move and form compact tonal structures. They must also be linked together. Were it not for this it would be easy to exhibit all chords with the most perfect proportions. By devices similar to those of the Greek architects, the musician hides every *apotome*, and with such success that even Helmholtz himself is deceived. His misconceptions are fully demonstrated in "Imperfections of Modern Harmony" in the *Popular Science Monthly*, vol. xvi., p. 510. They are referred to here, not to expatiate on the errors of learned men, but to prevent designers of musical instruments from wasting time and thought. Prof. Airy, in his celebrated work "*On Sound and Atmospheric Vibrations*," quotes the music of "God Save the Queen" in numbers, but omits certain notes that seem to have puzzled him. If now these notes, with their numbers, are inserted, his dilemma will be seen, and a convenient illustration found in proof of the unsuspected or disbelieved fact that there are five fundamental ways of attempting to deceive the ear in the performance of this well-known and comparatively simple strain, but that its perfect intonation is impossible. 1st. The errors may be systematized, as by the adoption of any one or many forms of "temperament" (as on a piano-forte). 2d. The errors may be glossed over and atoned for by disarming the coldly critical faculty, by appeals to the feelings, and a general giving and taking, mutual compromises being made between the singers, etc.; in which case they will be undefined and unacknowledged; yet they must be variations of the following schemes. 3d. When the four melodies are correct, the chords are incorrect.

	God	Save	Our	Gra
Soprano or melody..	C 48	C 48	D 54	B 45
Contr 'alto.	G 33	A 40	A 40	G 36
Tenor.....	E 30	E 30	F 32	D 27
Bass	C 24	A 20	D 27	G 18

At "our" the chord is out of tune for D:A (27:40) is not in the required ratio of 2 to 3. See "ACOUSTICS," sec. 45, in *ENCYCLOPÆDIA BRITANNICA*, p. 101, Am. Ed.

4th. If now the chords are in the required ratio the four melodies must be slightly tampered with. To avoid complication the keynote C will here be represented by 128.

C 128	C' 129½	D 144	B 120	C 128
G 96	A' 108	A' 108	G 96	G 96
E 80	E' 81	F 86½	D 72	E 80
C 64	A' 54	D 72	G 48	C 64

The notes marked (') are altered from the proportions established for the diatonic scale, that the pro-

portions of the combined notes in each column, that form chords, may be correct.

But this form of variation is hardly possible in actual performance, for the singers would sustain or repeat notes at the same pitch (being ignorant of the requirements of the harmony), unless they modified them as in the second case hypothecated above. Therefore the errors would not allow the singers to return to the pitch at which they started, if the chords were sung with perfect intonation. 5th. They would proceed in this manner:

C 129½	C 129½	D 144	B 120	C 128
G 97½	A 108	A 108	G 96	G 96
E 81	E 81	F 86½	D 72	E 80
C 64½	A 54	D 72	G 48	C 64

In an ordinary brick wall any one brick rests on one-half of two others. A similar "division of the difference" is noted in quartet music, by which unconnected or, more correctly speaking, distantly related harmonies are bound together. By the use of such "ligatures" the most novel and strange combinations of tones are literally welded together in elaborate music.

If the present harmony be only slightly enriched the divergencies must be more numerous, and partake also of the nature of those shown in 4; while as already stated in actual performance they would be rendered as in 1 or 2. Here is a simple illustration in C being represented by 336:

C 336	C 336	D 384	B 320	C 341½
G 252	F Sharp 240	F Sharp 240	G 256	G 256
E 210	E 216	C 168	D 192	E 213½
C 188	A 144	A Flat 134½	G 128	O 170½

The third C of the top line, the second G of the second line, the second E of the third line, and the second C of the fourth line are higher than the corresponding notes in the first column. The melodies are untrue. Although the second C of the top line is retained at the same pitch in the second column, it is necessary to change the altitude of the second E of the third line that this column or chord may be in the required ratio of 6 : 9 : 10 : 14.

These figures not only prove the variations, but give the exact measure of the variations. And these must occur whenever the harmonies pass the boundaries of the great triune system of triads, in any key. This consists of the chord of the tonic, with its dominant (found by multiplying the vibration numbers of the tonic triad by three and dividing by two), and its subdominant (found by dividing the same numbers by three and multiplying by two). The mere use of the relative minor chords of these major harmonies leads to the necessity of a compromise, as shown above.

It is, therefore, possible for some simple negro-melodies to be sung in tune in four-part harmony, but not music rising even to the very low level of an ordinary hymn. Helmholtz and Ellis, by their arguments, refer to music intended for the gratification of musically intelligent persons. It must here be noted that the greater the brilliancy and splendor of the harmony the greater latitude the ear allows the musician in his departures from strict mathematical proportion. This does not wholly account for the predominance of discords in modern music of the best kind. One must look deeper for the causes of artistic phases. Yet the knowledge of the fact has given a freedom to composers in projecting their mighty harmonies, representing the passionate strivings, aspirations, disappointments, etc., of noble souls (as in the truly heroic "Eroica" Symphony by Beethoven, or the psychologic studies of a Wagner or Liszt), and to gain a certain

onward sweep or dynamic power in an elaborate movement. Dissonant compounds of tones demand "resolution," or progress. They indicate unrest, and hold us spellbound as they pass points of comparative rest. Hence it is incorrect to say that the proportions given in sections 45 and 46 in ACOUSTICS in *ENCYCLOPÆDIA BRITANNICA* can be preserved in ordinary quartet music. The best executants strive to hide such unavoidable discrepancies with subtle skill, and an art-concealing art worthy of the best Greek architects.

Yet the difficulties they have had to overcome must not be underestimated now that they are surmounted. Occasionally among amateurs they reappear and cause perplexity. For instance, the violin is tuned to the key of "D." If now a composition is to be played in some other key, the open strings of this instrument are avoided, not because they yield a different quality of tone from the notes made with the fingers, but because of their pitch being incorrect. The cello is tuned like the viola—to the key of "G," and hence corresponding peculiarities are noticed when this key is not used for them.

When tuning such instruments to the piano-forte, to perform piece in a key with two or three more sharps, it is important that the pitch of "A" be carefully adjusted, so that it may not be ever so small a degree above the corresponding note of the piano-forte. When preparing to play in a composition with several flats this "A" should be tuned a very little above the pitch of the piano-forte. In both cases the other strings are tuned, as usual, on the Pythagorean system. If these conditions are not observed the unsatisfactoriness of the accords will become unpleasant to the performers. To explain the reasons here would be to occupy space for a subject that falls under the head of "temperament." In the present article it is intended simply to point to the fact that the ear being deceivable, modern musicians have learned to deceive it, and put together the marvellously elaborate architectonic forms, or gossamer sound-fabrics, such as are found in the organ fugues of Bach or the orchestral scores of Wagner. To honor musicians let it be said that "they prefer creating an art with the imperfect proportions that are attainable, to indulging in useless sighs for perfect proportions that are unattainable."

Having seen that such art-works would be impossible without deviations from absolute truth, as regards the proportions of intervals, it is well to point out that some variations are made by musicians during performance that are not unavoidable, but voluntary, and simply to heighten the effect. Their aims in this respect are precisely analogous to those of the Greek architects. For, as obedience to mathematical truth for art-works of stone rendered them "hard and dry," in a particular sense, so, in tone-works, obedience to metronomic time-beats, and the observance of perfect proportions for intervals (in those cases where deviations are optional), lead to an inartistic, mechanical delivery that is immediately stigmatized. Hence the variations of *tempo* that a good conductor makes in a symphonic movement by Beethoven, with such gradations that they do not attract attention, or the *nuances* (*tempo rubato*, etc.) a good pianist makes in a nocturne by Chopin, or the gradual raising or depressing the pitch on a penultimate note as it gradually approaches the tonic, in accordance with the character of the emotion expressed.

Psychologic principles override mathematical principles in all such cases; and the sense of hearing is not offended, but excited, in the desired manner. The ear accepts as true that which is a true revelation of a soul-state, rather than mere symmetry of speeds of vibrations or recurring musical accents or phrases. These motions, to resemble emotions, must necessarily be subject to delicate and constant fluctuations.

The ability to remember the actual pitch of tones so well as to dispense with a tuning-fork distinguishes some musicians from early childhood. An extraordi-

nary fastidiousness, as regards quality of tone (timbre), is common in China among the Musical Mandarins. Instruments of extremely soft and gentle tones—such as the neck flute—are highly prized in India. Some orientals employ musical intervals smaller than our semitone, and the Maories perceive most delicate variations of pitch.

To estimate rightly the powers of the human ear it is necessary to review the highly elaborated systems of music that were brought to perfection by ancient nations, and especially that of the Chinese. Their knowledge of acoustics and the particular effect of various modes of causing strings to vibrate was so marvellously great as to be out of all proportion to the art-works created to display such beautiful tones. Hence, their best music appeals more to the sensuous nature and understanding than the imagination and the emotions.

A few hours from birth, when the skin of the newly-born infant is not sensitive to the prick of a pin, and the eyes are unaffected by flashed lights, the ears are open to impressions. Through these gates the mental perceptions are first aroused. The sense of hearing is the first to awake and the last to sink to sleep. The cry of the young child, animal, or bird goes straight to the heart of the mother, and needs no theory to explain its meaning. It is most truly interpreted there. We recognize our friends by their voices, and learn their moods by the music of their speech, yet not by studying the overtones that cause the particular quality of their voices, or by consciously analyzing the variations of pitch in sentences, but, as it were, by instinct. Musical tones, as a means of expression, are similarly significant, and thus the art of music obtains its justification. (S. A. P.)

EARLY, JUBAL A., a lieutenant-general in the Confederate army, was born in Franklin co., Va., Nov. 3, 1816. He entered West Point in June, 1833; after graduating in 1837 was appointed second-lieutenant in the Third artillery, and served in the Seminole War in 1837-8. In July, 1838, he resigned his commission, studied law, and practised at the bar of his native county from the beginning of 1840. He was a member of the legislature of Virginia in 1841-2. When the Mexican War broke out, he was made major of the regiment of Virginia volunteers, and served with great gallantry in several important engagements.

He was a delegate to the convention of 1861, opposed and voted against the ordinance of secession; but, when it was adopted, he signed it, and entered the service of the Confederate States as colonel of the Twenty-fourth Virginia regiment. As colonel he commanded a brigade at the action of Blackburn's Ford on Bull Run, on the 18th of July, 1861, and at the battle of Manassas, on the 21st of July. For his gallantry on the latter occasion he was promoted to a brigadier-generalship, to rank from the day of battle. He was engaged in the battle of Williamsburg on the 5th of May, 1862, where he was severely wounded. After his return to duty during the seven days' battles around Richmond, in June and July, 1862, he was assigned to the command of a brigade in Ewell's division, Jackson's corps, and was engaged in the battle of Malvern Hill, on the 1st of July; also in the battle of Cedar Run or Slaughter's Mountain, on the 9th of August, 1862; and in the subsequent operations against Pope on the Rappahannock and around Manassas. At the battle of Sharpsburg, or Antietam, on the 17th of September, he succeeded to the command of the division by reason of the wounding of the division commanders (Ewell on the 28th of August, and Lawton in the battle), and he commanded the division at the battle of Fredericksburg, on the 13th of December, 1862. He was subsequently promoted to the rank of major-general, and assigned to the command of Ewell's division. During the battle of Chancellorsville, on the 1st of May, 1863, Gen. Early held the lines at Fredericksburg, and had several engagements with Sedg-

wick's corps. He led the attack which resulted in the capture of Winchester in June, 1863, and took an active and conspicuous part in the Pennsylvania campaign which immediately followed that event, leading the van of the Confederate army, which reached Chambersburg, Pa., June 16, and participating in the decisive battle of Gettysburg. He was engaged in all the subsequent operations of the army of Northern Virginia in the fall of 1863, and at Mine Run commanded Ewell's corps.

In the winter of 1863-4 Gen. Early was sent to the Valley of Virginia at the time of Averill's raid, and remained in command there until March, 1864, when he returned to his division, and was engaged in all the battles in the Wilderness, beginning on the 5th of May, 1864. On the 8th of May he was assigned to the command of A. P. Hill's corps, by reason of the sickness of that general, and remained in command until the 21st of May, which period embraced all the operations around Spotsylvania Court-house. Gen. Early was engaged in the operations about Hanover Junction, in command of his division, but at their close (May 26) he assumed command of Ewell's corps, that officer being unfit for duty on account of severe sickness.

On the 31st of May Early was made a lieutenant-general, and participated in the important operations about Cold Harbor, until the 12th of June, when he was detached and sent in pursuit of the Federal general Hunter, whom he intercepted at Lynchburg, when, after a slight engagement, the latter retreated precipitately, and was pursued into the mountains back of the town. Then, having been joined by Gen. Breckinridge's command, Early moved rapidly down the valley, crossed the Potomac into Maryland, defeated Gen. Lewis Wallace at Monocacy Junction July 9, and then threatened Washington on the 11th. After demonstrating in front of Washington until the night of July 12—during which time he arrived in sight of the dome of the capitol—when, finding the works had been heavily reinforced from Grant's army, and it was not practicable to make an attack with his small force of less than 8000 men, Early retired, and returned to the Valley of Virginia. Here, until late in the winter, he maintained a protracted and eventful campaign against Sheridan. Gen. Early displayed his usual pluck and dashing military skill, but the result of the long and active campaign was unfavorable to the Confederates. On the 30th of March, 1865, Gen. Early was relieved of his command. Upon this occasion Gen. Lee wrote him a letter, in which he expressed the fullest confidence in Gen. Early's "ability, zeal, and devotion to the cause," and thanked him for "the fidelity and energy" with which he had always supported Gen. Lee's efforts, and for "the courage and energy" which he had always manifested in the service of the South.

After the surrender of the Confederate armies Gen. Early succeeded in reaching Mexico, where he remained for several months; he then went to Cuba, and finally to Canada, and did not return to Virginia until the spring of 1869. In 1870 he resumed the practice of the law at Lynchburg. He has published a valuable historical work, *Memoirs of the Last Year of the War* (1867).

(E. L. D.)

EARTH-ALMOND, CHUFA. This is one of the *Cyperaceæ*, or sedge-grasses, and stands almost alone among this numerous family in being of service to man. It is a native of the south of Europe, where it has long been known for its small tubers, which are produced in great abundance. From these a drink called *orchata de chufas* is made, which is very popular with the lower classes in Spain. To make the drink the tubers are beaten to a paste, mixed with a little sugar in water, and then strained, when it looks like milk. The tubers, however, according to Prof. Jackson of Boston, contain a peculiar form of sugar. On analysis he found in them—

Water.....	15.40
Fibrous matter.....	21.45
Starch.....	27.
A form of sugar.....	12.25
Wax.....	50
Fat oil.....	16.65
Mucilage.....	6.65

Eaten raw, the tubers taste like chestnuts or cocoanuts. They were introduced to America in 1845 by the United States Patent Office, and, unlike many new introductions, achieved at once a popularity in the Southern States. The tubers are planted two feet apart each way, a number in a hill, and the produce of one bushel to the acre has been from 200 to 500 bushels. They are somewhat troublesome to harvest, and the most profitable way is to let swine gather the crop. A native species, *Cyperus Hydra*, also makes tubers, much smaller than those of the earth-almond, besides having numerous creeping roots, which make the species a terror to the Southern farmer. The earth-almond resembles the *Hydra*, or "nut-grass," in appearance, but is free from its vices. Repeated attempts have been made to introduce it in the place of coffee. John Ludwig Christ issued an octavo volume in 1801 at Frankfort-on-the-Main to show the immense amount of money which Germans might save by the universal use of this instead of coffee. Those who have experimented with it in America regard it as the best of the many substitutes suggested, but not likely ever to be as popular as the original. It seems to thrive well in many parts of the United States, even in Minnesota, but the best results have been obtained in rich and rather damp sandy soil in Alabama.

(T. M.)

EARTH-WORM (*Lumbricus*, L.), a genus of Annelid animals of the order *Oligochaeta* and family *Lumbricina*. The body is cylindrical, attenuated at both extremities, and composed of a number of narrow rings or segments (in some cases upwards of 150), the most anterior of which shows on its ventral surface the oral aperture; there is no true differentiated head. A thickened, flesh-colored zone, formed by the union of 6-8 of the anterior segments, and designated the *cingulum* or *clitellum*, is present in the adult. The mouth is edentulous, and conducts into a muscular pharynx extending as far back as the seventh segment; upon this follows a narrow oesophagus, a crop or "proventriculus," and the muscular gizzard, succeeded at about the eighteenth segment by the straight sacculated intestine. The circulatory system consists of three principal longitudinal trunks (one dorsal, or *supra-intestinal*, one ventral, or *sub-intestinal*, and one situated underneath the nerve-cord, *sub-neural*) and their branches, which carry a deep-red, non-corpusculated blood-fluid. Five to eight pairs of so-called hearts, formed by the expansions of the commissural vessels, are situated in the anterior region. A colorless corpusculated fluid, answering to the blood of other invertebrate animals, occupies the body-cavity. The nervous system consists essentially of a pair of cephalic ganglia lodged over the pharynx in the third segment, and a ventral ganglionic chain and its branches. A pair of greatly convoluted tubes, known as the *segmental organs*, subserving either a respiratory or renal function, and opening internally into the perivisceral cavity by means of wide funnel-shaped apertures, and externally by superficial pores. The sexes are united in the same individual, but mutual fecundation takes place. The generative organs consist of two pairs of testes, opening on the ventral aspect of the fifteenth segment, one pair of minute ovaries, whose oviducts open on the fourteenth segment, and two pairs of spermathecae, or seminal receptacles, situated in the tenth and eleventh segments. The eggs are deposited in chitinous capsules, from one to fifty or more in a capsule, and the young undergo no metamorphosis. Locomotion in the earth-worm is effected by eight rows of short bristles or setae, four of which are

developed not far from the median line of the ventral surface, and the other four laterally.

The various species of the genus *Lumbricus*, while they are to be met with over the greater portion of the earth's surface, are yet governed in their local distribution by certain particular conditions of the soil, which are not always readily apparent. Localities which retain for a considerable length of time the moisture of the earth, such as fields, meadows, and paved court-yards, are much more populous than dry, sandy, or gravelly spots, where but a scanty vegetation is supported, and localities where the depth of soil does not afford sufficient protection from the cold of winter are usually deserted. Perrier found that exposure to the dry air of a room for only a single night was fatal to the animal, while, on the other hand, individuals retained their vitality after being completely submerged in water for a period of nearly four months. Earth-worms are nocturnal in their habits, and but rarely, except in the pairing season, expose their bodies during the daytime, lying usually concealed in their burrows at some distance from the surface; even during their nocturnal wanderings they but rarely emerge completely from their subterranean abodes; and indeed it has been asserted that in a perfectly healthy condition they never leave them. The senses are but feebly developed, that of hearing being completely absent. Darwin found that while these animals were entirely indifferent to the deepest and loudest tones emanating from the human voice, a bassoon, piano, or metallic whistle, and consequently to those undulations of the atmosphere which convey the impression of sound to the human ear, they were extremely sensitive to the vibrations transmitted through any solid body. Worms that under ordinary circumstances appeared indifferent to the sound of a piano retreated instantly into their burrows when the pots containing them were placed on the instrument and the note C on the bass clef or G above the line in the treble was struck. The visual organs are completely absent, yet the observations of both Hoffmeister and Darwin seem to prove that not only are these organisms cognizant of the difference between night and day, but that even minor changes of luminosity are keenly appreciated by them. The power of distinguishing between the various degrees of luminous intensities resides in the anterior portion of the body, or what corresponds to the head, and hence it is conjectured that for the exercise of this power the worm is dependent upon the rays of light passing through the skin and in some manner exciting the cerebral ganglia. The sense of smell is but imperfectly developed, and appears to be restricted to certain odors.

That the earth-worms possess a certain amount of intelligence appears to be almost indisputably proved by the manner in which they habitually plug up (probably for the purpose of protecting their bodies from the cold moisture of the adjacent earth) their burrows with leaves, their method of procedure, as observed by Darwin, being almost precisely that which would be employed by a man in plugging up a tube with similar objects. In a vast majority of cases it was found that the leaves were drawn in such a way as to encounter the least possible amount of resistance, those with broad bases being seized at the tips, and, *per contra*, those which separated (pines) or spread out towards their apices being seized at their basal ends.

One of the most interesting facts connected with the lives of these lowly organisms, and perhaps one of the most surprising in the entire range of physiographic science, is the important part played by them in the economy of the earth's history—namely, the formation of vegetable mould. From the observations of Mr. Darwin it would appear that the entire vegetable mould covering a country has been, and constantly is being, subjected to a species of animal digestion, it being at successive periods passed through the intestinal canals of worms. It has long been known that small objects scattered over the surface of a field or meadow disappear in course of

time beneath a superficial layer of mould or turf, apparently undergoing a process of sinking, as induced by the force of gravity drawing toward the centre of the earth. And, similarly, fields that were at one time stony and considered unfit to be worked, have been found after a number of years to be covered with a comparatively deep deposit of soil, and in some cases to such an extent as to leave no superficial traces of the previously existing stones. In like manner, paved walks and the floors of ancient ruined buildings have, after a lapse of years, been buried beneath a greater or less depth of soil, and human relics and utensils that had doubtless been left exposed on the surface have been turned up by the ploughshare from varying depths of a first-sown field. This disappearance has been conclusively shown by Mr. Darwin to be due in great measure, if not almost exclusively, to the quantity of fresh earth that is constantly being brought to the surface in the form of "worm-castings"—i.e., the earth that is periodically being passed through and ejected from the intestinal canals of worms as a result of their burrowing operations. From data accumulated from various sources, and largely as the result of his own personal observations, Darwin estimates the quantity of worm-castings annually thrown up over each square acre of land to be equal in weight to no less than fifteen tons; and if this fifteen tons' weight of material were equally distributed over the surface of the acre, it would raise the general level by about fourteen-hundredths of an inch. In other words, about one inch of fresh soil would be deposited in the course of seven years. Assuming with Darwin that there are, on an average, 26,800 worms to each acre of land—which is about one-half the number claimed by Hensen for the most favored localities—then each single individual in the above period of seven years must have brought to the surface no less than one hundred and forty ounces of material! When it is borne in mind that worms live only in the top layer of the soil, and usually at depths from the surface of from four to twelve inches, and since they are constantly reburrowing and throwing up their castings, it is self-evident that in the course of every few years this top soil, or what constitutes the vegetable mould, must pass in rotation through the intestinal canals of these creatures. Through this process of intestinal rotation, it is contended, the ground is brought into a suitable condition for vegetable development. By the constant breaking up and loosening of the earthy material free access is given to the penetration of the air and the atmospheric waters, and the soil rendered fit for the retention of moisture and for the absorption by it of all soluble substances. The bones, shells, and other hard parts of animals, as well as the leaves, stems, and branches of plants, are rapidly buried beneath the surface, and are there, in a slowly decomposing condition, brought within the assimilating influence of the living roots.

The specific determination of the various forms of *Lumbricus* has not yet been satisfactorily accomplished, nor has it yet been absolutely determined to what extent the American forms are identical with those of the Eastern hemisphere. (A. H.)

EASTBURN, MANTON (1801–1872), an American bishop of the Protestant Episcopal Church, was born at Leeds, England, Feb. 9, 1801. He came to America while a child with his parents, and graduated at Columbia College, N. Y., in 1817. After studying theology at the Episcopal seminary in New York, he was ordained deacon in 1822, and made assistant minister of Christ Church, New York. In 1825 he was ordained priest, and became rector of the Church of the Ascension in 1827. He was consecrated assistant bishop of Massachusetts Dec. 29, 1842, and in the following February became bishop of that diocese. In his doctrinal views he was decidedly Low Church, and severely rebuked some mildly ritualistic practices introduced by Rev. Dr. Croswell in the Church of the Advent, Boston. He co-operated with other denominations in religious and benevolent work. He died at Boston, Sept.

12, 1872. Besides sermons and pastoral charges he published *Lectures on Hebrew, Latin, and English Poetry* (1825); *Essays in Biblical Literature* (1829); *Lectures on the Epistle to the Philippians* (1833); and edited with notes *Thornton's Family Prayers* (1836). His elder brother, JAMES WALLIS EASTBURN (1797–1819), was also a minister of the Episcopal Church, and was associated with Robert C. Sands in literary work, but died at an early age. His chief poem, *Yamoyden*, (1818), was founded on the story of the Indian King Philip.

EAST GREENWICH, the county-seat of Kent co., Rhode Island, is on the west shore of Narragansett Bay, and on the New York, Providence, and Boston Railroad, 14 miles south of Providence. It has a court-house, two banks (one national), two hotels, a weekly newspaper, five churches, an academy, public schools, and a public library. It has two cotton-mills, a woollen-mill, print-works. It was incorporated Oct. 31, 1677. Population, 2887.

EASTHAMPTON, a town of Hampshire co., Mass., 5 miles S. of Northampton, and 16 miles N. of Springfield. It is on the New Haven and Northampton Railroad, and on the Mount Tom branch of the Connecticut River Railroad. It is a handsome village, picturesquely situated at the foot of Mount Tom, and the Mankam River affords water-power. Easthampton has a town hall, a good public library, the well-endowed Williston seminary for boys, a national bank, 4 churches, and a weekly newspaper. Among the industrial works (which are extensive) are manufactories of buttons, rubber goods, suspenders, steam-pumps, iron castings and cotton yarn. Valuation of the township, \$2,340,500; annual public expenditure, \$25,397. There is no town debt. Easthampton was settled about 1657, and was incorporated in 1785. Population of township, 4206.

EAST LIVERPOOL, a city of Columbiana co., Ohio, is on the Ohio River, 24 miles above Steubenville, and 44 miles W. N. W. of Pittsburg, on the Cleveland and Pittsburg Railroad. It has two national banks, 4 hotels, 3 weekly newspapers, 9 churches, and 5 schools. Its chief manufacture is pottery, for which there are about 30 works, besides brick-yards and a fire-brick-factory. The other industries are a foundry, glass-factory, two stave-mills, a flour-mill, and planing-mill. It has water-works and gas-works. It was settled in 1810 and incorporated in 1837. Its property is assessed at \$1,750,000, its public debt is \$30,000, and its yearly expenses \$25,000. Population, 5568.

EASTMAN, SETH (1808–1875), an American army officer, was born at Brunswick, Me., Jan. 24, 1808. He graduated at West Point in 1829, and served in the infantry on the western frontier. In 1833 he became professor of drawing at West Point, and remained there seven years. He then served in the Florida War, and after spending some years in Minnesota and Texas, in 1850 went to Washington, and was employed for five years in the bureau of Indian affairs. He served in Utah in 1857–58, and after the outbreak of the civil war was employed as a mustering-officer at various points in the North. In 1863 he was retired from active service with the rank of lieutenant-colonel and brevet brigadier-general. He continued, however, to discharge such duty as was assigned to him till his death, at Washington, D. C., Aug. 31, 1875. He prepared a *Treatise on Topographical Drawing* (1857), but his most important publication was the illustrated work on the *History, Condition, and Future Prospects of the Indian Tribes in the United States*, which was published by order of Congress (Washington, 1850–57).

EASTMAN, MARY, an American novelist, wife of Col. Seth Eastman, was born at Warrenton, Va., in 1818. She was the daughter of Dr. Thomas Henderson, and was married in 1835. Having become familiar with Indian life through a residence of many years

on the frontier, she published *Dacotah, or Life and Legends of the Sioux* (1849), *Romance of Indian Life* (1852), *Chicora* (1854). When Mrs. Stowe attacked American slavery in *Uncle Tom's Cabin*, Mrs. Eastman published *Aunt Phillis's Cabin* (1852), which was considered the most successful attempt at a reply. She also contributed many shorter tales and sketches to magazines, some of which were collected in book-form.

EASTON, the county-seat of Talbot co., Md., is on the head waters of Third Haven River, a navigable inlet of Chesapeake Bay, 50 miles south of Baltimore. It is on the Delaware and Chesapeake Railroad, 81 miles south of Wilmington. It was settled in 1737 and incorporated in 1787. In colonial times it was known as Talbot Court-house, and was the centre of social life of a large district. Evidences of its former importance are to be seen in the handsome suburban residences of the olden style. It is the seat of a Protestant Episcopal bishop. Besides the court-house, Easton has several fine buildings, among which are the music hall, Masonic and Odd-Fellows' halls. It has 3 hotels, a national bank, 3 weekly newspapers, 8 churches, 5 schools, an academy, a female seminary, and orphans' home. The industrial works are a paper-mill, 3 foundries, 2 flour-mills, 2 fertilizer-factories. Its property is valued at \$1,200,000; its public debt is \$5000, and its yearly expenses about \$4800. It is the largest town on the eastern shore of Maryland. Population, 3005.

EASTON, a city of Pennsylvania, county-seat of Northampton co., at the confluence of the Lehigh River with the Delaware, 67 miles by rail N. of Philadelphia. Across the Delaware lies Phillipsburg, in New Jersey; and on the opposite side of the Lehigh is the borough of South Easton. The town is regularly laid out upon a site somewhat hilly. Situated in an iron-ore region, and near the best basins of Pennsylvania anthracite, Easton and its vicinity have many large and important iron-works. Business is facilitated by the Morris, the Lehigh Navigation, and the Delaware canals. The following railways either end here or pass through or very near the city; the Delaware, Lackawanna, and Western, the Lehigh Valley, the Central Railroad of New Jersey, the Delaware, Belvidere, the Easton and Amboy, and the Lehigh and Susquehanna. Besides its iron-works, Easton has a large number of other manufactories, including tanneries, machine-shops, paint-works, and manufactures of cordage, pottery, furniture, etc. It is the seat of Lafayette College (Presbyterian), has an opera-house, a library association, 9 public-school buildings, newspapers, national banks, street railways, gas-works, and an abundant water-supply. The adjacent borough of South Easton has large railway shops, iron- and wire-works, a cotton-mill, and other industrial works. A chain bridge and other bridges connect it with Easton. Population of Easton, 11,924; of South Easton, 4534. This town was founded in 1728, and incorporated as a borough in 1789. In early times its site was known as the Forks of the Delaware.

EASTON, NICHOLAS (1593–1675), a colonial governor of Rhode Island, was born in England in 1593. He was by trade a tanner, and being a man of strong religious feeling, emigrated with his two sons, Peter and John, to the Puritan settlements in New England. Landing in May, 1634, he lived for a short time at Ipswich, Mass., but in the next spring commenced Agawam or Newberry. In 1638 he built the first house in Hampton, but in consequence of the Antinomian controversy withdrew to Pocasset, R. I., where he was admitted a citizen in August, 1638. In the following May he removed to Newport, where he built the first house, which however was burnt by the Indians two years later. He had already been chosen a magistrate of the colony, and during the time of

the English Commonwealth is said to have favored a republican form of government. In 1650 and again in 1654 he was chosen president of the council. In 1663 he erected the first wind-mill on the island. In 1665 he adopted the principles of the Society of Friends, but this did not prevent his being chosen deputy governor in the next year. This position he held for four years, and in 1672 he was made governor, and was re-elected in 1673. He died at Newport, R. I., Aug. 15, 1675.

His son, JOHN EASTON, was for many years attorney-general of Rhode Island and in 1674 was chosen deputy governor. In 1690 he was elected governor, and during the five years in which he held this office strenuously resisted the encroachments of Sir William Phipps, the royal governor of Massachusetts. He also wrote a *Narrative of the Causes which led to Philip's Indian War of 1675*, which was published at Albany in 1858.

EASTPORT, a town and island of Washington co., Me., is on Passamaquoddy Bay, and is the extreme eastern point of the United States. It is connected with the mainland at the north by a bridge, 1280 feet long. The island was formerly called Moose Island, and is separated from Lubec in Maine by Cobscook Bay, and from Campobello and other islands of the Province of New Brunswick by Passamaquoddy Bay. The spacious and well-protected harbor is never closed with ice, as the tide rises here 25 feet. Eastport has 2 banks (1 national), a custom-house, United States signal-station, a weekly newspaper, 8 churches, a public library, a high-school, and other schools. The inhabitants are largely employed in connection with the fisheries. Within a few years past much attention has been given to sardine canning, there being 13 factories in operation, which pack nearly 4,000,000 cans yearly. The other industries of the town comprise 2 saw-mills, with ship-yard and dry-docks, stove-factory, and other factories. Eastport has daily steam communication with Portland, Boston, St. Johns, N. B., and Calais, Me. In July, 1814, it was captured by a British fleet from Halifax, and remained in possession of the British for some months. Population, 4006.

EAST SAGINAW, a city and port of entry of Michigan, in Saginaw co., on the left bank of the navigable Saginaw River, nearly opposite Saginaw City, 15 miles from Saginaw Bay, and 90 miles N. N. W. of Detroit. It has a river-front of 4½ miles, and an area of 3905 acres. It is on 5 lines of railway—the Flint and Pere Marquette, the Saginaw, Huron, and Tuscola, the Port Huron and North-western, the Detroit and Bay City, and the Michigan Central—and it is the terminus of some lines of branch-railway, and has extensive commerce on the lakes. It has street-railways, well-paved streets, Holly water-works, gas and electric lights, and is one of the best-built cities in the State. It is the headquarters of vast lumbering interests, and has numerous manufacturing and industrial works connected with that trade. The city is well sewered. It has 11 public and several Catholic school-houses, a public library of 6000 volumes, well-endowed, a home for the friendless, an orphanage, a hospital, 14 churches, 6 banks (4 national), with \$700,000 capital, and over \$275,000 surplus. The manufactures include wooden-wares, axes, tools, saws, files, boats and other vessels, oars, dairy salt (from wells), flour, belting, carriages, machinery, and a great variety of other goods. East Saginaw has also a large wholesale and distributing trade, and is a great shipping-point for farm-products and for horses. It has 5 daily and 3 weekly newspapers. The valuation is about \$12,000,000, and the public debt is \$600,000. East Saginaw was settled in 1836, and became a city in 1859. The population has increased from 3001 in 1860 to 19,016 in 1880.

EAST SAINT LOUIS, a town of Illinois, St. Clair

co., is on the Mississippi, opposite the city of St. Louis, Mo. It is the converging point of a great number of railways, and is connected with St. Louis by a splendid bridge of steel. Adjoining East St. Louis are the great national stock-yards, one of the largest cattle-markets in the world, covering several hundred acres, and having a bank, an exchange building, and large hotel accommodations. The town has car-works, iron-works, 2 newspapers, several banks, a free public library and reading-room (5000 volumes), public and Catholic schools, the Howe Literary Institute (Baptist), and large grain-elevators. Communication is had with St. Louis by ferry and by tramway over the bridge. Population, 9185.

EATON, the county-seat of Preble co., Ohio, is on the Cincinnati and Chicago Air-line Railway, 53 miles N. of Cincinnati. It has 2 banks (1 national), a fine opera-house, 2 weekly newspapers, 8 churches, 2 good graded schools. It has an iron-foundry and machine-shop, 3 saw-mills, a grist-mill. It is 1200 feet above the sea-level and is geologically at the outcrop of the Niagara and Clinton formations, and is noted for its beauty and salubrity. On the west side of the village is St. Clair's (or Seven-mile) Creek, with two or three cascades, making a fall of 20 feet within 100 rods. A mile west is the site of Fort St. Clair, built by Gen. Arthur St. Clair, in his campaign against the North-western Indians in 1791, and afterwards maintained by Gen. Anthony Wayne till the treaty of Greenville in 1795. During this war a supply-train on its way to Gen. Wayne encamped here, and was furiously attacked by a force of Indians under Little Turtle, but the latter were driven off. The village of Eaton was laid out in 1806 by William Bruce, and, when Preble county was organized in 1808, was made the county-seat. In and around it are several chalybeate springs and flowing wells. Population, 2143.

EATON, DANIEL CADY, an American botanist, was born at Fort Gratiot, Mich., Sept. 12, 1834, son of Amos B. Eaton and grandson of Amos Eaton, also a botanist. He graduated at Yale College in 1857, and at Lawrence Scientific School of Harvard University in 1860. In 1864 he was made professor of botany in Yale College. Besides various scientific articles published in periodicals, he has contributed to Chapman's *Flora of the Southern States* (1860) and to Gray's *Manual* (8th ed., 1868), and has published an excellent work on *Ferns of North America* (1878-79). He is also a joint author of *Algæ Americane Boreales Exsiccatae* (1879).

EATON, WILLIAM (1764-1811), an American general and adventurer, was born at Woodstock, Conn., Feb. 23, 1764. When only sixteen years of age he enlisted in the Revolutionary army, and was discharged when peace was proclaimed. He afterwards obtained a liberal education, graduating at Dartmouth College in 1790. He was clerk of the Vermont house of delegates in 1791, but entered the army again in 1792 with the rank of captain, and served five years in the North-west. He was then appointed consul to Tunis, and arrived there in March, 1799. He was successful in procuring for American vessels immunity from depredations of Tunisian cruisers. Having returned to the United States in 1803, he was appointed navy-agent of the United States for the Barbary states. He again sailed with the American fleet to the Mediterranean in 1804. A romantic project was now formed. Eaton sought out Hamet Caramelli, who had been driven from the government of Tripoli, and with him gathered a motley band of troops amounting to 500 men. These he led across the desert 600 miles against Derne, capital of a province of Tripoli, and on April 27, 1805, with assistance of the American fleet, assaulted and captured the place. Eaton was wounded, but continued to hold the city in spite of fierce assaults by the reigning bey. In June the attacking party was completely defeated, and Eaton was preparing to march on Tripoli when he learned that the American

consul-general at Algiers had concluded a peace, agreeing to pay a ransom for the Americans yet held in bondage. Eaton returned to the United States, and received many marks of popular favor, while the legislature of Massachusetts granted him 10,000 acres of land in Maine. He presented claims to the United States government for losses incurred in his expedition, but obtained no satisfaction until Aaron Burr, taking advantage of his discontent, tried to enlist him in his schemes. Pres. Jefferson then caused Eaton to be paid, and the latter testified against Burr on his trial at Richmond. Afterwards, failing to obtain such employment as his services and talents led him to expect from the Government, he retired to Brimfield, Mass., and was for a time a member of the State legislature, but became a victim of intemperance. He died at Brimfield, June 1, 1811.

EAU CLAIRE, the county-seat of Eau Claire co., Wis., is at the head of steamboat-navigation on the Chippewa River, at the mouth of the Eau Claire River, 75 miles by water from the Mississippi River and 89 miles E. of St. Paul, Minn. It is on the Chicago, St. Paul, and Minneapolis Railway, and is the terminus of the Wisconsin and Minnesota Railroad and of the Chippewa Valley and Superior Railroad. It is divided by its 2 rivers into 3 parts, which are connected by 3 bridges. It has a court-house, a city-hall, 3 banks (1 national), 12 hotels, 2 daily and 4 weekly newspapers, 12 churches, 6 public schools, a public library, gas-works, street-railway, and telephone-exchange. Its industries comprise 12 saw-mills, cutting annually 250,000,000 feet of lumber, 6 planing-mills, a paper-mill, 3 flour-mills, 2 foundries, 3 machine-shops, 5 grain-elevators. It was laid out in 1855, and incorporated in 1872. Population, 10,119.

EBEL, JOHANNES WILHELM (1784-1861), a German clergyman, was born March 4, 1784, at Passenheim, in East Prussia. He studied theology at Königsberg University and came under the influence of J. H. Schönherr, whose dualistic theosophy he embraced. After receiving his degree he taught in the gymnasium at Königsberg, and in 1807 became pastor at Hermsdorf. In 1810 he returned to Königsberg as preacher and religious teacher in Friedrich college, and in 1816 became preacher in the Old Town church there. The earnest and thoroughly evangelical tone of his preaching excited opposition among the rationalistic clergy. Ebel, by his personal piety and mystical views, had attracted a number of devoted followers, among whom were several ladies of noble families. A ministerial rescript issued in 1826, and warning congregations against mysticism and separatism, was made the basis of persecution against Ebel, who was charged with holding secret meetings and founding a sect of immoral tendency (the Königsberg *Mücker* or Pietists). The investigation was intrusted to his personal foes. Ebel having refused to submit to the trial as illegally conducted, was condemned and suspended from his office by the consistory in Oct., 1835, and his friend Diestel was similarly punished in December following. A criminal suit was then instituted against them which was conducted secretly, but after four years the accused were acquitted of all charges except founding a sect. For this Ebel was deposed and imprisoned; on appeal to a higher court he was in 1842 acquitted even of founding a sect, but was still deprived of his office. He then removed to Grunefeld and in 1850 to Ludwigsburg in Würtemberg, where he died Aug. 18, 1861. His character and life, which had long been the subject of gross misrepresentations, have been fully vindicated by Kanitz, *Aufklärung aus Aktenquellen über den 1835-42 zu Königsberg geführten Religionsprozess* (Basle, 1862). Ebel published several works, among which are *Die Weisheit von Oben* (1823; enlarged 1868); *Die Treue* (1835); *Gedehliche Erziehung* (1825); *Die apostolische Predigt* (1835); *Verstand und Vernunft* (1837); *Grundzüge der Erkenntniss der Wahrheit* (1852); *Die Philosophie der heiligen Urkunde des*

Christenthums (1854-56). Rev. J. I. Mombert has published a good biography of Ebel, with extracts from his works, under the title *Faith Victorious* (N. Y., 1882).

EBELING, CHRISTOPH DANIEL (1741-1817), a German geographer, was born near Hildesheim, Hanover, Nov. 20, 1741. He attended the University of Göttingen from 1763 to 1767, giving especial attention to the study of history and theology. A dulness of hearing which increased from year to year made him shrink from undertaking pastoral work, and in 1769 he became a teacher in a commercial school in Hamburg. He prepared some practical works for this institution, and soon obtained a wide reputation on account of his knowledge of ancient languages, the fine arts, and geography, especially of the New World. His reviews of musical works, published in the Hamburg journals, were highly esteemed. He contributed to the *Hanover Magazine* a brief history of the opera, and translated into German the first volume of Dr. Charles Burney's *Musical Tour*, treating of the state of music in France and Italy. This translation was published at Hamburg in 1772, but with the translation of the later volumes Ebeling had little to do. In 1784 he was appointed professor of Greek and history in the gymnasium at Hamburg, and afterwards was also superintendent of the city library. He published a large *Collection of Travels*, in ten volumes (Hamburg, 1780-90). He contributed to Büsching's great work on geography, the volumes treating of the geography and history of America, and for this received the thanks of the United States Congress. In the last ten years of his life he became totally deaf and did little literary work. He died at Hamburg, June 30, 1817. His valuable collection of books and maps was purchased and presented to Harvard College in 1818.

EBERLE, JOHN (1787-1838), an American physician and author, was born at Hagerstown, Md., Dec. 10, 1787. He studied medicine at Lancaster, Pa., and Philadelphia, and graduated from the University of Pennsylvania in 1809. He first practised his profession at Manheim, Lancaster co., Pa., then at Lancaster. Removing to Philadelphia in 1815 he became editor of the *Philadelphia Medical Recorder*. He took an active part in founding Jefferson Medical College, and was appointed professor of the practice of physic in that institution in 1825, and in 1830 was transferred to the chair of materia medica. In 1831 he accepted the same position in the Ohio Medical College, and removed to Cincinnati. In 1837, becoming professor of the practice of medicine in Transylvania University, he changed his residence to Lexington, Ky., and died there Feb. 2, 1838. He published in 1823 the first edition of his work on *Therapeutics and Materia Medica*; in 1830 his *Practice of Physic*; in 1833 his *Treatise on Diseases of Children*. He was remarkably familiar with ancient medicine, and did much to diffuse sound medical knowledge in the West. His works passed through several editions and have been translated into German.

EBERS, GEORG MORITZ, a German Egyptologist and romance writer, was born in Berlin, March 1, 1837. He received his first instructions at Keilhau, Thuringia, then attended the gymnasium at Kottbus and Quedlinburg, and began the study of law at Göttingen in 1856. Two years later, having received an injury in his feet, he turned his attention to classical and oriental studies, and in 1859 removed to Berlin. When his health was fully restored he visited the principal museums in Europe and in 1865 obtained permission to teach in Jena. Here he was made professor extraordinary in 1868, and lectured on ancient Egyptian art, history, and language. In 1869 he started on an extensive tour, going to Egypt by way of Spain and Northern Africa, and also visiting Nubia and Petra. After an absence of fourteen months he returned to Germany and was made professor of Egyptian antiquity in the University of Leipzig. In the

winter of 1872 he again visited Egypt, and in this journey discovered the Papyrus which bears his name. Besides a Latin thesis on the *Twenty-sixth Dynasty of the Egyptian Kings* (1865), he has published *Aegypten und die Bücher Moses* (Leipsic, 1868); *Durch Gosen zum Sinai* (1870; 2d ed., 1881); *Ueber das Alt-ägyptische Schriftsystem* (2d ed., 1875). The *Papyrus Ebers* (1874) is a hieratic treatise on the medical art. Prof. Ebers has also secured literary fame by his romances, the first of which, *Eine Aegyptische Königstochter* (Stuttgart, 1864), has passed through eleven editions in German and has been translated into the principal European languages. The story relates to the time of the conquest of Egypt by the Persians. His other romances relating to different periods of Egyptian history are *Uarda* (1877; 9th ed., 1881); *Homo sum* (1878); *Die Schwestern* (1880; 14th ed., 1883), and *Der Kaiser* (1881). He has also published two romances of modern life, *Die Frau Burgemeisterin* (1882), and *Ein Wort* (1883); and an idyl, *Eine Frage* (1881). Ebers in his romances shows a wonderful power of setting forth the life of ancient times without burying the human interest under a mass of antiquarian details. Throughout his career he has contributed numerous papers on Egyptian and oriental subjects to various periodicals, to Biedeker's *Handbuch für Aegypten*, and to Riehm's *Biblische Realwörterbuch*, and has trained some scholars who are already doing good work in the same field. He has also furnished the text for finely illustrated works on Palestine and Egypt.

EBRARD, JOHANN HEINRICH AUGUST, a German theologian of the Reformed Church, was born at Erlangen, Bavaria, Jan. 18, 1818. He is descended from a noble Huguenot family, which left France at the revocation of the edict of Nantes. He was educated at the gymnasium of his native town, and, after studying theology at the university there and at Berlin, became an instructor in a French Reformed family at Friedrichsdorf, in Hesse-Homburg. In 1841 he obtained his degree of Ph.D. at Erlangen, and after lecturing privately for some time on theology he was in 1844 called to Zurich, Switzerland, as professor of theology. In 1847 he returned to Erlangen, where he was made professor of Reformed theology. In 1853 he became counsellor in the Royal Consistory of the Evangelical Church of the Palatinate at Spire. Here he came in conflict with a party which had adopted Lutheran views. The introduction of a revised hymn-book in 1860 especially excited great opposition, and in the following year he resigned his position because the government would not sustain the action of the consistory. Returning to Erlangen, he lectured on theology at the university, and was busily engaged in authorship. In 1875 he was elected pastor of the French colony at Erlangen, and since 1876 he has been president of the Reformed synod of Eastern Bavaria. As an author he has been remarkably prolific, producing works on all branches of theology—systematic, historical, exegetical, and practical—besides a large number of polemical pamphlets and sermons. His first work was *Scientific Criticism of the Gospel History* (1842; third ed., 1868), intended as a reply to Strauss. His other theological works are *The Doctrine of the Lord's Supper and its History* (1845); *Continuation of Olshausen's Commentaries; Christian Dogmatics* (1851; 2d ed., 1862); *Practical Theology* (1854); *History of the Christian Church and Doctrines* (4 vols., 1865-67); *The Irish-Scotch Mission Church from the Sixth to the Eighth Century* (1873); *Christian Apologetics* (2 vols., 1874; 2d ed., 1878); and *Bonifacius, the Destroyer of the Churches of Columbanus* (1882). Ebrard has also, generally under the assumed name of "Gottfried Flammberg," written several dramas: *Mornay-Duplessis* (1859); *Rudolph of the Palatinate* (1860); *Hermann* (1861); and *Stephen Klinger* (1872), the last appearing under the name of "Christian Deutsch." A number of short moral and religious stories have also appeared from his pen at inter-

vals from 1860 to 1881. Among them are *The Rose of Urach*; *The File-cutter*; *The Golden Cup*; *The Bird-catcher of Eschlipthal*. His poems have been gathered in two volumes—*A Life in Songs* (1868), and *Ricordo, Impressions of a Journey in Italy*. Dr. Ebrard has given much attention to the Gaelic language, has translated Ossian's *Fingal* into German, adding an essay "On the Age and Genuineness of Ossian's Poems," and has prepared a *Grammar and Dictionary of the Mediæval Gaelic Language*.

ECCLESIASTES, BOOK OF. Dr. Ginsburg is bold enough to say: "On the Continent, where See Vol. VII. p. 539 Am. ed. (p. 623 Edin. ed.) Biblical criticism has been cultivated to the highest degree, and where Old Testament exegesis has become an exact science, the attempt to prove that Solomon is not the author of Ecclesiastes would be viewed in the same light as adducing facts to demonstrate that the earth does not stand still. In England, however, some scholars of acknowledged repute still adhere to the Solomonic authorship." What is here stated of English scholars is also true of American scholars. The slighting comparison made by Dr. Ginsburg justifies the retort that the more exact science is, if it be exact in opposition to the evidence, or without evidence, the more exactly wrong and silly it is. The assertion just cited as to the opinion concerning Ecclesiastes held by Continental scholars would be more exact if it were less sweeping. If the opinion that Ecclesiastes originated several centuries later than Solomon be correct, it is still a mistake to support it by mistaken arguments. And the proof of its correctness is not so overwhelming as to justify superciliousness toward those who hold a different opinion. Martin Luther wrote extensively on Ecclesiastes in German and Latin. He definitely held and taught that the Book of Ecclesiastes was composed of sayings publicly uttered by Solomon, but taken down and arranged by others. The scientific exactness which, in the face of this well-known fact, cites a careless and not very intelligible passage from Luther's "Table Talk," apparently ascribing Ecclesiastes to Sirach and the times of Ptolemy Euergetes, as if this passage contained Luther's deliberate opinion on the subject, is not of a sort to which a large class of English and American scholars aspire.

Of the arguments commonly adduced to prove the late origin of this work the numerous Aramaic forms may be treated as a class by themselves. Aside from these, considerations like the following are mentioned: "The complaint about the multiplication of profane literature (chap. xii. 12) could only have been made at a time when the Jews became acquainted with the Greek writings and Alexandrian philosophy." This statement would have been more plausible several decades ago, when men disputed whether the hieroglyphs of Egypt and the cuneiform inscriptions of the Euphrates valley were really literary records, than it now is. Add what we now know of the literary activity in those countries previous to the time of Solomon to what the historical books of the Bible tell us of the numerous Israelitish sources whence they drew their material, and especially to what they tell us of Solomon's own achievements in the way of songs, proverbs, and studies in natural history, and we have abundant explanation of this passage without going to Alexandria for it.

Again, we are told that the "representation of Coheleth as indulging in sensual enjoyments and acquiring riches and fame, in order to ascertain what is good for the children of men (chap. ii. 3-9, iii. 12-22, etc.), making philosophical experiments to discover the *summum bonum*, is utterly at variance with the conduct of the historical Solomon, and is an idea of a much later period." But precisely the reverse will seem to most people to be the truth. With the modification that Coheleth is not represented as indulging in sensual pleasure and the like *merely* for the sake of philosophical experiment, the conduct here ascribed

to him is decidedly such as we should expect in the historical Solomon. If Ecclesiastes be the production of a later age, its author has admirably mastered the literature of the Solomonic period and placed his Coheleth in the midst of the scenes of that period. As to the assertion that the idea of a philosophical search for the highest good belongs only to a later age, when did men ever begin to write their thoughts without beginning to philosophize concerning the highest good?

Apart from the Aramaisms, the supposed foreign terms in the book rather favor the idea of its Solomonic origin than otherwise. At what other period was Israel in Palestine ever brought into so direct and wide contact with the other populations of the earth?

Considerations like these sufficiently represent this branch of the argument. On the whole, it certainly confirms the testimony of tradition to the effect that the book is from Solomon. Even one who holds to its later origin must see that its teachings belong to the period when Solomon reigned.

The argument from the Aramaisms of Ecclesiastes needs to be treated with more caution. On the philological theories now commonly held, these peculiarities have weight to prove that this book, in its present form, belongs with Ezra, Nehemiah, and Chronicles to the latest group of Old Testament writings. It is conceivable, and, indeed, not on the face of it improbable, that one who holds to the Solomonic authorship of Ecclesiastes might construct, upon that basis, a theory of the Aramaisms in Hebrew literature, and might vindicate its right to supersede those now current; but until this is done, the existence of an element of uncertainty as to the Solomonic authorship of Ecclesiastes must be admitted.

The argument from the Aramaisms, however, has no weight to prove that the book is much younger than those of Ezra, Nehemiah, and Chronicles, and none, therefore, to prove its date to be later than that fixed by the testimony in the case for the close of the canon. The early controversies as to its canonical authority do not show that it was of recent origin, or that it was only at a late date admitted into the canon, but merely that it was less familiarly known than the other *hokmah* books of the Old Testament, so that some investigation concerning it became necessary. (See BIBLE.) The result of these investigations by the Jewish scribes of the first Christian century was to convince them that Solomon wrote Ecclesiastes, and that it had ever since been a part of the Scriptures.

Literature.—Schaff's edition of Lange includes both a translation of Zöckler's commentary, by William Wells, and a metrical version, with notes, by Dr. Taylor Lewis. The introductory discussions are quite full and valuable. Renan's *L. Ecclesiaste*, 1882, presents the most extreme view of the recent destructive criticisms.

(W. J. B.)

ECCLESTON, SAMUEL (1801–1851), an American archbishop of the Roman Catholic Church, was born in Kent co., Md., June 27, 1801. He was the grandson of Sir John Eccleston, an English gentleman who settled in Maryland shortly before the American Revolution. His parents were Episcopalians, but, after the early death of his father, his mother married a Catholic, and young Eccleston was sent to St. Mary's College, Baltimore, where he became a Catholic, and was regarded as a shining light. At the age of eighteen he determined to study for the priesthood, and entered the seminary attached to the college, May 23, 1819. He was ordained April 24, 1825, by Archbishop Maréchal, and shortly afterwards went to France to continue his studies at the Sulpician Seminary at Issy, near Paris. He returned to the United States in July, 1827, and was appointed vice-president of St. Mary's College, and in 1829 president of the same institution. Under his wise and admirable administration St. Mary's prospered. In 1834 the health of the venerable Dr. Whitfield, the fourth archbishop

of Baltimore, became so infirm that he consulted with his suffragan bishops as to the appointment of another and more vigorous ecclesiastic to assist him in his arduous labors, and to succeed him in the episcopal office. All concurred in recommending the president of St. Mary's College for this high dignity, although he was only thirty-three years old. In the summer of 1834 the papal brief was received appointing Dr. Eccleston coadjutor of Baltimore with the right of succession, and he was consecrated September 14 of the same year by Archbishop Whitfield. In a few months Archbishop Eccleston received the pallium from Rome, conferring upon him all the powers and honors of the metropolitan see of Baltimore.

Upon assuming the position of primate of the Catholic Church in the United States, Archbishop Eccleston made an exact examination of the affairs of his archdiocese. He had the satisfaction of finding a zealous and well-equipped body of clergy, and many religious institutions; but the Catholic population had so greatly increased that there was still much work for him to do. Under his wise and liberal administration the number of churches, schools, and religious orders was greatly multiplied. He introduced the Christian Brothers in the United States. The first school under these zealous teachers was opened at Baltimore in 1846. To meet the large increase of the German Catholic element Archbishop Eccleston brought into his diocese the priests of the Holy Redeemer in 1841. Their novitiate was first established at Annapolis, Md., in an old mansion which was once the residence of Charles Carroll of Carrollton, and which was presented to the order by his granddaughters. During the eighteen years that he presided over the archdiocese of Baltimore six large churches were built in Baltimore, and new churches in various parts of Maryland. One of the most important events of his administration was the establishment of St. Charles's Ecclesiastical Seminary, the original donation for which was from Charles Carroll.

Archbishop Eccleston presided over five provincial councils of Baltimore. The archbishop was deeply interested in the Baltimore Cathedral, to which he contributed liberally from his private means, and he had the satisfaction of seeing the edifice far advanced, and the improvement of the interior commenced. In the midst of his usefulness he was struck down by a mortal illness, while visiting Georgetown, D. C., in April, 1851, and expired on the 21st of the same month.

(E. L. D.)

ECHIUM. The blue-weed, blue-thistle, blue devil, of North Carolina, Virginia, and Maryland is *Echium vulgare* of Europe, there commonly known as "viper's bugloss," "viper grass," and "snake-flower." We have here an illustration of the value of common names in helping to solve other than philological questions. The plant has been considered a native of England, but its common name, bugloss (Latin, *buglossa*), is evidently a Greek word signifying "ox-tongue." The plant is certainly a native of the islands in the Grecian Archipelago, and we may believe, from the evolution of its English name, that it travelled from Greece to Rome, and thence perhaps with the Romans to Britain, and, as we know, from the north of Europe to the United States. The original bugloss may have been the garden-plant borage, the rough, ox-tongue-like leaves suggesting the name. The botanical name, *Echium*, is from the Greek *echis*, "viper," and so also "viper's bugloss" is a common name for this plant. It was long in high estimation as a cure for snake-bites in Europe, and is believed to be the "alcibiadion" of some ancient Greek writers, so named from a certain Alcibiades, who, when bitten by a viper, chewed the leaves, swallowed the juice, rubbed the plant over the bitten place, and was saved. Down to comparatively modern times it was used in such cases, six spoonfuls of the juice being given in wine; but it is now believed, as in the case of many similar remedies, that the

spirits in which the remedies were generally administered were more potent than the infusions they contained. Hence we find the explanation in most modern botanical works that "*Echium* is from *echis*, a viper, because the seed resembles the head of a viper," and not, as Sir William Hooker gives it, "because this or some allied plant was believed to cure a viper's bite."

It belongs to the natural order *Boraginaceæ*, an order well distinguished by the ovary being usually four-lobed and with the pistil rising in the centre from the base of these lobes. It has almost always rough leaves, and the flower-stalk uncoils after the manner in which the fronds of many ferns do. *Echium* has a tubular, bell-shaped corolla, with the limb almost two-lipped, and not regularly divided, as in the forget-me-not and other well-known plants of the same natural order. The flowers have a reddish tint when they first open, but afterwards change to a purplish blue. Sometimes they retain the red tint to the last. In the parts of the United States already noted they afford a pleasing variety to the eye of the traveller, who frequently passes acres of them, covering the whole surface with a sheet of reddish-blue. But they increase to this great extent only on comparatively neglected farms, and cannot be considered a troublesome weed in American agriculture.

Beyond its beauty it renders little service to man. So far as the honey is concerned, it is an excellent bee-plant, but complaints have been made that the rough hair with which the plant abounds tears the wings of the bees, which thus are prevented from reaching their hives. Rafinesque observes that a fine charcoal is made from the stems which is "useful to painters, as it does not soil paper." (T. M.)

ECKARDT, JULIUS, a German writer, was born in Wolmar, Livonia, Aug. 1, 1836. He was educated at St. Petersburg, Dorpat, and Berlin, studying chiefly law and history. He established himself at Riga, in 1860, as a consulting advocate, and afterwards became secretary of the Provincial Consistory of Livonia, and at the same time became one of the editors of the *Rigasche Zeitung*, the organ of the German party in the Baltic provinces. In 1867 he went to Germany, where he edited several journals—the *Grenzboten* (1867-70), the *Hamburgische Correspondent* (1870-74), the *Hamburgische Boersenhalle*, etc. He was secretary of the senate of Hamburg, 1870-82, and has since been in the Prussian state-service. His works treat principally of the Baltic provinces. Among them are—*The Baltic Provinces of Russia* (1869); *The Condition of Rural Russia since the Abolition of Serfdom* (1870); *Young Russians and Old Livonians* (1871); *The Society of St. Petersburg*, anonymous (1875); *Livonia in the Eighteenth Century* (1876); *Russia Before and After the War* (1879); *Berlin and St. Petersburg* (1880); *From Nicholas to Alexander III.* (1881); *Russian Transformations* (1882), and *The Prospects of German Parliamentary Government* (1882).

ECKERT, THOMAS THOMPSON, an American telegraphist, was born at St. Clairsville, O., April 23, 1824. In 1849 he was appointed postmaster at Wooster, O., and had charge of the telegraph-office there. In 1852 he became a telegraph-superintendent. In 1859 he engaged in gold-mining in North Carolina, but, on account of the outbreak of the Rebellion, was obliged to abandon his property and remove to the North. He was then invited to Washington, where he gave considerable information in regard to Southern affairs. He was placed in charge of the military telegraph connected with the Army of the Potomac. So useful was this system found that it was afterwards extended to the whole country. Mr. Eckert's services in this connection were of the utmost value to his country. In 1864 he was made assistant-secretary of war, and remained in that position till August, 1866. He was then made general superintendent of the Western Union Telegraph, and he has since continued to direct the operations of this company.

ECLIPTIC, the great circle of the heavens which the sun apparently, but the earth really, describes in the course of a year—so called because eclipses only happen when the moon, in her monthly journey round the earth, is at or very near this circle. The centres of both the earth and sun are always in the plane of the ecliptic, but the moon's orbit, being inclined to it at an angle of about $5^{\circ} 8'$, is in that plane only when in the act of crossing, which she does twice at each revolution around the earth.

The plane on which the earth daily rotates (plane of the equator) is inclined to that on which it yearly revolves (plane of the ecliptic) at an angle of about $23^{\circ} 27' 17''$, technically called the obliquity of the ecliptic. This angle in our age is decreasing at the very slow rate of a little less than $50''$ in one hundred years. At a very remote time in the future this decrease will cease, and be changed to an increase, to continue for ages, and then again to a decrease, and thus oscillating through a small arc of perhaps $1\frac{1}{2}^{\circ}$, will mark the flow of millenniums rather than of years or centuries.

That this angle is steadily decreasing the following facts will conclusively show. About 230 B. C. this angle, according to Eratosthenes, amounted to $23^{\circ} 51' 20''$.

Ptolemy, 370 years later, found it $23^{\circ} 35' 00''$.

In A. D. 1600, according to Flamsteed, it was $23^{\circ} 29' 00''$.

At the beginning of the year 1882 it was about $23^{\circ} 27' 17''$.

The refinements of astronomical calculations, to give which would be to exceed the scope and design of this article, have proved that these fluctuations are altogether too small to produce any perceptible variation in the normal changes of our seasons, and that with the hypothetical ice-age they could have had nothing to do.

The disturbing and ever-varying influences of the planets and satellites upon each other are very numerous and complicated, and to completely eliminate from the whole the effect which each exerts upon the others is beyond the reach of man's highest intellectual achievement.

When the sun and all the planets and satellites shall have been accurately weighed, their distances from each other measured, and their periods of revolution ascertained, it will be possible by mathematical analysis to compute the length of time required for a single oscillation of this plane and the extent of its vibratory arc.

One effect of the variation of the ecliptic's obliquity is to increase the latitude of all the stars in certain localities, and to lessen it in regions opposite. Another important effect of this change is, that the sun in one age does not, at the summer solstice, ascend as far north nor descend at the winter solstice as far south as in another, thus producing, as before stated, a very slight change in the seasons.

The ecliptic passes through the centre of the zodiac, a belt about 16° in breadth in which all the major planets and their satellites perform their journeys round the sun. Many of the asteroids, owing to their great inclinations, extend beyond the limits of the zodiac, and hence are called ultra-zodiacal planets.

The north pole of the ecliptic is situated in the constellation Draco, though somewhat remote from any conspicuous star, and is $66^{\circ} 32' 43''$ north of the equator, or $23^{\circ} 27' 17''$ south of its pole. The north pole of the equator is in the constellation Ursa Minor, distant at the present time about $1\frac{1}{2}^{\circ}$ from Alpha (called also Polaris) of that constellation. The south pole of the ecliptic is situated near Epsilon Doradus, a fifth-magnitude star, and is of course the same distance south of the equator that its north pole is north of it, they being exactly a semi-circumference, or 180° , apart. No star brighter than the sixth magnitude is within 6° of the south pole of the equator, and hence there is now no pole-star for the southern hemisphere.

The two points of intersection of the planes of the ecliptic and equator are called the equinoxes, or equinoctial points, and they also are 180° apart. The one

crossed by the sun's centre in his annual journey from south to north is called the vernal, and that from north to south the autumnal, equinox. It is from the vernal—situated at the first point of the sign (not constellation) Aries—that right ascension on the equator and longitude on the ecliptic are reckoned (always eastward), from 0° to 360° on the ecliptic, and from 0^h to 24^h on the equator. Some astronomers, however, reckon by degrees instead of hours on the equator. (L. S.)

ECUADOR, a centralized republic of South America, has in undisputed possession a territory estimated at 180,000 square miles. The Galápagos Islands, lying on the equator at a distance of 600 miles from the mainland, belong to Ecuador; their area is 2950 square miles, and since 1832 some of them have been occupied by a penal colony, which furnishes supplies to whalers touching there.

Produce and industries.—The chief article of export is the *cacao* bean, of which chocolate is made. Of this there are two varieties, one of which has always been considered among the best in the market. Ever since the Spanish conquest great quantities have been sent to Spain, a great deal goes to Perú and Chili, while of the remainder England and Germany are the principal consumers. In 1880 nearly 15,000 tons, valued at \$3,500,000, were exported; in 1882 the export was valued at \$3,867,900. The introduction of aniline dyes destroyed the nascent industry of indigo-producing. The collection of india-rubber is becoming important, though in European markets, and those of the United States, the rubber is considered inferior to that of any other country whence it is brought. In 1880 nearly 4000 cwt. found its way across the isthmus of Panamá, chiefly to New York. The total export in 1882 was valued at \$1,045,700. The exportation of cotton, which in 1874 was nearly half a million of quintals, has dwindled to almost nothing. In 1882 the other more important exports were cinchona bark to the value of \$319,950; ivory-nuts, valued at \$418,600; Panama hats, leather, and skins, and coffee. In addition, tobacco, rice, sarsaparilla, bamboos, mats, and a few other articles, in comparatively insignificant quantities, are exported, to the neighboring countries chiefly. The total exports in 1882 were valued at \$5,469,790.

Constitution, government, etc.—The constitution of 1830 was supplemented by that of 1843, but this has been greatly modified—notably in 1861. According to this constitution the executive power is lodged in a president and vice-president, elected by a majority of 900 electors voted for by a majority of citizens, who must be Roman Catholics and able to read and write. The presidential term is six years, and the president cannot be re-elected; he has a veto, but cannot act officially at a greater distance from Quito than eight leagues. There are several other things he cannot do, but the man who gets into power is usually a dictator, who violates the constitution at his will. The cabinet consists of a home secretary, a minister of finance, and one of war and marine. There is also a council which passes upon certain executive acts; this consists of the vice-president, the cabinet, the president of the supreme court, a representative of the church, and one of the landed interest. The legislative power is vested in a congress of 16 senators and a lower house of 30 members, elected biennially by the people. Congress elects the supreme court, which is in permanent session at Quito. There is a lower court in each province; the *alcaldes* preside over municipal tribunals, and there are also parochial courts. Trial by jury obtains in criminal cases, but does not work very well. Slavery was abolished in 1854. The army in time of peace consists of 1500 men, and there is no navy other than two or three revenue vessels.

Gen. Ignacio de Veintemilla, who, in 1876, while holding command of Guayaquil, had caused himself to be proclaimed president, was declared dictator for an

unlimited period by a convention, July 10, 1878. Again in 1882, when his term was properly drawing to a close, he incited a sham revolution, and then issued a pronunciamiento (April 2), in which he styled himself "supreme chief by the will of the people." A real revolution ensued, and soon Veintemilla's power was restricted to Guayaquil and Esmeraldas. In January, 1883, the dictator's troops were driven from the latter town, but escaped by steamer to Guayaquil. The insurgents had formed a provisional government at Quito, and their cause found a steady increase of favor throughout the country. In May their several armies moved from different directions on Guayaquil, and Veintemilla, after having seized the deposits in the bank of Ecuador, was so convinced of the desperate state of his affairs that he offered to abdicate his dictatorship in favor of Señor Antonio Flores, son of the first President of Ecuador, but the latter declined. After a siege of two months, Gen. Rinaldo Flores on the morning of July 9 took Guayaquil by storm, and Veintemilla fled to Peru. Local governments were organized in several places, and a national convention was called for October 9. In this convention Señor José M. Caamaño, of Guayaquil, was elected provisional president of the republic.

Finances.—The finances of Ecuador are in a very rotten condition. In 1881 the public revenue was about £700,000; the expenditures £720,000. The national debt, home and foreign, is £3,800,000.

EDDY, THOMAS M., D. D. (1823–1874), an American minister of the Methodist Episcopal Church, was born Sept. 7, 1823, near Cincinnati, Ohio. He was educated at a classical academy at Greensboro', Ind., and in 1842 became an itinerant preacher in the Indiana Conference. He was a frequent contributor to the press, and in 1856 was appointed editor of the *North-western Christian Advocate*, which position he held for twelve years, during which time the circulation of that paper increased from 14,000 to 30,000. Besides his labors as editor he was still frequently called upon to preach on important occasions.

In 1868 he became pastor of a church in Baltimore, and after serving three years was appointed pastor of the Metropolitan Church in Washington, D. C. In 1872 he was a delegate to the General Conference, and was elected by that body a missionary secretary. In this capacity he labored assiduously till his death, which took place at New York, Oct. 7, 1874. He published a *History of Illinois During the Civil War*.

EDISON, THOMAS ALVA, an American inventor, was born at Milan, O., Feb. 11, 1847. The family soon afterwards removed to Port Huron, Mich., and Thomas, who had received all his education from his mother, was, at the age of twelve, a train-boy on a railroad. He learned something of printing, and started a newspaper in a baggage-car. A station-master, whose child he had rescued from death on the railroad track, in gratitude taught him the art of telegraphy. Edison then practised the art in many places in the United States and Canada, becoming noted for his skill and rapidity in transmission of messages. He also studied the principles of the science, and made various inventions of practical importance. He failed, however, in his attempts at duplex telegraphy. In 1868 he happened to be in New York when the indicator of the gold and stock company broke down, and, in the absence of a competent employé, volunteered his services, which were not only successful in adjusting the instruments, but suggested to his inventive mind a new device—the printing telegraph. The success and immediate usefulness of the new contrivance induced prominent telegraph companies to employ him in researches aiming at further inventions. He also established in Newark, N. J., the manufacture of printing telegraphs. This, however, he sold in 1876, and removed to Menlo Park, N. J., where he erected large workshops for the purpose of making experiments in the

application of electricity to the wants of every-day life.

Altogether Mr. Edison has taken out nearly 400 patents, 29 of these having been issued in a single week in January, 1882. His most valuable inventions have been patented in other countries as well as in the United States. The American patents may be classified as follows: 35 relate to automatic and chemical telegraphs, 8 to duplex and quadruplex telegraphy, 38 to printing telegraph instruments, 14 to improvements in the Morse telegraph apparatus, while the others relate to electric signals, the electric light, district telegraphs, fire-alarms, etc. The electric pen is one of the most curious of his minor inventions in this department, while his electric railway at Menlo Park, three miles in length, opens a prospect of a change of incalculable proportions in the movements of modern civilization. On this railway a well-loaded train can be carried at the rate of 42 miles an hour on level ground. The locomotive is controlled by an ingenious electric brake, or by a reversal of the current. In a wider application of this invention stations along the line would contain the necessary engines, dynamos, etc., while the current would pass through the rails and the wheels of the locomotive to the motor inside. Mr. Edison has also contrived electro-motors for running sewing machines and various domestic purposes.

Among his remarkable inventions relating to sound are the microphone, for the detection of faint sounds; the megaphone, by which ordinary sounds can be heard at a great distance; the phonograph, a marvellous instrument, by which the sounds of the voice can be registered and preserved; the carbon telephone, and the phonomotor. He also invented the micro-tasimeter, by which very minute variations of temperature can be measured; for instance, the heat of the corona of the sun and of the star Arcturus was thus measured in 1878.

The difficulties of duplex telegraphy—that is, transmitting messages in opposite directions on the same wire at the same time—were at last overcome by his untiring energy and inventive skill, and soon he was able to obtain quadruplex and sextuplex transmission of messages. This system has been acknowledged by the most prominent telegraph companies to have been the means of immense saving in the construction of their lines.

The pecuniary profits arising from his numerous patents have been largely expended in prosecuting further experiments with the aid of able assistants.

Mr. Edison's name has been most prominently connected with experiments in electric lighting. At first he used platinum for burners, but carefully sought for a better, more accessible, and less expensive material. After a protracted series of experiments among metals and minerals, carbon was found to have the greatest resisting power to the electric current. For the purpose of preventing its combustion by the access of oxygen from the air, it had to be placed in a vacuum as nearly perfect as could be made. But a further investigation was necessary to determine from what material the carbon should be obtained. Charcoal and other ordinary forms of carbon could not be used on account of their porosity. Vegetable fibres, silk, cotton, flax and others were carbonized and tried with various results, but none were satisfactory, chiefly on account of their looseness of structure and the want of tenacity in the carbonized fibre. For a time specially prepared cardboard seemed the most available substance. Finally, however, Mr. Edison pronounced carbonized bamboo to have all the requisite properties, so that now in each household lamp a small strip of bamboo will furnish light for at least 600 hours.

The search among the various metals and minerals and the attempts to lessen the expense of procuring platinum had incidentally led Mr. Edison to some extremely lucrative inventions, which, however, he

readily abandoned to others in order to pursue diligently the main object of his investigation.

In all the exhibitions which have been made of various methods of applying the electric light to domestic uses Mr. Edison's displays have been noted for their brilliancy and utility. The great difficulty formerly experienced in the use of the electricity for such purposes was that, when the light was subdivided, the extinction of one light affected all the others. But Mr. Edison's invention has enabled one light to be raised, lowered, or extinguished without disturbing the others, and without producing waste heat elsewhere. His incandescent lamp may be said to combine economy, purity, steadiness, safety from fire, and simplicity in manipulation. It does not taint the atmosphere and gives out only a slight heat.

Mr. Edison still continues to prosecute his search for improvements in the various inventions he has sent forth for the benefit of the world. Though he has chiefly devoted his attention to electricity and its applications, his success has been as marked in other fields. He is very systematic in his habits, keeping a daily record of his experiments. He is modest and retiring, and his mode of life is very simple. In every respect he is an admirable representative of American mechanical genius and perseverance.

EDMONDS, JOHN WORTH (1799–1874), a New York jurist and spiritualist, was born at Hudson, N. Y., March 13, 1799. He graduated at Union College, Schenectady, N. Y., in 1826, studied law, and was admitted to the bar in 1819. After practising for some years with success in Hudson, he was elected to the State legislature in 1831, and in the next year to the State senate. In 1836 he was appointed by the United States government an Indian agent, and held the position for two years. In 1841 he removed to New York city, where he practised his profession with great success. In 1843 he was one of the inspectors of the State prisons, and introduced various reforms in the treatment of criminals. In 1845 he was appointed a circuit judge. In 1847 he became judge of the supreme court, and in 1852 a member of the court of appeals. In 1851 he had commenced an investigation of the phenomena of Spiritualism, and in 1853 openly avowed his faith in that system. In consequence of the popular prejudice against this belief, he retired from the bench and devoted himself to private practice. He continued firm in his adherence to the views he had professed in his work on *Spiritualism* (1853; 2d ed., 1865) and defended them in other publications. His moral character was above reproach, and his reputation as an able and learned lawyer remained unimpaired to the last. He died at New York, April 5, 1874.

EDMUNDS, FRANCIS W. (1806–1863), an American painter, was born at Hudson, N. Y., Nov. 22, 1806. Though evincing a strong liking for art in his youth, he became a clerk in a bank, and after rising to the position of cashier removed to New York city, where he held a similar position in several banks until 1855. He joined with others in forming the Bank-Note Engraving Company of New York, and several country scenes painted by him were engraved on notes prepared by that establishment. Throughout his business career Edmunds practised painting diligently in his leisure hours, but had no regular art-training. In 1836 he exhibited a painting, *Sammy the Tailor*; in 1838 he was elected an associate of the national academy and afterwards an academician. He profited much in his knowledge of art by a visit to Italy in 1840. Among his pictures are *Dominie Sampson* (1837); *City and Country Beaux* (1840); *Stealing Milk* (1843); *Vesuvius* (1844); *Florence* (1844); *Trial of Patience* (1848); *Taking the Census* (1854); *Thirsty Drover* (1856); *The New Bonnet* (1859); *Gil Blas and the Archbishop*. He died at New York in 1863.

EDMUNDS, GEORGE FRANKLIN, an American

lawyer and senator, was born at Richmond, Vt., Feb. 1, 1828. The son of a farmer, he was educated in the village school and by a private tutor. Having studied law, he was admitted to the bar in 1849, and two years later removed to Burlington, the chief city of the State, where he practised his profession with diligence and success. Taking part in the movement which eventually led to the formation of the Republican party, he was elected to the State legislature in 1854, and, continuing there, was chosen speaker in 1857. From the lower house he passed in 1860 to the State senate, where he served two terms. After the outbreak of the rebellion a State convention was held in Burlington for the purpose of uniting members of all parties in support of the national government. The resolutions for this purpose were drawn up and presented by Mr. Edmunds and were unanimously adopted. On the death of United States Senator Foot in the spring of 1866 Mr. Edmunds was appointed by the governor to fill the vacancy, and his first speech was a eulogy of his predecessor. Though he thus entered the Senate without the usual previous experience in the House of Representatives, he soon showed himself admirably qualified for his position. From the start he has been remarkable for his devotion to public duty, studying carefully every measure brought before the Senate and endeavoring if possible to remedy its defects. When Pres. Johnson attempted to enforce a Southern reconstruction policy at variance with that intended by Congress, Senator Edmunds reported from the judiciary committee the Tenure of Office act, which effectually restrained the president's power. Though not approving all the measures of Pres. Grant's administration, he remained throughout on friendly terms with the president, while Sumner and others of his associates passed over to the opposition. He has always been devoted to the interests of the Republican party, but has refused to secure a temporary advantage at the sacrifice of any principles. In this way he opposed the admission of Colorado as a State under a constitution which confined the franchise to white men. During the trouble arising from the presidential election of 1876, Mr. Edmunds was prominent in devising and securing the reference of the disputed questions to the electoral commission, and afterwards served as a member of that commission. His fidelity in discharge of his duty has been honored by three elections to the Senate, in which he has served on the most important committees, and in March, 1883, he was elected president of that body. Tall and slender, bald with full gray beard, he looks older than he really is. In speaking he is deliberate and undemonstrative; his style is simple and weighty; he is especially noted for dry humor and sarcasm, and is strong in debate. His literary attainments are extensive, and in knowledge of civil and parliamentary law he is without a rival in the Senate. He has been prominently mentioned in national conventions of the Republican party as a candidate for the presidency, but has uniformly discountenanced such action.

EDUCATION, SECONDARY, or that which is intermediate between the elementary and the collegiate, is, in America, chiefly conducted by means of academies and high schools. These institutions belong to that grade often known in Europe as middle schools. They correspond to the "great public schools" of England, as Harrow, Eton, Westminster, and Rugby, to the grammar or high schools of Scotland, and to the gymnasias or "classical drill schools" of the continent.

The first institutions of secondary instruction founded in America were modelled on the "public or foundation schools of England." In Boston, Cambridge, Dorchester, Salem, Ipswich, and Hadley, of Massachusetts, and Hartford and New Haven, were these so-called grammar schools established in the seventeenth century. Their primary design was to fit students for college. They were supported both from the public fund and from endowments, as well as from small

tuition fees. The town of New Haven paid its master, Ezekiel Cheever, the most distinguished teacher of early New England, at first £20 a year for his services, a sum that in 1644 was increased to £30. But the first endowments (of a large amount) coming from individuals were received from the estate of Edward Hopkins, who died in London in 1657. He had been governor of Connecticut seven times between 1640 and 1654; and bequeathed certain sums "to give encouragement," as expressed in his will, "in those foreign plantations for the breeding up of hopeful youths, both at the grammar school and college, for the public service of the country in future times." New Haven, Hartford, Cambridge, and Hadley received the larger portions of these bequests. Although the donations of Governor Hopkins were, particularly in Hartford and Hadley, used to maintain a common English school, yet in New Haven the support that was thus furnished to the pursuit of classical studies was great, so great that one in thirty of all the graduates of Harvard College prior to 1700 came from that town, although it at no time of this period had more than five hundred inhabitants. The schools so endowed do not seem to have been designed for the exclusive use of the towns in which they were situated. This doubtless was their primary purpose; but as Judge Shaw, of Massachusetts, decided in 1833 in reference to a contest which arose between the town of Hadley and the academy which succeeded the grammar school, that the Hadley school was founded for the benefit of "all the persons in that (then) newly-settled part of the country who desired to avail themselves of a grammar school adapted to instruct and qualify pupils for the university." This was doubtless true of all schools endowed by Hopkins.

Prior to the Revolution it would appear that the secondary schools were few, and that the support accorded them was slight and desultory. Many graduates of Harvard and Yale who desired to become teachers found little demand for their services. They were, therefore, compelled to enter the ministry. But while pursuing this vocation they were able to teach the classics, and they fitted a large number of students for college. In the middle of the eighteenth century, however, appeared a revival of interest in the intermediate school. In 1746 Samuel Moody graduated at Harvard College, and at once began his distinguished career as a teacher in the York Grammar School of Maine. Since the death of Ezekiel Cheever, in 1708, no teacher of equal celebrity with Master Moody had arisen. His school at York, though the only public school in town, became the resort of scholars. In 1763 was founded the Dummer School at Byfield, Mass., the first of the New England academies, and to it Master Moody was transferred. Under his administration there is reason to believe that it was the best school of its type in America, and that it had hardly been surpassed by the Boston Latin School, under the charge of Master Cheever. The success of the school at Byfield was doubtless of influence in the foundation of academies at Andover and at Exeter, N. H. Phillips' Academy at Andover and Phillips' Exeter Academy were founded by members of the family whose name they bear in 1778 and 1782; and they have for a century been regarded as the best schools in America preparatory for college. They have, to a degree, served as a model for other schools of secondary instruction, as the Williston Seminary of Easthampton, Mass., founded by Samuel Williston in 1841, and academies in Maine, Vermont, and a few other States. The establishment of other academies at once followed the foundations of Phillips': fifteen were incorporated in Massachusetts before 1797. Their relation to the public-school system, on their application for aid from the State, became a subject of debate, and it was affirmed that they "were to be regarded as, in many respects and to a considerable extent, public schools; as a part of an organized

system of public and universal education." But, though the academy spread through New England, and obtained a footing in New York, and has in later years been represented in a few institutions of the West, it has remained pre-eminently a New England institution.

But by the side of the academy has arisen since 1840 in New England a public school, like the early grammar school, designed to prepare students for college. It is now almost universally known as the high school. Between 1830 and 1850 the interest in public schools greatly revived. (See COMMON SCHOOLS.) At the same time the small endowments of academies, and other reasons of a financial character, contributed to their decline; and, although the stronger institutions flourished, the weaker either surrendered their charter or became incorporated into public schools. At the present time, therefore, in even New England the high school, as the instrument of secondary instruction, is relatively far more important than a generation since. Its usefulness differs greatly in different States and towns. The high schools of Massachusetts are of as good a grade as any, and a few of them are excellent fitting-schools.

Throughout the West, at the time of its settlement, the high school became the chief institution of intermediate instruction. The number of schools of this grade changes from year to year, and also with important changes in the school laws, but nearly all towns of Western States of 15,000 or more inhabitants have schools in which the classical studies, and the mathematics necessary for admission to college, can be pursued. It is not to be questioned that the general influence of these schools upon the higher education has not been favorable. They have not afforded opportunities for a thorough preparation for college. Many of the colleges, therefore, have been obliged to establish preparatory departments. But frequently these departments, since they naturally failed to receive the principal attention of officers, have languished. It is the common desire of a well-equipped college to be freed from the encumbrance of a fitting-school. In the lack of opportunities for secondary instruction is found one reason of the inefficiency of many colleges. Compelled to receive students, if they were to receive any, not qualified to enter upon collegiate studies, they have been obliged to spend a quarter or even a half of the course in completing the work that should have been finished in the preparatory school. This fact renders many colleges of the West and South institutions as much for secondary as for superior instruction.

In addition to high schools and academies there are in all parts of the United States various private institutions that afford secondary instruction. They are open both to day-scholars and boarders, and are especially designed for young women. They usually, though not always, bear the name of "seminary." For support they depend on both tuition-fees and endowments. (See COLLEGES IN AMERICA.)

(C. F. T.)

EDWARDS, AMELIA BLANDFORD, an English author, was born in 1831. She was the daughter of an army officer, and while very young began her literary career. Among her works are short histories of France (1858) and of England (1856); numerous novels, *My Brother's Wife* (1855); *The Ladder of Life* (1857); *The Little Marquis* (1857); *Hand and Glove* (1859); *Barbara's History* (1864); *Miss Carew* (1865); *Half a Million of Money* (1865); *Debenham's Vow* (1870); *In the Days of my Youth* (1873); *Monsieur Maurice* (1873); *Lord Brackenbury* (1880); also a volume of *Ballads* (1865); and *Untrodden Peaks and Unfrequented Valleys* (1873). Her book entitled *A Thousand Miles up the Nile* (1877) is a production of high value, having copious illustrations drawn on the spot by the author. Other works of hers are *The Story of Cervantes* (1862); a *Poetry-book of the Elder Poets*

(1879). She has given much attention to the study of Egyptian antiquities.

EDWARDS, BELA BATES, D.D. (1802-1852), an American Congregationalist theologian and author, was born at Southampton, Mass., July 4, 1802. He graduated at Amherst College in 1824, and after studying theology at Andover for a year became tutor in Amherst College. In 1828 he was made assistant secretary of the American Education Society, and in 1836 became professor of Hebrew in the Andover Theological Seminary. In 1848 he was transferred to the chair of biblical literature, which he held till his death. Besides the duties of the positions named, he was editor of the *American Quarterly Register* from 1828 to 1842, and of the *American Quarterly Observer*, which he founded in 1833. When this was united with the *Biblical Repository*, founded by Prof. Edward Robinson, Dr. Edwards remained as editor until 1838. He was also editor-in-chief of the *Bibliotheca Sacra* from 1844 till his death, which took place in Georgia, April 20, 1852. His most important work is to be found in the periodicals which he edited. Among his earlier publications were, *Biography of Self-taught Men*, *Missionary Gazetteer* (1832); *Memoirs of Elias Cornelius*, and a volume on *The Epistle to the Galatians*. After his death several of his sermons and addresses, with a memoir by Prof. E. A. Park, were published in 1853.

EDWARDS, JONATHAN, D. D. (1745-1801), an American Congregationalist divine, frequently called the "younger Edwards," as being a son of the more distinguished theologian of the same name, was born at Northampton, Mass., May 26, 1745. At an early age he had much intercourse with the Indians, and his father wished him to become a missionary to them. He lived for a time among the Six Nations, but before the outbreak of the French and Indian war returned home. He graduated at Princeton in 1765, and, having studied theology with Rev. Dr. Bellamy, was licensed to preach the next year. He was for a time a tutor in Princeton, and in 1769 was ordained pastor of the church at White Haven, near New Haven, Conn. After a pastorate of twenty-six years he resigned on account of difference in doctrinal views with his congregation. He was soon settled in Colebrook, but in May, 1799, was elected president of Union College, Schenectady, N. Y. After a brief service in this position he died at Schenectady, Aug. 1, 1801. He was a man of great learning, and carried on an extensive correspondence with learned men of Europe and America. His complete works, with a memoir by his grandson, Rev. Tryon Edwards, D.D., were published at Andover in 1842.

EDWARDS, MATILDA BARBARA BETHAM, an English novelist, a cousin of Miss Amelia B. Edwards and a niece of Sir W. Betham, was born at Westerfield, Suffolk, in 1836. When nineteen years old she published *The White House, by the Sea*, a very popular tale. Other works of hers are *Doctor Jacob*; *Kitty*; *A Winter with the Swallows in Algeria*; *A Year in Western France*, and *Mrs. Punch's Letters*. She wrote also a great number of papers on social and literary subjects, and contributed largely to *Punch* and the leading periodicals.

EDWARDSVILLE, the county-seat of Madison co., Ill., is on Cahokia Creek, 18 miles N. E. of St. Louis, on the Wabash, St. Louis, and Pacific Railway, the Toledo, Cincinnati, and St. Louis Railroad, and the Wabash Branch Railroad connecting with the Chicago, Alton, and St. Louis Railroad and the Indianapolis and St. Louis Railroad. It has a courthouse, 2 banks, 5 hotels, 3 weekly newspapers, 10 churches, a high school and other good schools. It has 3 flour-mills, 3 carriage-factories, 2 saw-mills, 3 machine-shops, and within the city limits four shafts are sunk to a bed of bituminous coal 6 feet thick which underlies the country at a depth of from 80 to 200 feet. The surrounding country is fertile, produc-

ing fruit and sugar-cane as well as grain. It was first settled in 1805 by Thomas Kirkpatrick, and a mill and block-house served as nucleus for the town, which he laid out in 1816. It was named from Ninian Edwards, governor of Illinois Territory and also first governor of the State, who was a resident of the town. Population, 2887.

EFFINGHAM, the county-seat of Effingham co., Ill., is on a prairie east of Little Wabash River, 100 miles east of St. Louis, and 200 miles south of Chicago. It is on the Illinois Central Railroad, the St. Louis, Vandalia, and Terre Haute Railroad, the Wabash, St. Louis, and Pacific Railroad, the Springfield, Effingham, and South-eastern Railroad. It has a park, a fine court-house, 2 banks, 4 weekly newspapers, 6 churches, and 2 graded schools. It has machine-shops of the St. Louis, Vandalia, and Terre Haute Railroad, a foundry, 2 flour-mills, and other industries. It was settled in 1857, and incorporated as a city in 1869. Population, 3069.

EGGLESTON, EDWARD, an American author, was born at Vevay, Ind., Dec. 10, 1837. Owing to ill-health his education was irregular, but he entered the Methodist ministry when only nineteen years of age. Soon after he removed to Minnesota, where he spent some years in pastoral work, though his health repeatedly broke down. In 1866 he removed to Evanston, Ill., where he was chiefly engaged in work connected with Sunday-schools, editing *The Sunday-School Teacher* and contributing to other papers, especially stories for children. In May, 1870, he became literary editor of the *Independent* in New York, and in July, 1871, the editor of *Hearth and Home*, but resigned this position in October, 1872. He afterwards had charge of a Congregationalist church in Brooklyn, though chiefly engaged in literary labor, and since 1879 he has devoted himself entirely to the latter. His principal publications are *The Hoosier Schoolmaster* (1871); *The End of the World* (1872); *The Mystery of Metropolisville* (1873); *The Circuit Rider* (1875); *Roxy* (1878); *The Hoosier Schoolboy* (1883). These novels are vivid pictures of the frontier life amid which his boyhood was passed. Since 1880 he has been engaged in writing *A History of Life in the United States*, portions of which have appeared in serial form in *Harper's Magazine*.

EGG-PLANT, a well-known vegetable, *Solanum melongena* of botany, *melongena* being altered from the Arabic word *bydengana*. It is supposed to be a native of Arabia or of warmer parts of the East Indies, though not now known to be indigenous anywhere; but it has long been under culture, and certainly from the earliest Roman times. It is not distantly related to the mandragora, a noted narcotic, and hence received the name of mad-apple. By the Spaniards it is called *belangela*, by the Italians *malanzana*, and by the Germans *tollapfel*,—all suggesting the idea of insanity in connection with the fruit. There is one form, *Solanum ovigera* of some authors, which has a fruit about the size and color of a hen's egg, commonly grown for ornament in British gardens, and hence the American "egg-plant." In France it is known as *aubergine* as well as *melongene*.

The egg-plant requires a great deal of heat to bring it to perfection; hence it is almost unknown as a vegetable in England and the northern countries of Europe. Though in use in the warmer parts of the world, its culture reaches its greatest perfection in the United States. It is not unusual to see fruits measuring three feet in circumference, and sometimes six of these will be borne by a single plant. In the hot sandy soils of New Jersey, wherever it is possible to obtain quantities of rich fertilizing material, the raising of egg-plants is a profitable branch of market-gardening. It requires a great deal of heat and attention to raise the young plants, and care to preserve them in the earlier stages from the beetle *Doryphora decem-lineata*; but these difficulties make the growth more profitable to those who discover how to overcome them. In cooking the

plant is sometimes stewed, but generally is cut in thin slices, soaked for a while in water with a little salt, and then fried, sometimes being first dipped in crumb-batter. The vegetable does not seem as popular in Europe, even when it grows well, as here. A leading French authority describes the variety popular in France as having "un fruit long et gros comme un concombre, dont l'écorce est purpurine et unie," and that it is "agréable quand il est apprêté avec du sel, du poivre, du vinaigre, et-cet.; mais en général il est venteux, malaisé à digérer." But this long kind, eaten like cucumbers and quite as indigestible according to this author, gives place in America to the large round variety, which is regarded as one of the most wholesome of American vegetables. (T. M.)

EGILSSON, SVEINBJÖRN (1791–1852), an Icelandic antiquarian and lexicographer, was born March 12, 1791, at Innri-Njardvik, in the south-west of Iceland. He was the son of a peasant, but was brought up in the house of Magnus Stephensen and instructed by Arni Helgason, afterwards titular bishop. In 1814 Egilsson went to the University at Copenhagen, and in 1819 he was made assistant in the Latin school at Bessastadir. In 1846 he was called to the rectorate at Reikjavik, having already received the degree of Doctor of Theology from the University of Breslau. He resigned his post in 1851 and died Aug. 17, 1852. He was one of the founders of the Royal Society of Northern Antiquities in 1825, and until his death a member of its committee on old manuscripts. In 1816 he was one of the founders of the Icelandic Literary Society. His reputation is based on his scholarly dictionary of the words used in the poetry of the Old Norse literature: *Lexicon poeticum antiquæ linguæ septentrionalis* (Copenhagen, 1860); on his Latin translations of the sagas of the Norse kings: *Scripta historica Islandorum*, and on his Icelandic translation of Homer. (R. B. A.)

EGYPT. In 1879 the English and French governments, anticipating bankruptcy at Cairo, urged on the Porte the necessity of appointing a new viceroy in Egypt, with the result that Ismail Pasha was deposed by an Imperial Hatte, and his son Mohammed Tewfik nominated khedive in his place. Sir Rivers Wilson then returned to Egypt to negotiate terms of liquidation with the state creditors, and in the following year a new law of liquidation was issued at Cairo, by which interest on all the state debts was reduced to an average of 4½ per cent., the great powers of Europe signifying their assent to the arrangement, while England and France undertook a special joint control over the finances of the country. This law of liquidation formed the basis of English intervention two years later. Order in Egypt was first disturbed Feb. 1, 1881, by a military demonstration, headed by the colonels of the three regiments of guards at Cairo, Ali Fehmy, Abd el Aal, and Arabi, who, having some days previously signed a petition to the chief minister, Riaz Pasha, representing the grievances of the army, had been arrested at his instance, and had been forcibly released a few hours later by their men. The three regiments on that day marched to the Aledin Palace, and petitioned the khedive to appoint a new minister, and to reform certain abuses chiefly connected with the army administration, but including also matters of political interest. This bold action gave their leaders a prominent position with the public, and their names grew rapidly popular. Arabi especially, by his superior education and his gift of eloquence, attracted general attention, and he became the daily recipient of addresses and petitions from every part of Egypt, as well as the recognized spokesman of the party of constitutional reform, which now began to call itself the "National Party." A desire of reform in the direction of popular institutions had long existed among the better educated class in Egypt, and at his accession Tewfik Pasha had issued a decree promising the con-

vocation of a chamber of notables, and other liberties essential to modern progress, which had, however, remained a dead letter. But now the popular desire was renewed, and in the summer of the same year Arabi was intrusted by the leaders of the party with the task of enforcing the fulfilment of his promise on the khedive.

A second military demonstration was accordingly made, Sept. 9, 1881, which may be distinguished from the first by the fact of its having been distinctly political. In it Arabi, for the first time, in the name of the Egyptian people, formulated their demands for a chamber of deputies, as well as for the dismissal of Riaz, and an increase of the national army to the full number allowed by law, 18,000 men. On this occasion the khedive being prepared for the demonstration and supported by the English consul and the English controller, made some attempt at evading the popular demands, but in the end yielded. Riaz was dismissed, a new promise was given of summoning a chamber, and the army also was to be increased. At the suggestion of the national leaders, Sherif Pasha, known as the author of a draft constitution, and believed, though a Turk by birth, to be a staunch reformer, was then named first minister, and Mahmud Sami (afterwards head of the nationalist cabinet), minister of war. A chamber of notables was also summoned, and met at Cairo, before the close of the year, while about the same time Arabi issued a manifesto, in which he stated the objects of the movement he had supported, and the position in it of the army as guardian of the popular rights. This was published in the *London Times*, Jan. 14, 1882, and attracted so much attention that it was thought advisable by the English and French governments to suggest his being included as under-secretary of war in the new-formed cabinet.

Up to this moment the national movement had been directed solely against the Circassian oligarchy, which had so long misruled the country. It looked to Europe, and especially to England, for support; and the English and the French governments had each by turns shown it some encouragement. But on the 8th of January Lord Granville and M. Gambetta, for reasons which have not yet transpired, delivered, through their agents at Cairo, a joint note to the Egyptian government, in which, assuming a tone of menace to the popular party, they recorded their guarantee of personal protection to the khedive against all danger which should menace him from without or from within Egypt. This turned the storm of popular indignation against themselves, and against Sherif Pasha, who supported them, and the excitement was considerably increased by the receipt of letters from the sultan's private secretary, in which Abdul Hamid, as caliph, called upon Arabi to defend the interests of the Mohammedan nation in Egypt, and alluded to the recent invasion of Tunis by the French as an episode about to be repeated on the Nile.

These letters arrived at a critical moment, when the newly assembled deputies were debating the terms of the constitution promised them, and it encouraged them to claim the control of that part of the budget not affecting the debt, as part of their prerogative. The claim was strongly resisted by the French and English controllers, and by Sherif Pasha, whom the latter had gained to their interests. Popular pressure, however, proved too powerful for them, and, on Feb. 2, Sherif Pasha resigned his office, and a new ministry was appointed, having Mahmud Sami and Arabi Pasha at its head, and giving the Nationalists, for the first time, full power in the government. The decree authorizing a constitution of the most advanced type was signed by the khedive Feb. 6, and from that date till the middle of May Egypt was governed according to the usage of constitutional government. Then, however, a quarrel broke out between the khedive and his ministers, on the subject of a sentence passed on certain Circassians who had been convicted of plotting

the death of the ministers; and the incident was made use of by the controllers for an attempt to bring about a counter-revolution. On May 17 the English and French fleets were ordered to Alexandria to support the authority of the khedive, and simultaneously with its arrival Sir Edward Mallet and M. de Sinkiewitz, the English and French ministers, delivered an ultimatum to the Nationalist ministry, calling on them to resign their offices and demanding the exile of Arabi. This led to an open rupture. The ministers resigned, indeed, their offices, but a popular demonstration forced the khedive immediately to reinstate Arabi as minister of war and practical dictator of the country. The two powers, France and England, now appealed to the Porte. A conference was assembled at Constantinople, and the sultan despatched Dervish Pasha as his special commissioner to restore tranquillity to Egypt and re-establish his authority. The Nationalists, nevertheless, refused either to allow Arabi to leave Egypt or Turkish troops to land on Egyptian soil; and, though Dervish was received with great show of loyalty at Cairo, he was unable to effect the purpose of the powers.

Matters stood thus till June 11, when a serious riot occurred at Alexandria, in which 50 Europeans lost their lives, and over 400 natives of the town. Its origin has been variously stated as traceable to Arabi Pasha, to Dervish Pasha, and to the khedive himself, but the official account now accepted in England describes it as an accident caused by the violence of popular feeling, augmented by the presence of the fleet and connived in by the police. At the time, however, it was attributed by the English government to the secret action by the Nationalist leaders, and public indignation was violently inflamed against them by articles which appeared in the *Times* and other organs of London opinion. The European colony began to leave Egypt. Mercantile enterprise was checked, and the price of Egyptian bonds fell to 52. It is probably owing to financial pressure that armed European intervention was then decided on by Mr. Gladstone.

On July 11 a pretext was found for hostilities in the arming of certain forts in the Alexandrian harbor, which the English admiral, Sir Beauchamp Seymour, regarded as a menace to his position, and, after sending in his ultimatum, the town was bombarded, with the result that on the second day it was evacuated by the Egyptian troops, who set fire to the town as they retreated, thus burning down the European quarter of Alexandria, with a loss to property estimated at £4,000,000. The khedive now, although he had ordered the defence of Alexandria, went over to the English, taking refuge on board the admiral's flagship, while Arabi, with the army and a vast number of fugitives, entrenched himself at Kafr Dowar, some twelve miles off, in which position he repelled all attempts made to dislodge him.

Six weeks then elapsed, which were made use of by the Nationalists to organize a provisional government at Cairo. The Khedive Tewfik was deposed by a decree of the religious Sheykhs of the Azhar University, as a traitor to his country and his religion, and the executive government was intrusted to a council called the Mejtiss el Orfi, which maintained order, levied taxes, and raised recruits for the army. The task of national defence was intrusted to Arabi.

By the middle of August the attack on Kafr Dowar was abandoned, and an Anglo-Indian army, about 38,000 strong, was landed at Ismailia, on the Suez canal, which Arabi, confiding in M. de Lesseps' assurance that its neutrality would be maintained, had left unguarded. Sir Garnet Wolseley commanded the expedition, and advanced slowly along the line of the sweet water canal towards Tel el Kebir, where Mahmud Fehmy Pasha, the chief of Arabi's staff, had traced another line of entrenchments. Battles were fought at Shaluf, Nefish, Mahsameh, and Kassouin. At Mahsameh, Mahmud Fehmy was made prisoner, having advanced too far on a reconnoitring expedition,

and at Kassouin the life-guards decided the day by a charge, the first that they had made since Waterloo. On Sept. 9 the Egyptians advanced in attack, and shelled the British camp, but the movement failed, their commander, Ali Fehmy Pasha, being wounded. Finally, on the 13th, Sir Garnet Wolseley moved forward his whole forces, and by a rapid night-march stormed the lines of Tel el Kebir. The Egyptians were surprised at daybreak and utterly routed, Arabi saving himself with difficulty by flight.

The battle was followed up by a brilliant forced march on Cairo; and at nightfall Gen. Drury Lowe reached the city gates, while the national council was still deliberating what course to pursue. The suddenness of his arrival disconcerted the leaders, and Arabi Pasha surrendered himself as prisoner of war to the English. Sir Garnet Wolseley, with the bulk of his forces, entered Cairo on the following morning, and a few days later the khedive was brought back to the city and reinstated in his office. The national army was disbanded, and Arabi's life was only spared by a sudden revulsion of public feeling in England, which insisted that the sentence of death intended for him should be commuted into one of perpetual exile. He and five of his companions left Egypt Jan. 4, 1883, for Ceylon.

(W. B.)

Earl Dufferin, who had come from Constantinople as a special commissioner to Egypt, was the agent in effecting this change in policy. He found abundant room for his diplomatic skill in attempting to settle the complicated affairs of that ill-fated country. The dual control ceased in January, 1883, though France protested against the action of England. In February Sir Auckland Colvin was made financial counsellor to the khedive. Various political trials and executions took place in the former part of the year, but in October the khedive granted a general amnesty, and set free those imprisoned for participation in the outbreak. The restoration of tranquillity was in a measure due to the hopes inspired by the presence of Earl Dufferin. Yet the necessary expenses of the reforms in administration which he proposed actually increased the burdens of the people, who were already groaning under taxation, and Egypt was required to support in part the British army of occupation. The numbers of the latter, however, were steadily diminished, in accordance with Mr. Gladstone's promise of an early withdrawal, until the Soudan war, which he had tried to keep out of the problem, compelled him to reverse his policy. The Egyptian army had been reorganized under the English Gen. Wood, but the number of British officers was limited to 25, and one-half of the regiments were to be commanded by Egyptians. A separate constabulary force was organized under Baker Pasha for the preservation of domestic order. This was really a military force, and when Hicks Pasha's army of the Soudan was annihilated by El-Mahdi, November 3, it was despatched to the relief of the towns and garrisons in Soudan. England was now compelled to take an active part in this war, for events of which see SOUDAN.

II. RECENT ARCHÆOLOGICAL DISCOVERIES.

WITHIN a few years past there have been archæological discoveries of unusual importance. See Vol. VII. A remarkable causeway, presumably dating from the time of Khafra (Greek, Chephren), has been laid bare at Gheezeh; a large number of pyramids of different epochs have been opened at various points of the great pyramid-field, which extends from Memphis to the Fayoom; and the family vault of the priest-kings near Dayr-el-Baharee, Thebes, has yielded the most extraordinary treasure of mummies, papyri, and sepulchral objects of all kinds ever found in a single hiding-place. These discoveries, together with others of less magnitude, range over a period which may be roughly estimated at 3000 years.

The causeway of Khafra.—This causeway was discovered by Herr Emil Brugsch, assistant conservator of the Boolak Museum, in January, 1881. It connects the pyramid of Khafra (generally known as the Second Pyramid) with the singular subterranean structure commonly, but erroneously, called the "Temple of the Sphinx." This latter monument,

discovered by the late Mariette-Pasha, in 1858, is situate about 250 feet to the S. E. of the Great Sphinx. In plan and general arrangement it resembles the *Mastabas*, or tomb-chapels, of the Ancient Empire, to which period it undoubtedly belongs. From these it is, however, distinguished by the splendor of its materials; namely, red granite and alabaster. The structure is rectangular and oblong, consisting of one long hall, two transverse halls, some side-chambers, and corridors. One of these chambers, built entirely of large blocks of alabaster, contains six horizontal niches, or *loculi*, evidently designed for the reception of mummies. At the bottom of a deep well, at the east end of the building, were found nine portrait-statues of Khafra, third Pharaoh of the IVth Dynasty, and builder of the second pyramid of Gheezeh. Eight of these statues were shattered. The ninth, magnificently sculptured in green diorite, and almost perfect, now occupies the place of honor in the museum at Boolak. Each statue was engraved with the cartouche of Khafra; but the building is wholly devoid of inscriptions. The discovery of a road of communication between this monument and the second pyramid shows, however, that the former was a dependency of the latter, and enables us to assign it with comparative certainty to the reign of Khafra. This road is paved, like the transport causeways of the first and third pyramids. It starts from the ruins of the funerary chapel attached to the east side of the second pyramid, and thence leads direct to the granite mausoleum; not descending to the actual level of that monument, but conducting apparently to an entrance in some superstructure now destroyed. At the upper end of this road, where it adjoins the chapel of the pyramid, the remains of a granite doorway have been found, and some fragments of a diorite statue of Khafra, similar to the statues previously discovered in the well of the mausoleum. The paved roadway is almost perfect, and does not seem to have been at any time enclosed between walls.

This remarkable discovery justifies archæologists in henceforth rejecting the name assigned by Mariette to the "Temple of the Sphinx." The granite and alabaster monument was evidently not a temple, and it had no connection with the sphinx. Its connection was with the funerary chapel and pyramid of Khafra, some 1500 feet away to the N. W.; and the *loculi* in its mortuary chamber distinctly point to the fact that it was a tomb. Seeing that it was at this period customary for the king's family to be buried around, or near, his pyramid, it seems reasonable to conclude that this mausoleum was designed for the family of Khafra.

Recently explored pyramids.—No less than fourteen pyramids have been explored since 1879. Of these, three were excavated in 1880 by order of the late Mariette-Pasha, and the remaining eleven in 1881 and 1882, under the direction of Professor Maspero, who, on the death of Mariette, in January, 1881, succeeded to the post of director-general of the museums of Egypt. We proceed to treat of these pyramids, not in order of discovery, but in chronological succession; beginning with the remarkable structure known as the pyramid of Meydoom.

The pyramid of Meydoom., situate about a mile and a half to the N. W. of the village of Meydoom, stands in the midst of a very ancient necropolis containing numerous tombs of the family and court functionaries of Seneferoo, last king of the IIIrd Dynasty. Hence, Egyptologists have concurred in believing this magnificent monument to be the sepulchre of that Pharaoh. Built in stages, or tiers, like enormous steps, it towers more than 240 feet above the level of the desert. The débris of the upper stages, which must have been very lofty, forms an immense mound, like a natural hill, rising to a height of 120 feet around the base of the structure. This mound has now been cut through, and cleared down to the base of the pyramid, thus revealing the lower tiers, the masonry of which

looks perfectly new, as if but just built. The whole revêtement of this pyramid consists of polished blocks of fine Mokattam limestone, so admirably fitted that the joints are scarcely traceable. Each tier, or stage, is inclined at an angle of $74^{\circ} 10'$. The three top tiers (which alone were visible before the late excavations) measure 69 feet, $20\frac{1}{2}$ feet, and 32 feet. This pyramid is unlike every other in Egypt, and excels all in the excellence of its masonry. Prof. Maspero began his operations in November, 1881, by opening a vertical trench down the north face of the mound. On Dec. 13, precisely in the centre of the first stage, 20 metres above the level of the plain, the workmen uncovered a square aperture from which the facing-block had been extracted. The entrance—open, but choked with rubbish—was now disclosed to view. Up to this moment it had been believed that the pyramid was inviolate. The entrance passage, which measures 1.20 metre square, descends at a steep incline, strikes the living rock at a depth of 10 metres, and thence becomes an excavated shaft carried down at the same incline, and of the same dimensions, as before. The pyramid is, in fact, formed upon a core of rock, around which the stages are built. A "stopper" stone originally blocked the passage, 5 metres from the entrance; and that the pyramid must have been open at least 3000 years ago is proved by the discovery of three hieratic inscriptions of the XXth Dynasty, scribbled by Egyptian tourists on the ceiling of the passage at the precise spot once occupied by the "stopper." These *graffiti* merely record the visit of two scribes named Sokari and Amenmes. The passage, after descending for more than 40 metres, led to a central chamber which contained only some pieces of highly desiccated timber. Whether the passage took an upward incline before reaching this chamber has not been stated. It is possible that the true sepulchral chamber has not yet been found. The village of Meydoom (which stands high upon an ancient mound) perpetuates to this day the name of "Metun," which appears in a list of towns belonging to Prince Nefermat, a son, or, at all events, a near relative, of Seneferoo. In this inscription, which occurs in Nefermat's tomb, a little distance north of the pyramid, Metun is styled "Metun of the cattle."

It is not possible to assign a positive date to the pyramid of Meydoom, or to the king who is supposed to have built it. Mariette, following Manetho, places the beginning of the IIIrd Dynasty at B. C. 4449, and the beginning of the IVth at B. C. 4235. Brugsch gives B. C. 3966 and B. C. 3733. The death of Seneferoo, as last Pharaoh of the IIIrd Dynasty, would, in either case, synchronize with the commencement of the IVth line.

The Pyramid of Unas.—The huge, flat-topped structure called the *Mastabal el Faraoun*, in the necropolis of Sakkarah, was supposed by Mariette to be the tomb of Unas, ninth and last Pharaoh of the Vth Dynasty. The explorations of Prof. Maspero prove, however, that Unas was buried in the pyramid numbered XXXV. by Lepsius, and entered on Perring's plan as No. IV. It is situate a little to the S. W. of the famous step-pyramid of Sakkarah; is much ruined; has been stripped of its casing-stones, and is encumbered by mounds of débris, which prevent exact measurements being taken of its base. The length of each side is, however, approximately estimated at 220 feet, and it is supposed to have been 62 feet in height. Prof. Maspero commenced excavations on the north side of this pyramid about Feb. 10, 1881, and his workmen reached the sepulchral chamber on the 28th. Like the pyramid of Meydoom, it proved to have been violated long before; and an Arabic inscription on the ceiling of the entrance passage leads Prof. Maspero to believe that it was broken into about A. D. 820, at the time when the Great Pyramid of Gheezeh was rifled, and probably by the same band of marauders. The structure is built

around and upon a core of limestone rock, through which a descending passage, more than 30 feet in length, running due south, leads to a first hall, the walls of which are bare. Then follows a level passage about 45 feet long, blocked at three points by three enormous portcullis stones of granite, still *in situ*. A similar portcullis-stone, also *in situ*, blocks the outer entrance. The ancient tomb-breakers, unable to remove or destroy these obstacles, had excavated a passage round the first, and made their way over the three last. It was in their footsteps that Prof. Maspero and his workmen followed, when the entrance was found. Beyond the last portcullis, the passage (here lined with hieroglyphic inscriptions) leads into the actual tomb, which consists of a central hall, a sepulchral chamber, and a chamber (*serdab*) with recesses for funereal statues. The two former are built with pointed roofs. The entire wall-space of the central hall, part of three sides of the sepulchral chamber, and the walls of the short corridors between the several chambers, are covered with hieroglyphed inscriptions in vertical columns, consisting of prayers, magical formulas, and ritualistic texts. These last contain a complete ceremonial of the last services for the dead at the period of the Vth Dynasty; and as an interesting evidence of the unbroken unity of tradition in matters of religion, it is to be noted that many of these texts occur, with but slight variation, in monuments of the XIIIth, XVIIIth, and XIXth Dynasties. Some of the magical formulas of the pyramid of Unas are actually identical not merely in substance, but in phrase and orthography, with texts of the XXVIth Dynasty; so proving that at this early period, instead of being still in course of formation, the language and religion had already passed into the crystalline stage. The upper end of the sepulchral chamber in this pyramid is lined with alabaster, and decorated with engraved ornamentation, filled in with green and black paint. The sarcophagus, which is of black basalt, remains *in situ*; its cover flung near the doorway. The shattered mummy and torn bandages of Unas strewn the floor. Some fragments of the skull, a tibia bone, some rib bones, and one perfect arm, being the only recognizable remains of this ancient Pharaoh, were removed to the museum at Boolak. A pot of black paint, a workman's plumb-line, and some bones of the sacrificial ox slain during the funeral service, were also found. If the tomb ever contained any objects of value, they were stolen by the early tomb-breakers, who likewise tore up part of the pavement of the sepulchral chamber, in search of treasure. The ancient name of the pyramid of Unas was "Neferasu," i. e., "The most Beautiful of Places."

The hieroglyphic texts from this pyramid, with translations by Prof. Maspero, have been published. (See *Recueil des Travaux*, Vol. III., 1882.)

The Pyramid of Teta.—This pyramid, as it appears on Prof. Maspero's plan (see *Recueil des Travaux* as above), is considerably larger than the pyramid of Unas. It is situate to the N.E. of the Stepped Pyramid of Sakkarah, three other ruined pyramids intervening; and it stands nearest but one to the edge of the desert, near the Cat-mummy pits. This pyramid was opened by Prof. Maspero May 29, 1881. The early tomb-breakers had, as usual, been beforehand with the modern explorers, and in this instance had boldly attacked the massive portcullis stones which blocked the entrance-passage. Teta, first Pharaoh of the VIth Dynasty, was also the first Egyptian king who assumed the title of *Se Ra*, "Son of the Sun." His pyramid bore the name of *Tat-Asu*, "The most Stable of Places."

The Pyramid of Rameri Pepi I. is situate considerably to the S.S.E. of the Stepped Pyramid, and is numbered XXXVI. by Lepsius and 5 by Vyse. This pyramid was opened by direction of Mariette-Pasha in June, 1880. This pyramid is described as entirely destroyed in the upper part, and containing two cham-

bers, one of which has been broken into through the roof. Both are built of fine Mokattam limestone, with pointed roofs. The entrance passage, as usual, is on the north side. The sepulchral chamber measures 25 feet 8 inches by 10 feet 3 inches. The walls were originally covered with inscriptions; those on the long side walls have, however, been destroyed at some remote period, and only those on the end walls remain. The hieroglyphs are finely cut, and colored a brilliant green; the roof, where perfect, is decorated with incised stars, white on a black ground. The basalt sarcophagus, though much damaged, is yet *in situ*. It bears the official cartouche of the king, "Ra-Meri," and is nearly 12 feet in length, the sides being more than 12 inches in thickness, and the bottom 20 inches. Some portions of the wooden mummy-case were found; also a quantity of brown and yellow bandages, and a well-embalmed hand, supposed to be the hand of the Pharaoh. The inscriptions are very archaic, and, although not historically important, are of great value in regard to the light which they throw upon the mythological development of the Egyptian religion at this remote period. The king is repeatedly said to be not dead, but living; fed with the viands of the gods; identified with Horus; dwelling among spirits; and one with Osiris. All the principal deities of the Egyptian Pantheon are mentioned. The antagonism of Horus and Set is distinctly alluded to; the name of Amen is found, which is remarkable at this early date; and a reference to Sothis points to a possible chronological date. The funereal inscription of Pepi-na, a priest of the pyramid of Pepi, informs us that the name of this structure was *Men-Nefer*, i.e., "The Good Station," which was also the name of Memphis. In the famous inscription of Una, a functionary who flourished under the three first Pharaohs of the VIth Dynasty, it is stated that king Pepi sent him to a locality named Ruau, to fetch "a white stone sarcophagus," which command he duly executed, bringing the sarcophagus "with its cover" by water from Ruau to Memphis. The sarcophagus discovered in the pyramid of Pepi is evidently not the same, being of basalt; but the "white stone" sarcophagus fetched by Una may have been intended for some member of the royal family.

The Pyramid of *Mer-en-Ra*, elder son and successor of Rameri Pepi, lies to the S.W. of the pyramid of Pepi, in a direct line with the pyramid of Unas and the Matabat el Faraoun. It was opened by order of Mariette-Pasha in December, 1880. This pyramid has been not only broken into and plundered in ancient times, but has been despoiled of nearly half its masonry. The modern explorers entered it by way of a forced passage bored by the early tomb-breakers. This forced passage opened into the true entrance passage, which is very low, and covered with hieroglyphic texts in vertical and horizontal lines wherein occur the two cartouches of the king. A first chamber, built of fine white limestone, with a pointed roof, opens from the passage and leads into a second and larger chamber containing two rectangular sarcophagi of red granite. The walls of both chambers contain hieroglyphed texts very archaic in style, and of a mythological and ritualistic character, treating chiefly of the labors to be performed by the deceased in the fields of Aahlu (Elysium), and of his passage through the various gates of the lower world. The myths of Osiris, Ra, and Set are alluded to; and the gods are said to have been born of Nut, with crowns on their heads and collars of leaves upon their necks. Horus is spoken of as "the avenger of his father;" and the king is described as the twin-brother of Orion, rising with him in the east, and setting with him in the west of the heavens. The mummy of Mer-en-Ra had been dragged out of the sarcophagus and stripped of its bandages, which, however, were distinctly impressed upon the surface of the skin. The body (now removed to Boolak) is remarkably well preserved, only a portion of the lower jaw

being gone. The features are almost perfect, the eyes are closed, the nose has fallen in. The discovery of this extremely ancient mummy (from 5000 to 5500 years old, according to the chronologies of Brugsch and Mariette) proves that the processes of embalmment during the VIth Dynasty were substantially identical with those employed in later times. In life Mer-en-Ra was a small man of the type of the modern fellah. That he was thin is shown by the tightness of the skin. He was between 30 and 40 years of age. His sarcophagus, which measures 6 feet 10 inches long and 4 feet 4 inches high, is engraved with the royal titles, i.e., "The living Horus, lord of diadems, king of Upper and Lower Egypt; Mer-en-Ra, the twofold Golden Hawk; Mer-en-Ra, heir of Khab; Mer-en-Ra, the Great God; Lord of the Horizon; Mer-en-Ra, Living like the Sun." From the inscription of Una, who received from Mer-en-Ra a commission such as he had previously executed for the king's father, we learn the name of this pyramid. "His majesty," says Una, "despatched me to Abha to bring for the Living Lord the sarcophagus of the living (Lord) with its cover and pyramidion, and a statue, for the pyramid *Kha-nefer* (i.e., 'The Beautiful Rising') of Mer-en-Ra, the Divine Ruler." The statue and pyramidion are gone, but the sarcophagus is most probably the one discovered *in situ* in 1880. The smaller sarcophagus was uninscribed.

The Pyramid of *Nefer-ka-Ra Pepi II.*, younger brother and successor of Mer-en-Ra, was opened under the direction of Prof. Maspero, April 18, 1881. The ancient name of this pyramid was *Men-Ankh*, i.e., "The Permanent Life."

Six other pyramids, including a large one formerly opened and reclosed by Perring, have been excavated since 1880 in the Necropolis of Sakkarah. One of these (opened in December, 1880) proved completely blank. Also, at a point about 10 miles south of Esneh, in Upper Egypt, the ruined pyramid called by the Arabs *El-koôla* was attacked during the spring of 1882, but without success. Though levelled almost to the ground, this little pyramid, the base of which is only 60 feet square, kept its secret to the last. No entrance was found, and Prof. Maspero inclines to believe that none has ever existed. In such case the structure would probably have been only monumental, and a subterranean vault may lie far below excavated in the rock. One of the two ruined pyramids of Lisht, near Kafr-el-Ayât, about 7 miles north of Meydoom, was taken in hand at about the same time. After seven months' labor the entrance was found, and the descending passage cleared for a distance of 50 feet. Just at this juncture, when another week or ten days would have crowned the work with success, the serious aspect assumed by the military rebellion in Egypt caused the excavations to be suspended. The pyramid had been violated in ancient times, and ruthlessly mutilated. The wall-surfaces of the passage had evidently been covered with inscriptions; but the inscriptions had been chipped off by the early treasure-seekers, and the sand which choked the passage was full of illegible fragments. From the appearance of these fragments and other indications Prof. Maspero pronounces the Lisht pyramid to belong to the XIIth Dynasty.

It must not be supposed that these pyramid explorations are made without a definite and important object. They are, on the contrary, the most important excavations which have, perhaps, ever yet been undertaken in Egypt; and they have for their object the restoration of the history of the early dynasties. In this history there occur two strange and ominous chasms, the earliest of which is not illustrated by a single monument. This chasm falls between the VIth and XIth Dynasties; the VIIth, VIIIth, IXth, and Xth Dynasties being an absolute blank. Historians have vainly sought to bridge this void by means of conjectures more or less ingenious, but Prof. Maspero differs from them all in believing that no such void exists. The

great pyramid-field, he argues, reaches from Aboo-Roash, a little below Gheezeh, to the Fayoom; and the pyramids, which range in an irregular line from north to south, are, he maintains, chronologically classified in that order. The pyramids of Aboo-Roash, which are the most northerly, are also the most dilapidated, and look as if they might be the most ancient. There is nothing to show to what king or period they belonged. Next come the pyramids of Gheezeh, which date from the IVth Dynasty; next follow the pyramids of Abooseer (Vth Dynasty); next, those of Sakkarah, which, as these latest explorations show, belong to the VIth Dynasty. Between Sakkarah and the Fayoom lie many more, few of which have been explored, though all probably have been violated by ancient plunderers. These, according to Prof. Maspero's theory, should belong to the Pharaohs of that lost period, which comprises the VIIth, VIIIth, IXth, and Xth Dynasties. The Fayoom, with its pyramids, brings us to the XIIth Dynasty; the XIth being the dynasty of the Mentuhoteps and Entefs, who had their residence and tombs at Thebes. For many years Prof. Maspero has held by his opinion, and stood alone in so holding by it. As successor to the late Mariette-Pasha he is now in a position to test the accuracy of his judgment, and it is his announced intention to open every pyramid from Sakkarah to the Fayoom. Whether his theory be proved or disproved, science cannot fail to benefit by his researches.

The Discovery of Royal Mummies at Dayr-el-Baharee, Thebes.—On July 2, 1881, the most extraordinary archæological treasure ever discovered in a single hiding-place was betrayed into the hands of the Egyptian government by a native fellah named Mohammed Abd-er-Rasoul. The existence of a sepulchral treasure of unusual value had long been suspected by the authorities. Objects of great historical and archæological interest, appertaining for the most part to the XXIst Dynasty, were annually brought to Europe by travellers who proved not only to have purchased them at the same place (Luxor), but also from the same persons. Among these objects were libation-vases, canopic jars, Osirian statuettes, or *Shabti*, and several superb papyri written for royal personages of the family of Her-Hor, first Pontiff-King of the Sacerdotal line. On succeeding to the post of director-general of the museum of Egypt, Prof. Maspero at once proceeded to investigate into the sources of this illicit traffic, which was found to be in the hands of four Arab brethren, one of whom—apparently the principal offender—was forthwith arrested, interrogated, and imprisoned. His dogged fortitude was, however, shaken by neither bribes, punishments, nor threats; and the secret would not even then have transpired but for Mohammed, eldest of the four, who turned “king's evidence,” and claimed the £500 reward offered by the Egyptian government. Upon the information thus given two officers of the Boolak Museum were at once despatched in a Khedival steamer. These officers—Herr Emil Brugsch, assistant conservator of the museum, and Ahmed Effendi Kemal, secretary and interpreter to the same—were met a little above Luxor by the said Mohammed, and by him conducted to a lonely spot in that embayed recess in the great limestone range on the western bank of the Nile, which is commonly called after the ruins of the Christian convent of Dayr-el-Baharee. Here, at a short distance to the S. W. of the great temple of Hatasu (so admirably concealed that, according to Prof. Maspero's report, the keenest observer might have passed it twenty times without noticing it), they were shown the mouth of a small pit, and told that here was the place of the treasure. Being lowered into this pit, down a vertical shaft measuring 2 metres square by 11½ metres in depth, they found themselves landed in a subterraneous passage along which they had to crawl upon their hands and knees. At the end of a distance of 7 metres this passage

turned abruptly northward—that is to say, at right angles to its first direction—and after proceeding for a distance of 23 metres was interrupted by a flight of roughly hewn steps. At the foot of these steps the passage (still trending due north) was continued some 40 metres farther, and ended in a large sepulchral chamber measuring 7 metres in length by 4 metres in breadth. The entire length of the excavation, taken in a straight line from S. to N. and including the sepulchral chamber, is 74 metres; or, including also the first short passage from E. to W., 81 metres. The height of the short passage was only 1.10 metre; the height of the long passage varied from 1.40 metre to 5 metres. This last was found strewn with fragments of mummy-cases and linen wrappings. Funereal vases, boxes, rush-woven baskets, etc., were piled against the walls. In one corner, rotting in a crumpled heap, lay the famous leather canopy of Queen Isi-em-kheb. Farther on, almost blocking the passage, were several enormous sarcophagi elaborately painted, and surmounted by recumbent effigies; while yet farther on there appeared a crowd of mummy-cases, mostly stacked upright, leaning against each other, and looking strangely human, with carved and painted masks, and hands piously crossed, as if in prayer. Upon each of these were painted bands of hieroglyphs, in which, accompanied by certain customary religious formulas, were stated the titles and names of the deceased. The amazement of Herr Brugsch and his companion may be conceived when, instead of a few petty princes of the sacerdotal line, such as they had expected to find, they read the names of nearly all the most famous sovereigns of the XVIIIth and XIXth Dynasties: Ahmes I., the patriot king who expelled the Hykshos from Lower Egypt after a dominion of 500 years; Queen Ahmes-Nofretari, his wife; Amen-hotep I., their son and successor; Thothmes II.; Thothmes III., perhaps the greatest of all the Pharaohs; Seti I., a mighty warrior; and Rameses II., the Sesostris of the Greek historians, commonly called “the Great.” A still earlier hero, Sekenen-Ra Taaken, prince of Thebes, of the XVIIth Dynasty, one of the leaders of the great war of national independence, was also found in this passage; and Queen Hathor Hont-taui, wife of Pinotem I. of the XXIst Dynasty. Entering the mortuary chamber at the end, an extraordinary sight met their eyes. They beheld a vault stored from floor to roof with enormous sarcophagi, packed one upon another, gorgeous with color and glittering with varnish. These proved to be the coffins of the family of Her-Hor Se-Amen, who was High Priest of Amen at Thebes under the last Ramesside Pharaoh, and who (according to inscriptions found in the Temple of Khons at Karnak) finally assumed the style and title of royalty, and became the founder of the XXIst Dynasty. The mummy of this first priest-king was not found. He may possibly have been buried at Tanis, where monuments of his line and time have been discovered; or his remains and relics may have been dispersed by the Arabs. Here, however, was found the body of his mother Queen Notem-Maut, his grandson Pinotem I., his great-grandson Pinotem II., Queen Makara, Queen Isi-em-kheb, Prince-Pontiff Masahirti, Princess Nasi-Khonsu, and several other personages apparently of royal and priestly descent belonging to this dynasty. The members of the Her-Hor family were for the most part enclosed in two coffins; some in three. Those of the XVIIIth and XIXth Dynasties were, with but one exception, enclosed in a single mummy-case; that exception being Queen Ahmes-Nofretari, whose mummy in its crimson-painted inner coffin of “cartonnage” was again enclosed in a gigantic outer shell of the same material 7.17 metres high, fashioned in the form of an Osirian statue. This huge effigy represents the mummied queen, and the face bears every appearance of being a portrait. The arms are crossed, each hand grasping the *Ankh* (♀), symbolical

of eternal life. The head is surmounted by the plumed headdress peculiar to the God Amen; and the plumes, which are of painted wood, measure 1.50 metre in height. The total height from the ground to the top of the plumes is therefore 8.67 metres. This cartonnage (made of many layers of linen saturated in some kind of resin, and coated with stucco) is stamped in part with a reticulated hexagonal pattern, resembling a section of honeycomb; the hollows being painted blue, and the rest of the surface yellow. A similar outer case of the same size and pattern, inscribed with the name of "The Royal Wife and Royal Mother, Aah-hotep," was also found here. It is to be remembered in connection with this circumstance that in 1859, at but a short distance from the mouth of the lately discovered vault, there was found, under some 12 or 15 feet of sand, the superb mummy-case, jewels, and mummy of a queen of this name. Among the jewels were a poniard and a pectoral ornament inscribed with the names of Ahmes Ranephehti, first Pharaoh of the XVIIIth Dynasty, and a flabellum, or feather fan, bearing the name of Kames, a Theban prince of the XVIIth Dynasty, who is supposed to have been the husband of Queen Aah-hotep, and the father of Aahmes. The carelessness of the burial and the miscellaneous nature of the treasure found with the mummy have given rise to much learned speculation. The discovery of the queen's outer sarcophagus in the Her-Hor vault suggests, however, a simple explanation of the mystery. The jewels were doubtless the

spoils of several royal mummies, secreted *en masse* in the inner coffin of Aah-hotep, and so removed from the vault; the whole being in all likelihood temporarily hidden in the sand, pending a safe opportunity for transporting the booty to Luxor. It seems impossible to doubt that the mummy of Ahmes (which is among those recovered) was originally arrayed with the poniard and pectoral ornament which bear his name; and the flabellum of Kames points to the probability that this prince's mummy has been destroyed or sold by the Arabs.

Among other relics of personages, whose mummies may originally have been laid in the vault, must be noted the empty coffins of Thothmes I. and Rameses I.; while of the famous Queen-Pharaoh, Hatasu, daughter of Thothmes I., was discovered an extraordinary *memento* in the shape of a small cabinet containing a dried human liver, which we are fain to suppose is that of the great queen herself. The cabinet is made of wood and ivory, and is sculptured with both cartouches of Hatasu. A tiny model mummy-case, 10 inches in length, adorned with the royal fringe of asps, disks, and "tats," inscribed for a priest named Soutimes, contained a similar liver.

The following list, tabulated according to the chronology of Mariette (which is based on that of Manetho), gives the various mummies, empty coffins, and royal relics in their historical order. The exact succession of some numbers of the Her-Hor line is not, however, as yet finally determined.

XVIIITH DYNASTY.—(Circa B. C. 1750 to B. C. 1703.)

1. Sekenen-Ra Taaken (prince of Thebes)..... Mummy; mummy-case.
2. Queen Ansera (probably his wife)..... Mummy.
3. Queen Aah-hotep..... Outer sarcophagus.

XVIIIITH DYNASTY.—(Circa B. C. 1703 to B. C. 1462.)

4. King Ahmes-Ranephehti Mummy; mummy-case.
5. Queen Ahmes-Nofretari (his wife) Mummy; mummy-case; outer sarcophagus.
6. Queen Merit-Amen..... Mummy.
7. King Amenhotep I..... Mummy; mummy-case.
8. Queen Hontimooohoo..... Mummy; mummy-case.
9. King Thothmes I. (son of Amenhotep I.)..... Mummy-case.
10. Queen Hatasu (daughter of Thothmes I.)..... { Small cabinet, containing a desiccated human liver.
11. King Thothmes II. (brother and husband of Hatasu)..... Mummy; mummy-case.
12. King Thothmes III. (second brother of Hatasu) Mummy; mummy-case.
13. Queen Sitka (?)..... Mummy.

XIXTH DYNASTY.—(Circa B. C. 1462 to B. C. 1288.)

14. King Rameses I Mummy-case.
15. King Seti I..... Mummy; mummy-case.
16. King Rameses II..... Mummy; mummy-case.

XXTH DYNASTY.—(Circa B. C. 1288 to B. C. 1110.)

No mummies of this dynasty were found, unless the mummy of a prince named Tat-f Pthah-au-f-Ankh, styled "Royal son of Rameses," be of that period. He was possibly a son of one of the last *rois fainéants* of this line. Of Rameses IX. there was found some indication in the shape of various fragments of a chair, or stool, made of wood, bronze, and ivory.

XXIST DYNASTY.—(Circa B. C. 1110 to B. C. (?).)

17. Queen Notem-Maut (mother or possibly wife of Her-Hor). Mummy; two mummy-cases.
18. Pinotem I. (Pontiff; apparently not styled king)..... Mummy; mummy-case.
19. Queen Hathor Hont-taui (wife of Pinotem I.)..... Mummy; two mummy-cases.
20. King Pinotem II..... Mummy; mummy-case.
21. Queen Makara Mummy; two mummy-cases.
22. Prince-Pontiff Masahirti..... Mummy; three mummy-cases.
23. Princess Nasi-Khonsu..... Mummy; two mummy-cases.
24. Queen Isi-em-kheb..... Mummy; three mummy-cases.

Besides the foregoing there were found several mummies of royal children, including a young son of King Ahmes I.; also the mummy and mummy-case of one Nebsooni, a priest, grandfather of Queen Hont-taui and husband of a certain Queen Tentamen, of the XXIst Dynasty; the mummies of various royal ladies, also of this dynasty, who were priestesses of Amen; several mummy-cases of servants of the royal household, some mummy-cases without inscriptions, some mummies without mummy-cases, and some imitation mummies, consisting of pieces of wood bandaged to represent human forms, and enclosed in cases from which the original occupants had been abstracted. Of

other sepulchral treasures there was found a vast store of funereal statuettes (*shabti*), bronze libation-jars, "canopic" vases for containing the viscera of the mummied dead, small vases, bottles and vessels in various materials, amulets, four papyri, etc., etc., numbering in all some 6000 objects.

The above list is separable into two parts or groups: the first group containing mummies and relics of the XVIIth, XVIIIth, XIXth, and XXth Dynasties; the second group consisting of mummies and relics of members of the family of Her-Hor. Had no names been painted on the coffins of these royal personages, Egyptologists could have classified them dynastically from the

the inefficiency of the Theban police, at this period. Not the foreign foe, but the native tomb-breaker, was the real source of danger to the dead. Then, and long before then, at least as early as the reign of Rameses IX., there existed bands of desperadoes who lived by plundering the city of tombs upon the western bank, and who respected a mummied Pharaoh no more than a mummied ibis. There are yet extant two papyri—the “Abbott papyrus” and the “Amherst papyrus”—both original documents of the time of Rameses IX. (XXth Dynasty), and both relating to these tomb-robberies. The “Abbott papyrus” is the actual draft of a report penned by the scribe of the commandant of police at Thebes, and it gives a circumstantial account of an official tour of inspection made through various parts of the Necropolis (chiefly among the royal tombs) from the 18th to the 21st day of the month Athyr, in the tenth year of Rameses IX. A list is given of the tombs found intact; of those unsuccessfully attempted and showing marks of violence; of others violated and sacked, where “the thieves had torn their occupants from the coffins and mummy-cases, and had cast them in the dust, and had stolen their funerary furniture, and also the gold and silver and the ornaments that were with them.” The “Amherst papyrus” contains the confession of one of the robbers, as taken down by a scribe in attendance on the Governor of Thebes. The culprit admits having broken into the sepulchre of King Sevek-eon-saf and Queen Nubkhas his wife (XIIth Dynasty), and relates how he and his companions despoiled these royal mummies of their valuables, and then set fire to their mummy-cases. Other papyri of an earlier date, written in the reign of Rameses III., reveal a generally demoralized condition of society under the XXth dynasty, and show that not only did anarchy reign in the provinces, but that disaffection and conspiracy were rife among the priestly and military castes in Thebes itself. If such was the state of the capital under a powerful Pharaoh like Rameses III., there can be no doubt that the mischief must have largely increased under his feeble successors, in which case tomb-breaking would have flourished almost unchecked during the reigns of those later Ramessides who preceded the dynasty of the priest-kings. The marvel is, indeed, not that so many Pharaohs of the earlier dynasties should have been removed from their sepulchres and reinterred in the tomb of the Her-Hor family, but that any royal mummies of those periods should have survived the century and more of warfare which had been waged against the dead. For there can be no question that it was for protection against theft and sacrilege that the remains of their illustrious predecessors had been gathered by their priest-kings into the shelter of their own sepulchre. The fact is indirectly proved by a number of inscriptions written in the hieratic script upon the mummy-cases and bandages of several of the Pharaohs of the XVIIIth and XIXth Dynasties. These inscriptions, though dated some in the reign of Her-Hor, some in the reign of Pinotem II., and some in the reign of Masahirti, are almost identical as to substance. Each purports to be the record of an official visit of inspection to a royal tomb; each is dated, and signed by numerous witnesses. These inspectors of tombs were careful to state how they “renewed the funerary appointments” of the royal dead; that is to say, how they swathed them in fresh outer bandages, garlanded their mummied forms with flowers, and repaired, or renewed, their coffins. They were also empowered to remove these ancestral Pharaohs from place to place, if necessary; and it is clear that this could only have been done with the object of baffling the tomb-breakers. Also, it is impossible that their coffins can have needed repair or renewal, unless wilfully injured. Mummy-cases of a much more ancient date than any found at Dayr-el-Baharee have come down to the present day, perfect even to the gilding and coloring of their surfaces. The

dryness of the Egyptian climate, and the safety from insect ravages which was insured by the places and conditions of burial, render anything like natural decay wholly impossible. The rough treatment to which many of the Dayr-el-Baharee coffins had evidently been subjected at the period of these inspections can have arisen from no other cause than sacrilegious violence. Of the original coffins of Amenhotep I. and Thothmes II., only the lids remain; the lower part of both being of rougher and later work. From the mummy-case of Thothmes III. the gilding is scraped off, and the whole much battered and disfigured. The coffin of Rameses I. is a wreck, all but the lid, and was found empty. A very finely-bandaged mummy lying near by is supposed, however, to be the mummy of the founder of the XIXth Dynasty. The original mummy-case of Rameses the Great must have been either destroyed or injured beyond repair, as his mummy reposes in an entirely new and very handsome coffin of carved sycamore wood, of XXIst Dynasty workmanship. The hieratic inscriptions traced on the coffin and on the bandages of the mummy show that this famous Pharaoh was first visited by the inspectors when yet in his own sepulchre in the Valley of the Tombs of the Kings; and that after this inspection his mummy was at least four times shifted from tomb to tomb (*i. e.*, to the tomb of Seti I., to the tomb of Queen Ansera, to the tomb of one of the Amenhoteps, and back to the tomb of Seti I.) before being finally deposited in the sepulchre of the priest-kings. Seti himself was twice shifted, and Rameses I. three times. All these facts are shown by the inspectors' entries. It seems singular that the only mummies which bear these entries are those of Amenhotep I., Thothmes II., Rameses I., Seti I., and Rameses II. The great Ahmes, who founded the XVIIIth Dynasty, his famous queen, Thothmes III., and the rest, though carefully rescued and sheltered, were either not periodically visited, or were left uninscribed. These examinations, as far as we have record of them, begin with the sixth year of Her-Hor, reappear under Pinotem II., and end with the sixteenth year of the pontificate of Masahirti. It must evidently have been at some date subsequent to that last entry, and before the interment of Queen Isi-em-kheb, that these defunct guests were received *en masse* into the family vault of the priest-kings. Prof. Maspero conjectures that this admission was the act of King Menkheperre II., and that the vault and passages became therefore so crowded that he sealed the sepulchre forever, and was, with his descendants, buried elsewhere. Prof. Maspero's exhaustive report (*La Trouvaille de Deir-el-Bahari*, Cairo, 1881) contains many more details of this discovery than we have space to quote; but the following measurements of the mummies of some of the most celebrated Pharaohs are too curious to be omitted:

	Metre.
Ahmes Ranebpehti	
(founder of the XVIIIth Dynasty) }	 1.67.
Queen Ahmes Nofretari (his wife).....	1.68.
Amenhotep I.....	1.65.
Thothmes III.....	1.60.
Seti I.....	1.75.
Rameses II.....	1.80.

From these measurements we learn that Queen Ahmes Nofretari was one inch and three-eighths taller than her husband; and that Thothmes III. and Rameses II., the two most famous Pharaohs of Egyptian history, were respectively the shortest and the tallest of all this illustrious company.

Having escaped depredators, ancient and modern, these royal mummies, and the treasure found with them, are now safely lodged in the Museum of Egyptian Antiquities at Boolak, near Cairo, where several additional rooms have been built for their reception. A new catalogue of the collection, including these acquisitions, has been published.

(A. B. E.)

EHNINGER, JOHN WHETTON, an American artist, was born in New York, July 22, 1827. He was educated at Columbia College, and after graduating in 1847 he went to Paris, when he entered the atelier of Couture. He studied for several years in Paris and other European cities, and executed a number of pictures which were greatly admired when they were exhibited in the United States, several of them being selected by the Art Union as subjects for engravings to be issued to its subscribers. Ehninger has attempted many themes from the highest, such as Christ Healing the Sick, to the most familiar. His most popular as well as his best performances are representations of American country-life, such as A New England Farm-Yard, Love me, Love my Horse, and Yankee Peddler. He has been a frequent contributor to both the English and American illustrated papers, and has made etchings for Hood's "Bridge of Sighs," Washington Irving's "Dolph Heyliger," Longfellow's "Miles Standish," and other stories and poems.

(W. J. C., JR.)

EISENLOHR, AUGUST, a German Egyptologist, was born at Mannheim, Oct. 6, 1832. He studied theology at Heidelberg and Göttingen, but on account of a nervous disease was obliged to discontinue his studies in 1853. On his recovery in 1858 he devoted himself to agriculture, and afterwards to natural science, especially chemistry. From 1862 to 1865 he had a manufactory of aniline colors. In the latter year he was accidentally drawn to the study of Chinese, and then to Egyptian hieroglyphics, in the interpretation of which he followed Chabas and afterwards Brugsch. In 1869, having presented an analytical explanation of the Demotic part of the Rosetta Stone, he was admitted as an instructor in Egyptology in the University of Heidelberg. Having been sent by the Grand Duke of Baden to Egypt he ascended the Nile to the second cataract, and examined in Alexandria the great Harris papyrus, a document of Rameses II., 1320 B. C. He returned through Palestine, Syria, and Asia Minor. In 1872, having purchased from its owner, Miss Harris, for the British Museum, the papyrus, whose value he had ascertained, he published an essay on it (Leipsic, 1872), and a translation of it in the *Aegyptischen Zeitschrift*. In the same year he was made professor extraordinarius in the University of Heidelberg. He published in 1875 an explanation of the ancient Egyptian measures from a papyrus in the British Museum. He has also translated and explained another papyrus of the museum under the title, *Ein Mathematisches Handbuch des alten Aegypten*, Leipsic, 1877. The papyrus Rhind from which this is taken was probably written in the time of the Hykshos, 1700 B. C., and contains a summary of the mathematical knowledge and operations of that age.

EJECTMENT. The action of ejectment is still in use in some of the United States, stripped however almost entirely of the fictions and forms by which it was attended at the common law. In those States where it is still retained it is the sole method of settling the titles to land. The claimant issues a writ directed to the tenant actually in possession. All persons claiming a title adverse to the plaintiff are then permitted on application to come in and defend. On the trial it is incumbent on the plaintiff to prove (1) possession on the part of the defendant, and (2) his own superior title. It is believed to be a universal rule that the plaintiff must recover on the strength of his own title and not on the weakness of his adversary's. The judgment in ejectment is by statute generally made conclusive as to the title so far as the parties to the action are concerned, and all persons claiming from, through, or under them. In some States, however, it is made conclusive as to the right of possession only, and in Pennsylvania it has not even that effect, the judgment being only deemed conclusive as to such right when it has been preceded by another similar

judgment between the same parties. In a few States the common law rule is retained, and any number of actions of ejectment may be brought for the same premises between the same parties until a court of equity intervenes to prevent vexatious and repeated litigation. In those States where separate forms of action are abolished and a code is in force, ejectment as a distinctive action has of course disappeared. The form of action, however, prescribed for the recovery of the possession of real estate is necessarily very similar to the action of ejectment, and is governed by much the same rules. Substantially the same evidence is required and the judgment is usually made conclusive with respect to the title involved. (L. L., JR.)

ELECTION LAWS, AMERICAN, prescribe and regulate the exercise by citizens of their rights of suffrage; they direct the manner and times of holding elections and declare who shall be entitled to vote at such elections.

The jurisdiction of the election laws of the United States extend only to such officers of the Federal Government as are elective, viz.: the President, the Vice-President, and members of the House of Representatives; and have no application to the election of the officers of the several State governments, which are regulated by their own particular codes. They prescribe that the President and Vice-President shall be elected by a college of electors, which college shall be composed of as many electors as there shall be Senators and Representatives in Congress according to the appointment thereof at the time of the appointment of such electors. That the people shall vote directly for the electors, who in turn shall meet in college on the first Wednesday in December, in the year in which they are appointed, and at such place in each State as the legislature thereof shall direct, and after making a list of the names of the persons voted for by the electors for the offices of President and Vice-President, with the number of votes each received, make three certified copies of the same: one shall be delivered to the Vice-President at the seat of government, or, in case of his absence, to the Secretary of State, before the first Wednesday in January next ensuing; one shall be sent by the post-office to the President of the Senate at the seat of government, and the third one shall be delivered to the Judge of the District in which the electors shall assemble. That Congress shall be in session on the second Wednesday of February succeeding every meeting of the electors, and the certificates from them shall then be opened, the votes counted and the persons to fill the offices of President and Vice-President ascertained and declared agreeably to the Constitution. It provides also that no one shall be eligible to these offices unless he be 35 years old and be born in the United States. Members of the Congress are by the laws elected in the following manner: each State shall be entitled to two Senators in Congress, who shall be elected by the Senate and House of Representatives of the several States, on joint ballot; and that no person shall be eligible for the office of Senator unless he be 30 years of age and be 9 years a citizen of the United States, and be an inhabitant of the State for which he shall be elected. The members of the House of Representatives shall be elected directly by the people, and that there shall be one representative for every 30,000 inhabitants. That no person shall be eligible to this office unless he be 25 years of age and been a citizen of the United State 7 years, and a citizen of the State from which he shall be chosen. Under these laws all citizens of the United States are entitled to vote except citizens of the District of Columbia, who because of the District being the capital seat of the Federal Government are given no part in the elections. All the officers of its government are appointed by the President, and the United States courts exercise exclusive jurisdiction over the District. (See DISTRICT OF

See Vol. VII.
p. 687 Am.
ed. (p. 792
Edin. ed.).

use in some of the United States, stripped however almost entirely of the fictions and forms by which it was attended at the common law. In those States where it is still retained it is the sole method of settling the titles to land. The claimant issues a writ directed to the tenant actually in possession. All persons claiming a title adverse to the plaintiff are then permitted on application to come in and defend. On the trial it is incumbent on the plaintiff to prove (1) possession on the part of the defendant, and (2) his own superior title. It is believed to be a universal rule that the plaintiff must recover on the strength of his own title and not on the weakness of his adversary's. The judgment in ejectment is by statute generally made conclusive as to the title so far as the parties to the action are concerned, and all persons claiming from, through, or under them. In some States, however, it is made conclusive as to the right of possession only, and in Pennsylvania it has not even that effect, the judgment being only deemed conclusive as to such right when it has been preceded by another similar

COLUMBIA.) The Enforcement Act of May 31, 1870, which was founded upon the Emancipation Proclamation, makes it indictable and punishable for any one to prevent persons of African descent from voting, or for refusing to register such votes.

The various States of the country have from time to time enacted laws for the regulation and management of their own local elections, embracing the public choice of the officers of the State, city, and county, and prescribing the punishment to be inflicted upon any one who violates them, and according a proper remedy for any one who may, by fraud in the election, be hindered from the occupancy of an office to which he was elected. This consists in a contest with the person claiming to hold the same, wherein he must show that the incumbent's tenure is a fraudulent one. The right of suffrage is the highest branch of the liberty of the American citizen—a right inherent with his birth, in the free exercise of which he elevates his fellow to power, or transfers that power to another, and becomes a most effectual check upon the improper exercise of power by those in authority. It is that sovereignty, so essential to the free institution of the government, whose fundamental principle is that all men are born free and equal. The constitutions of the States secure to the citizen this right, prescribe and declare the number and nature of the offices, whose incumbents shall preside over the State and municipal affairs, the manner and form in which they shall be chosen, but leave to the qualified citizen the exercise of that right of choice. The laws of each State, as enacted by the legislature, enlarge and provide the means of effecting the ends of the constitution, and forbid the doing of those things by the citizen which would be a violation of them: as, voting twice at any one election, bribing others to vote or not to vote, personating voters, defacing or destroying the ballots, false representations as to qualification to vote, or making false returns of the elections; and punish such offenders with fine, imprisonment, and the deprivation of the rights of citizenship for such period as the court may direct.

(F. H.)

State Qualifications of Electors.—In all the States the following qualifications may be properly classed as universal, viz., that the elector be a male, over twenty-one years of age, neither a lunatic nor a pauper, and prepared to take, if necessary, an oath of allegiance to the Federal Government. The only one of these conditions not absolutely universal is the first, to which there are a few exceptions in certain States for particular elections. For several years after the late civil war, a few of the States disfranchised those who had taken arms against the United States, but these disqualifications no longer exist.

As to *residence in the State* previous to an election, 2 years are required by Kentucky and Rhode Island; 1 year by Alabama, Delaware, Florida, Illinois, Louisiana, Maryland, Massachusetts, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Texas, Vermont, Virginia, West Virginia, and Wisconsin; 6 months by Arkansas, California, Georgia, Indiana, Iowa, Mississippi, Nebraska, Nevada, and Oregon; 4 months by Minnesota, and 3 months by Maine and Michigan. Oregon further requires United States citizenship for 1 year, Pennsylvania for 1 month, Massachusetts 2 years, and New York 10 days.

Previous residence in *county* is required for 1 year by Kentucky; 6 months by Connecticut, Florida, Maryland, Massachusetts, Rhode Island, Texas, Tennessee, and Louisiana; 5 months by New Jersey; 4 by New York; 3 by Alabama, North Carolina, and Virginia; 2 by Iowa, Missouri, and South Carolina; 40 days by Nebraska; 30 days by California, Delaware, Georgia, Illinois, Mississippi, Nevada, Ohio, and West Virginia; and 10 days by Michigan and Minnesota. Besides these, a residence of 30 days in the district is required in New York, and 60 days in Pennsylvania;

Kentucky requires 60 days' residence in the precinct, Louisiana 30, and Nebraska 10; Ohio requires 20 days in the township or village, while residence at time of election only is required by Arkansas and New Hampshire.

Disqualifications exist in the several States as follows: Conviction for treason, embezzlement of public funds, malfeasance, bribery, or fraud, in Alabama, Arkansas, Kansas, Virginia, West Virginia, and Wisconsin. Michigan, Georgia, Kansas, and Virginia also include duelling, or challenging to a duel. Conviction of any infamous crime disqualifies in California, Delaware, Florida, Georgia, Iowa, Maryland, Minnesota, Nevada, New Jersey, New York, North Carolina, Rhode Island, Tennessee, and Texas; also of bribery or election fraud in Pennsylvania for 4 years, and in New York for betting on an election. No person under guardianship can vote in Florida, Kansas, Maine, Maryland, Massachusetts, Minnesota, or Wisconsin, and to deny the existence of Almighty God disqualifies in North Carolina.

Foreigners not citizens can vote on declaring their intention of becoming such in Arkansas, Florida, Georgia, Indiana, Kansas, Minnesota, Missouri (where declaration is required at least 1 year previously), Oregon, Texas, and Wisconsin. A former citizen of Mexico prior to 1848, now a United States citizen, can vote in California. *Property* qualification is required only in Rhode Island, where at least \$134 of real estate must be owned by each elector. Connecticut requires a good character and an ability to read any part of the constitution or State laws; Massachusetts does the same, and adds an ability to write name. Missouri requires all voters new after 1876 to be able to read and write. Two years' residence after naturalization is required in Massachusetts.

Tax is required from all over 22; to be paid not more than 2 years or less than 6 months before election, by Delaware; Massachusetts requires within 2 years, Rhode Island within 1 year, and Pennsylvania not less than 30 days. Georgia requires all taxes payable within the year. Persons excused from taxation are disfranchised in New Hampshire, and all electors must "certify to good behavior" in Vermont. The legislature is empowered to pass acts of disfranchisement for various crimes in Illinois, Indiana, North Carolina, and Oregon.

Primary Elections in Pennsylvania are regulated by two separate acts. The first, approved June 8, 1881, provides as follows: 1. That any candidate giving or offering, directly or indirectly, any gift or bribe of any nature to an elector at a primary or delegate election for the purpose of inducing him to cast his vote or use his influence for or against any particular candidate, shall be guilty of a misdemeanor, punishable by fine of not more than \$300 and imprisonment for not longer than 3 months. 2. That any elector accepting such bribe or (3) offering to sell his vote or influence at such election or convention shall also be guilty as above and subject to same punishment. 4. That any disqualified person voting at such election, or person procuring such disqualified vote, or person voting twice on the same day for the same candidate, or procuring another to do so, shall be guilty as above. Penalty \$200 and 3 months. 5. That any delegate to such election receiving or asking for any recompense to vote or abstain from voting for any person as candidate for office, shall be guilty as above. Penalty \$100 and 3 months. 6. That any person having to do with the conducting of such election or convention who shall receive or solicit any bribe in connection therewith shall be guilty as above. Penalty, \$100 and 3 months. 7. That any person offering to bribe or influence any officer of such election shall be guilty as above. Penalty, \$200 and 6 months.

The second act, approved June 29, 1881, provides as follows: 1. That every officer of any primary election in Pennsylvania shall be sworn before entering on his duties by one of the inspectors, and may swear any elector offering to vote at such election. 2. That any officer presuming to act in an official capacity without being so sworn shall be liable to fine of \$200; same penalty for his knowingly refusing any qualified vote or accepting any unqualified one, and for his wilful disregard of any party rule at such election; or if such officer be guilty of any wilful fraud in his duties, he shall be liable to fine of \$500 or 1 years' imprisonment, or both or either at discretion of court.

(E. F. S.)

ELECTRICITY.

See Vol. VIII. p. 4 Am. ed. (p.3 Edin.ed.).

WITHIN the past forty years the great generalization known as the Conservation of Energy has been made, and the forms in which energy exhibits itself have been investigated with great diligence and success, with the result of making much more definite than was formerly possible the conceptions of what is really taking place in matter when it is exhibiting various phenomena, such as heat, light, electricity, and magnetism. All the old theories concerning each of these have been discarded, and as no one now thinks of speaking of caloric when referring to thermal phenomena, so no one speaks of the electric fluid when electrical phenomena are involved. Those who have investigated the subject have satisfied themselves that whatever may be the form of electrical energy it cannot be a fluid.

Before one can form a judgment as to the probability of any theory of the nature of electricity being true or an approximation to the truth, one must have some kind of a mechanical idea of the physical conditions known to be present when electrical phenomena present themselves, and then see how far additional assumptions are necessary. To this end it must be borne in mind that all electrical phenomena, so far as we *directly* can observe them, are phenomena of common matter, and it is from the behavior of common matter that all inferences are drawn as to there being something else in some way involved. By "matter" is here meant just what is meant by that word in the law of universal gravitation: "Every particle of matter in the universe attracts every other particle of matter." If there be any kind of matter in the universe that is not subject to the law of gravitation, then that law is not universal, and it should read, "Some particles of matter," etc. Such terms as "electric matter" and "magnetic matter," when used to designate a kind of matter not subject to gravitation, are inappropriate, and not in accordance with scientific terminology, as their use makes indefinite what otherwise would be definite and accurate.

The phenomena of heat and of light furnish abundant evidence of the existence of some medium that is not matter, but which fills space and apparently is continuous, and not atomic or molecular in its structure. This medium is so related to matter that the vibrations of atoms and molecules generate waves in it which travel outward in straight lines from the vibrating body with the velocity of 186,000 miles per second. The accompanying diagram will aid to a conception of the

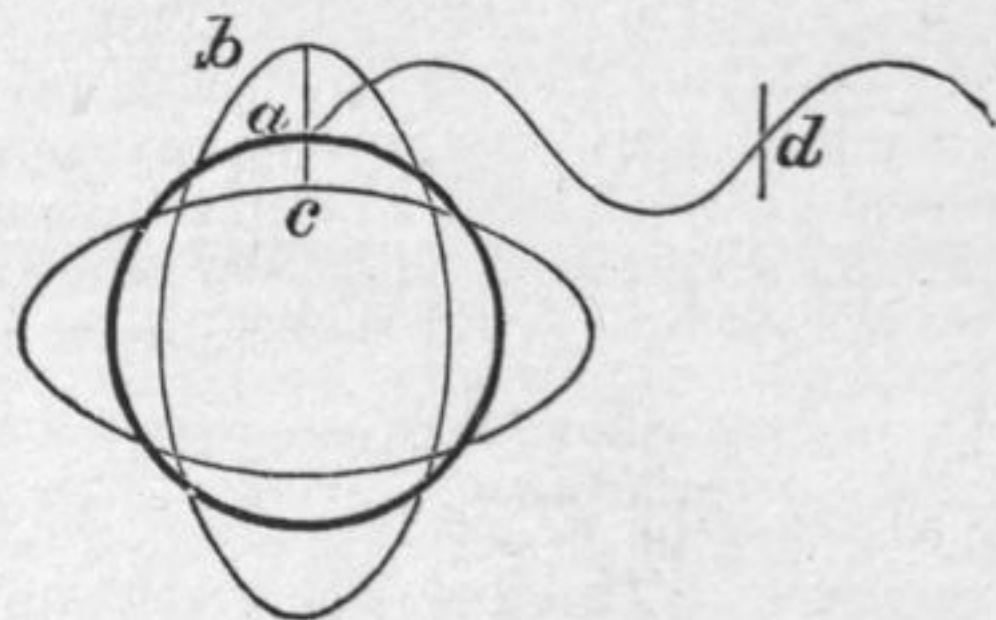


FIG. 1.

mechanical relations involved. Let the heavy-lined circle represent an atom of matter, and it is to be supposed to be surrounded by the continuous medium which is called "the luminiferous ether." If we adopt for the time the vortex-ring theory of matter—seeing that it has a stronger probability in its favor than any other that has yet been thought of—and we consider what happens when such an atom vibrates, that it must appreciably change its form, elongating into ellipses, the major axes of which are at right angles to each other as drawn, the point *a* of the atom vibrating between the limits *b* and *c*. The disturbance in the ether as *a* moves toward *c* incites

a movement that will at once begin to be conducted outward, and if some direction, *a d*, be chosen, the complete vibration *a c b a* will result in the undulation *a d*, and continuous vibration in a continuous line of undulations, called a ray, and wave-length *a d*, must obviously depend upon the rate at which such a disturbance is propagated in the medium, as well as upon the time of vibration of the atom. Such a line of undulations is called a "ray of light" when it happens to be of such a wave-length as is capable of affecting the eye and producing vision, and a "heat-ray" when of some other wave-length. It is also to be understood that when such undulations in the ether fall upon other atoms and molecules of matter, they are competent to set them vibrating in a way similar to the first or originating atom. This vibratory motion of the atom by which its form is changed constitutes the motion we call "heat," and is to be clearly distinguished from a change of position in space of the atom, the latter being called "free path motion," and is generally the effect of heat. Thus, a form of energy in matter is changed into a form of energy in the ether, and this latter may be again transformed into the original form in matter. We may speak of the vibrating atom as a source of energy, and the space about it which is affected by that energy as the field of force of the atom; and as these rays move in straight lines it is evident that such field is as extensive as is the universe. These facts from the phenomena of heat are chiefly of importance here in helping one to conceive such mechanical relations between atoms and the ether as are known to exist, that we may the better be able to conceive how other motions of atoms may affect the ether in a different way, and so develop still different phenomena.

Now, electrical phenomena are always developed whenever two different substances are brought into contact, or when two different substances in contact are heated, whether by friction or by the application of some source of heat. It is not essential that the two substances should be different kinds of substances; it is only necessary that the two should in some way be physically different. Thus, if a homogeneously constituted piece of wire, forming part of a circuit, be twisted at some point, its physical condition at that point will be different enough from the untwisted part to give rise to an electric current if the wire be heated adjacent to the twist. As we know the nature of the heat-motion, it is plain that two adjacent atoms or molecules, one of which is under constraint or differs from the other in mass or in complexity, cannot both vibrate at the same rate, the motions of each will be interfered with, and some differential motion must result, tending to force each molecule into some new position or to assume some other form of motion, as rotatory or other, which may react upon the ether.

The phenomena of induction and of attraction exhibited by electrified bodies, both of which are manifested in and through the most perfect vacuum that we can produce, and which also take place through bodies that are the most perfect non-conductors, such as glass and mica, prove incontestably that the electrified body does in some way affect some medium that surrounds it. The velocity of this movement in this medium has been measured in various ways, and has been found to be approximately the same as the velocity of light; and this leads one almost irresistibly to the conclusion that the medium must be the same in both cases, and that the velocity of propagation depends solely upon the properties of the medium itself. Suppose two bodies, A and B, be 186,000 miles apart; then, if A be suddenly electrified, the effect upon the ether will travel outward towards B and reach it in just one second. If A was made luminous at the same instant that it was electrified,

the light-ray and the inductive ray would reach B at the same instant; the light-ray would make B vibrate, and the inductive ray would electrify it and make it tend to move towards A; it would be attracted. Suppose that B be in contact with A, then would there be no appreciable time between the electrification of A and the effect upon B. If B be separated by a short distance from A, nothing could be put between them that would prevent the inductive effect; and in this particular the electrical effect upon the ether is singularly unlike the heat-effect upon it, for if B should be shielded by interposing any substance between it and A, more or less of the light would fail to reach it; and if an opaque substance were placed between, no such rays could reach it at all; they would all be either absorbed or reflected.

The space about an electrified body within which inductive effects may be observed is called the "electric field," and the effect upon a body in that field is called the "inductive effect," or simply "induction;" and it is to be noted that no specific name has been given to the effect upon the ether or the condition into which it is thrown by an electrified mass of matter. The corresponding effect of a heated mass is known as "radiant energy." It is to be apprehended that for the lack of such distinctive name, and of the importance of having some mechanical conception of the nature of it, the notion has grown up that electricity is ether or something that is not matter. On the one hand, attention has been occupied with what happens in matter, and, on the other hand, with what happens in the ether; and hence confusion, and the failure to agree as to the nature of electricity. The ether never exhibits any electrical phenomena except when it is affected by matter subject to certain physical conditions. If we call the physical condition of matter "electricity," then we have no name for its effects upon the ether. If we call the physical condition induced in the ether "electricity," then we have no distinctive name for the matter exhibiting such properties.

Some of the ablest living physicists hold the opinion that "potential energy, like kinetic energy, depends . . . upon motion" (see art. "Mechanics," § 297, vol. xv. ENC. BRIT.). Although in many cases of kinetic energy the form of the motion has not been clearly made out, yet it will add to clearness of conception if one will think out the various possible motions which a given body may have. Obviously a body may move in a straight or curved line or what is called its free path. It may vibrate with or without changing its form, or rotate on any axis, both of these without changing its position in space, and there may be various combinations of these motions, each involving energy, and, among atoms, each having its characteristic reaction upon the ether. The vibratory character of heat-energy has been clearly made out, and there is much reason for thinking that in like manner the characteristic of electrical energy is atomic or molecular rotation. If a current of electricity be passed through a long wire having one end free to move, the free end will be twisted, the torsion being right-handed or left-handed as the current goes this way or that. Imagine a rope-ring to be grasped by the hand anywhere and given a torsional strain. The rope will be twisted tighter on one side and untwisted to the same degree upon the other, and these two conditions will be conducted outwards through the ring, and one witnessing the advancing torsional movement might speak of it as a current if he chose, and, considering the whole ring of rope, the character of the motion would be what is called vortical. The above is a good mechanical analogy of what takes place in an electric circuit.

It is most in accordance with usage to speak of a battery as a generator of electricity, and the molecular physical disturbance that travels upon a conducting-wire as a current of electricity, implying in both cases

that electricity is as much a property of the matter exhibiting such phenomena as is heat when it appears, and thus electricity may be defined as a physical condition of ordinary matter that manifests itself in two ways: 1st, by inducing in the adjacent ether a particular condition of the nature of a stress; and, 2d, by being propagated with great velocity in some kinds of matter which are hence called conductors. All the other observed effects are secondary; for instance, attraction is due to the reaction of the electrically-stressed ether upon the attracted body, and heat to the direct conversion of the electric motion into vibratory atomic motion.

Electrical conductability is that property of matter by which it assumes the electrical condition by contact and without transmutation. It is the essential condition for maintaining an electric current. A break in the continuity of a conductor absolutely stops the current. The ether is an absolute non-conductor. The so-called electric are is maintained by the gaseous materials of the air, the volatilized carbon, or other material of the terminals. An electric spark that will jump two feet in the air will not jump a quarter of an inch in the best vacuum we can make, and that is nowhere near a perfect vacuum. Electrical induction, on the other hand, is always the result of transmutation. If a body be electrified by induction, the electrification is the result of the reaction of the electrically-stressed ether upon it, which in turn derived its stress from some electrified mass of matter. Radiant energy is transformed heat, and if a body be heated by radiant energy two transformations have taken place; the cases are analogous.

RESISTANCE is that property of a conductor which determines the amount of electricity that can traverse it in a given interval of time from a definite source of electricity. Resistance varies—

- (a) with the quality of the conductor;
- (b) with its physical condition;
- (c) with its form.

By "quality" is meant the distinctions that are made between matter of different kinds—such, for example, as copper, platinum, and zinc. Each of these elements possesses the property of responding to electrical excitation with a certain velocity, each different from the others. Suppose a wire of each of these substances to be a mile long and one-tenth of an inch in diameter. If a battery should be attached to the copper wire so as to complete a circuit, and a measure made of the amount of electricity that passed through that circuit in, say, one minute; then if the platinum wire should be substituted for the copper, and a similar measurement made of the amount of electricity traversing the circuit in the same interval, a much less quantity would be found to have passed. If the amount traversing the copper wire be represented by 100, then that traversing the platinum wire would be represented by 16, and a similar experiment with the zinc would give about 30. What is true for these specific cases is true for all substances that will conduct.

By "physical condition" is meant the state of the body as to its density or compactness of molecules, and also their motions. The denser a given conductor is, the better will it conduct—that is, the less is its resistance. Also, the colder a body is, the less is its resistance; the resistance depends upon its temperature. In all probability this is due to the expansion, which is the result of heat, as expansion lessens the density of a substance, and so will increase resistance.

By "form" is meant the relative dimensions of a substance. The resistance of a conductor like a wire varies as its length. By doubling or trebling the length of a conductor the resistance is doubled or trebled. If the resistance of a mile of copper wire be 5 units, then the resistance of two miles of it will be 10, and three miles 15; and this is true for all materials and all conditions of it. Resistance also

varies inversely as the cross-section of the conductors. If a copper wire a mile long and one-tenth of an inch in diameter has a resistance of 5 units, then if the wire be drawn to the twentieth of an inch in diameter the resistance of a mile of it will be 20 units, for the cross-section is but one-fourth that at first. It will take four such wires to be equal in cross-section to the one-tenth of an inch in diameter. To vary the diameter of a conductor of a given length is to vary its weight; and hence the greater the weight the less will be the resistance of it. This, too, is applicable to solid and liquid conductors.

Inasmuch as all kinds of matter have some resistance, it follows that in every electric circuit there must be some resistance in every part of it, the amount depending upon the quality of the material, the size of it, and its temperature.

As an example of the foregoing principles, suppose that in the figure is represented an electric circuit consisting of a galvanic battery with two plates, one of copper, C, and the other of zinc, Z, with a connecting wire, *w*. A current of electricity will traverse the circuit in the direction indicated by the arrow. Now, the circuit is made up of the several parts—copper plate, conducting wire, zinc plate, and the liquid between the plates. Each of these has its own resistance, depending upon quality, length, cross-section, and temperature. Suppose that the resistance in the connecting-wire be ignored, and the attention be directed to that in the battery alone. The resistance of every kind of a liquid is very many times greater than that of most metals—that is, when measured in equal lengths and cross-sections—and just as the resistance of a large wire is less than that of a small one of the same quality of matter, so will the resistance of a given length of liquid vary inversely as its cross-section. Let Z be moved towards C, and the liquid section will be shortened, and consequently the resistance in the cell will be lessened. This is one way of varying the resistance of a cell, or, as it is more generally called, the internal resistance of a battery. Again, suppose plate C to be made smaller and smaller, or, what will amount to the same thing, let it be slowly drawn out from the liquid; the cross-section of the liquid will be made smaller and smaller, and hence the resistance of the cell will be correspondingly increased. Thus, the internal resistance of a battery-cell may be varied in two ways.

POTENTIAL AND ELECTRO-MOTIVE FORCE.—If a platinum wire P N have a few coils made in it by wrapping it about a lead pencil or otherwise, and then it be heated at some point A adjacent to the coil, the

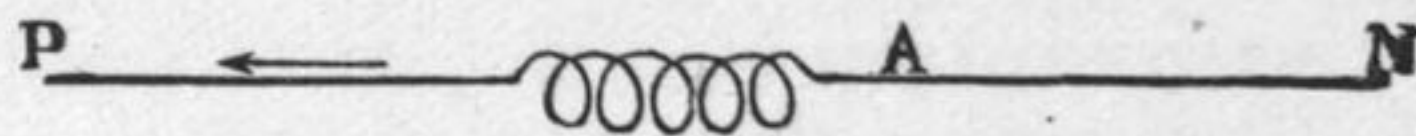


FIG. 3.

wire will become electrified in such a way that if it was suspended by its middle point, so as to swing freely, and an excited glass rod be brought near to it, the end P would be repelled and the end N would be attracted by the rod. If P and N should be bent round so as to be near each other, they will attract each other, while if the ends quite touch together a current of electricity will traverse the whole wire in the direction indicated by the arrow. The electrical condition of either end is called its potential, and the difference in potential between the ends is called the electro-motive force between them. The end P is said to have a higher potential than the end N, and electricity always flows from a point of higher to a point of lower potential. In a battery the two plates, being differently acted upon by the liquid, have a difference of potential

between them which is called the electro-motive force of the cell. When copper or platinum are employed with zinc to form a battery, the zinc has the lower potential, and as a consequence the current in the conductor connecting them outside the cell flows towards the zinc. If magnesium or sodium took the place of the copper or the platinum, then the zinc would have the higher potential, and the current would flow from the zinc towards the other element. Whether a substance is positively or negatively electrified depends upon what substance is employed with it. In the wire (fig. 3) the electro-motive force is maintained by the expenditure of the heat-energy. In the battery it is maintained through the solution of the surface molecules of one of the elements, in consonance with the general statement that electricity is developed upon contact of dissimilar substances. The surface molecules of the zinc that have acted are removed by the solvent action of the liquid, thus presenting a fresh surface of molecules.

CURRENT.—By “current” is meant the moving electricity in a conductor or a series of conductors—generally, that in a closed circuit. By “strength of current” is meant the amount of electricity that passes any point in a conductor in a given interval of time, generally one second. With any given source of electricity the current-strength will vary inversely as the resistance in the whole circuit. The greater the resistance the less will be the amount of electricity that can get through the circuit. Let B represent a battery-cell, Z the zinc, C the copper elements, and *S* a switch that may be swung about so as to touch either *a* or *b*, and let *r* be a coil of wire connecting *a* and *b*. When switch *S* is in the position shown there can be no current whatever, but the terminals, having a difference of potential, will attract each other. If *S* be made to touch upon *a*, then will the electric circuit be complete, and the current will flow in the direction indicated by the arrow. The strength of this current will depend upon the amount of resistance in the circuit, including the liquid in the battery and the wires. Let *S* be swung round so as to touch *b*, and the circuit will again be complete, and the current will flow as before, but the strength of the current will be greater, for there is less resistance in the circuit by the amount in *r* taken out.

OHM'S LAW.—All of these conditions are expressed in a simple equation which is known as Ohm's Law. Let *E* be electro-motive force, *R* resistance, and *C* current; then

$$C = \frac{E}{R}$$

Now, electro-motive force is measured in *volts*, resistance in *ohms*, and current-strength in *amperes*. The electro-motive force of an ordinary copper-zinc cell, or *Daniel* cell, is very nearly one volt. Suppose such a cell to have an internal resistance of one ohm, and that a wire so large and short that its resistance need not be considered, because it is so small, then the strength of that current will be, as

$$\frac{E \text{ in volts}}{R \text{ in ohms}} = C \text{ in amperes, } \frac{1 \text{ volt}}{1 \text{ ohm}} = 1 \text{ ampere.}$$

If, however, the connecting wire has a resistance of one ohm, the current strength will then be

$$\frac{1}{1+1} = .5 \text{ ampere.}$$

If the wire has nine ohms, then

$$\frac{1}{1+9} = .1 \text{ ampere,}$$

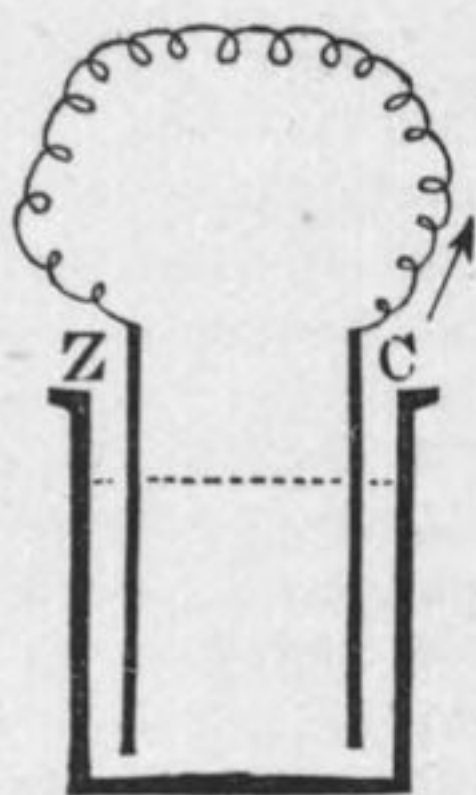


FIG. 2.

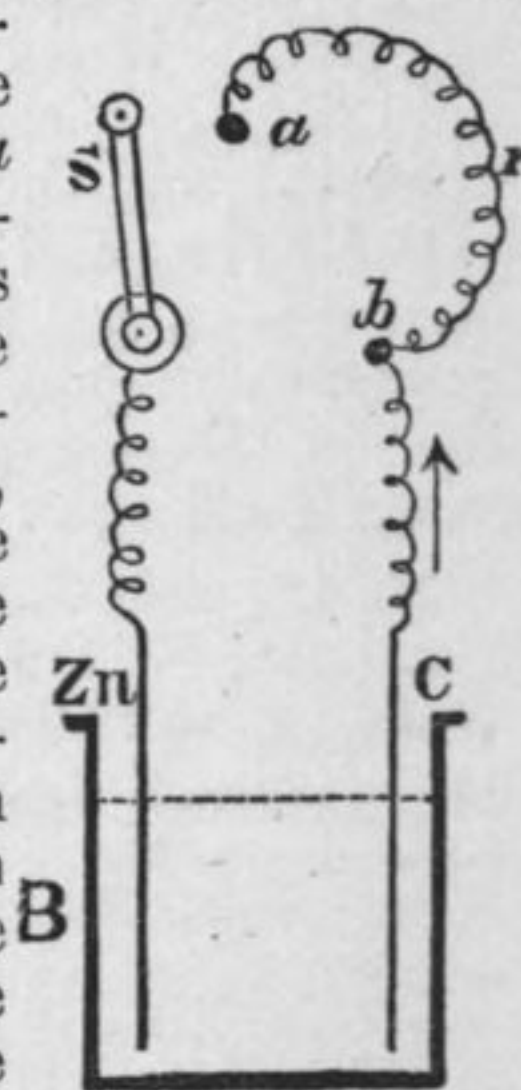


FIG. 4.

for in every case R must express the whole of the resistance in the circuit.

INTERNAL RESISTANCE.—To illustrate the application of Ohm's law to the internal resistance of a battery:

I. Suppose the plates Z and C (fig. 2) be very large, but that they dip slightly into the liquid. Suppose the internal resistance be one ohm and the current strength one ampere; now dip the plates so as to immerse twice the surface; the resistance will be reduced one-half and the current-strength will be doubled, for

$$\frac{1}{.5} = 2 \text{ amperes.}$$

If the surface be increased by dipping to ten times the original surface or cross-section, then the current will be

$$\frac{1}{.1} = 10 \text{ amperes,}$$

and so on. If the plates could be made infinitely large the current could be infinitely great.

II. Let the plates be as shown, and one inch apart, the resistance of the cell one ohm. As resistance varies directly as the length of a conductor, if the plates are brought within half an inch of each other, the resistance will be reduced one-half, and the current will be doubled. If they are brought so near as the one-tenth of an inch, the current will be increased ten times; but there is a practical limit to this approach of plates in a battery, because for the proper action of the cell it is essential that the liquid shall have free access to the plates. If the plates are too near each other, the liquid between the plates cannot be renewed when exhausted, and the cell is brought to a stand-still.

ON EXTERNAL RESISTANCE IN RELATION TO SIZE OF CELL.—Let the internal resistance of the cell be again one ohm, and the external resistance of wires and other connections be 100 ohms; then the current-strength will be

$$\frac{1}{1 + 100} = \frac{1}{101} \text{ ampere.}$$

Suppose the plates now to be made so large that their resistance is nothing, the current would then be

$$\frac{1}{100} \text{ ampere,}$$

a quantity differing from the former quantity by less than 1 per cent. The only way the current-strength in such a circuit can be increased is to increase the electro-motive force, and so affect the numerator of the fraction. This may be done by increasing the number of cells, each one of which will have its own electro-motive force and resistance. Let there then be ten such cells as the first, the current-strength will be

$$\frac{10}{10 + 100} = \frac{1}{11} \text{ ampere.}$$

Thus, current strength may be increased in this way or in that, according as the resistance in the external circuit is large or small.

Whenever the earth is made part of an electric circuit by burying the metallic terminals in it, as is customary in telegraph-work, the resistance of these "grounds," as they are technically called, has to be considered, as one can seldom be made to be less than fifty ohms and often they are several hundred.

If a certain telegraph sounder requires a current of one-tenth of an ampere to work it promptly, then a single cell cannot be made to work it if part of the circuit be made in the earth, for if the electro-motive force of the cell be one volt, its internal resistance five ohms, that of the line and grounds be one hundred and that of the sounder itself be five ohms, then the current will be

$$\frac{1}{5 + 100 + 5} = .018 \text{ amperes,}$$

though without the line and grounds the current would be

$$\frac{1}{5 + 5} = .1 \text{ ampere.}$$

GENERATORS OF ELECTRICITY.—Electricity may be generated by direct and by indirect action. By direct action is meant that the energy spent in producing it is immediately transformed into electricity as in a battery or thermopile; and by indirect action when a second transformation of the energy is involved as in all cases of induction. Electricity is generated—

I. Whenever two dissimilar substances are brought into contact. The phenomenon appears to be simply one of surface action. It is true for solids and for liquids. Thus, if a piece of copper and a piece of zinc be touched together, one becomes positively, the other negatively, electrified. The source of the electrification is in the different rates of atomic motion of the two substances. They have different atomic weights, and for a given temperature their rates of vibration must be different, and when such surfaces are placed in contact there must be a rearrangement of the interfering molecules, which results in what we call electrification. The effect is transient unless a fresh surface or a supply of energy to maintain the condition be provided. The first may be effected

a. By friction, in which fresh surfaces are brought into contact by rotation or otherwise, and

b. By solution, as in common galvanic batteries when the surfaces are renewed by the dissolution of the surfaces that have acted.

Whether a given body will be positively or negatively electrified by contact or friction will depend upon what substance it is in contact with. If glass be rubbed with flannel the glass becomes positive, if flannel be rubbed on hard rubber the flannel becomes positive, and if hard rubber be rubbed on silver the hard rubber becomes positive. The electricity produced in this way is generally of very high electro-motive force, 50,000 volts being not uncommon. In the galvanic battery the electrification of the plates is maintained by the chemical action of some liquid that acts upon one of them, generally the zinc. The dissolution of the zinc stops when the circuit is broken, but there is still electrification, and the wire terminals attract each other.

II. Electricity is generated by heating the junction of dissimilar metals, as in the familiar thermopiles, the heat applied being transformed into electricity.

III. Electricity is generated by the proper motion of either part of a magneto-electric system. Such a system consists of a magnet, a wire helix, and an armature.

When the pole of a magnet is thrust into or drawn out from a helix the two ends of the helix assume different potentials, or an electro-motive force is induced between the ends. If the two ends are connected outside by a conductor, the electro-motive force induced will discharge itself as a current through such conductor. If the terminals of the helix do not touch, they will be electrified and will attract each other. The phenomenon is a transient one, lasting no longer than the motion of the magnet lasts. If the magnet be stationary and the coil be moved over it, the same result in the helix will follow as before; and if the helix be already about the pole of the magnet, and a piece of iron be brought near to the pole, a similar electric condition will be induced.

For example, let $N S$ represent a magnet, H a helix of wire surrounding the pole, t the terminals of the

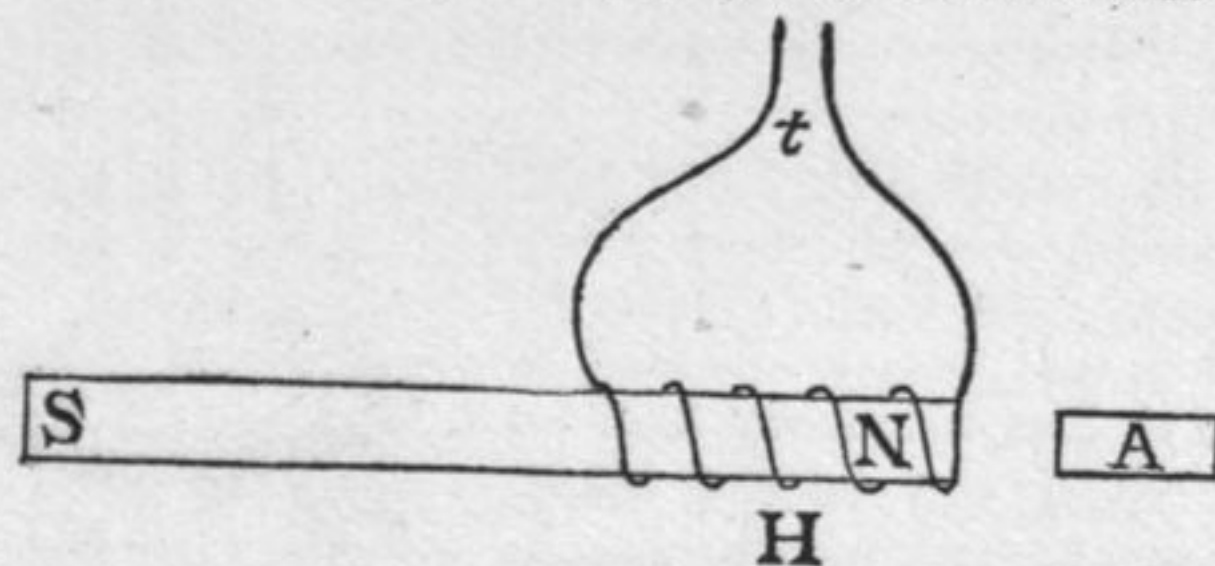


FIG. 5.

wire of the helix, and A a piece of iron. Now, if the magnet has its relative position to the coil changed, either by its own motions or the motion of the coil, or if with both magnet and coil stationary, and the attracted piece of iron, A, be moved either towards or away from the pole, an electrical disturbance in the coil will result, and the terminals *t* will attract each other; or, if they already touch each other, a current of electricity will pass through it. The field or space within which such effects will be produced is called the "magnetic field." It is the space occupied by the so-called lines of force of the magnet, such as may be traced by the lines assumed by iron filings when they are permitted to arrange themselves about a magnet. When any conductor of electricity is moved in this field in such a way as to cross these lines at right angles to them, the conductor is always electrified, its two ends having different potentials. The nearer it is to the poles of the magnet the greater will be the number of these lines which a given motion will cross and the greater will be the electro-motive force between the terminals, and the stronger will be the current, provided there is a completed circuit. When an armature of iron is used instead of moving magnet or coil, the strength of the magnet is varied, the magnetic strength being greatest when there is an open field and nothing to attract, and weakest when the armature is touching it and is large enough to engross all the lines of force; for the presence of the armature to a magnet rearranges and apparently absorbs these lines of force, enfeebling the magnet. The varying of the strength of the magnet has the same effect upon the encircling coil as the movement of the magnet within it.

When all of these parts are quiescent there is no electrical disturbance whatever. It is only while some mechanical energy is spent in moving some of them in this magnetic field that electricity appears; and all of the various forms of magneto-electric generators are but modifications of these essential conditions. When permanent magnets are employed, the machine is called a "magneto-electric machine." When an electro-magnet is substituted for the permanent magnet, it is called a "dynamo-electric machine." The current of electricity to maintain the strength of the electro-magnet and create a magnetic field is sometimes supplied by a separate machine, sometimes by making a part of the same machine furnish the needed current, and sometimes by making a part or the whole of the current from the machine go through its own coils. The magnets of any machine that maintain the magnetic field are called the "field magnets," whether these are permanent or electro.

THE MAGNETIC FIELD.—The lines of force, as traced by iron filings sprinkled about a straight bar-magnet, are seen to be curved, running from one pole to the other; and as these lines of force apparently repel each other, the shape of the field of such a magnet is oval. If the magnet is bent, so that its poles face each other, the lines of force are nearly straight lines between the poles, and the field is very dense; hence nearly all the forms of magneto and dynamo machines have their field-magnets made with their poles facing each other.

ARMATURES.—The piece of iron called a keeper that is furnished with a commercial permanent magnet is also called its armature. As this is inductively made a strong magnet when in the neighborhood of the poles, and as it is small compared with the magnet itself, it is found to be better to give to it the necessary motion rather than the larger mass. There are three specific methods of thus utilizing the magnetic field.

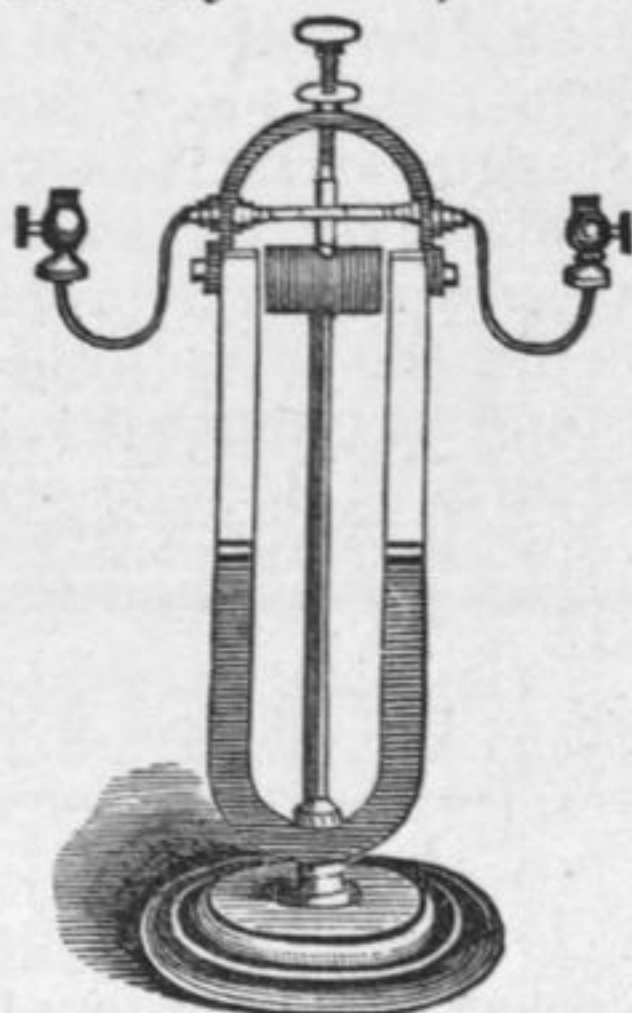


FIG. 6.

I. By making the armature in ordinary magnet form, surrounding it with a proper coil, and mounting it so that it may be rotated in front of the poles of the field-magnet. The common electro-magnetic engine of Page is a type of this method (fig. 6). If it be placed in circuit with a common galvanometer, and then it be rotated by friction of the hand upon the spindle, the generated electricity will manifest itself by the movements of the galvanometer needle. The common medical magneto machine, rotated with a crank by hand, is a familiar form of such machine. Some have been made very large, requiring an engine of several horse-power to run them, but they are now mostly superseded by the others.

II. The Siemens armature, in which the coil is wound longitudinally in deep grooves cut into the opposite sides of a spindle of iron.

III. The ring armature, in which a solid iron ring an inch or more in thickness, three or four or more inches broad, and the whole five or six inches or more in diameter, has its coil wound longitudinally in and out, completely covering the ring from sight. This is called the "gramme ring."

The distinctions between these three forms of armatures may be more easily perceived by comparing the accompanying diagrams, in which only the essential conditions are drawn.

In Fig. 7 N and S represent the poles of the field-

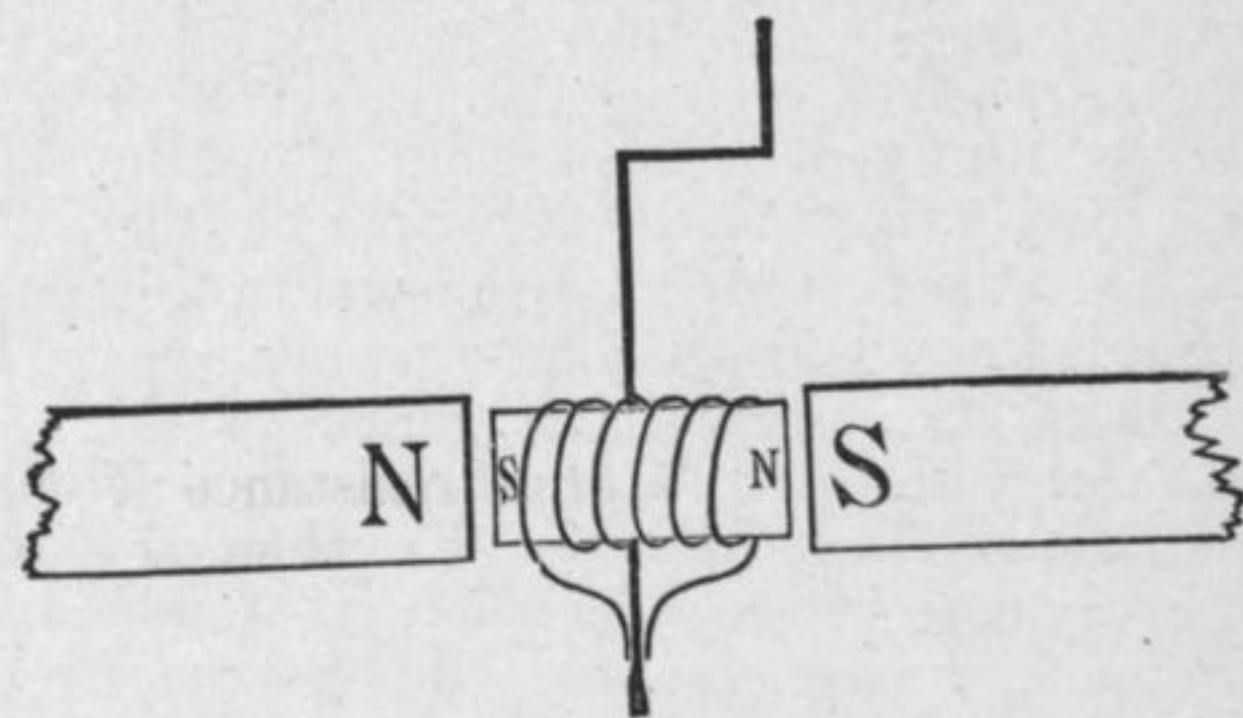


FIG. 7.

magnet, *n* and *s* the soft-iron bar armature with its coil, and an axis for rotation, indicated by the crank. The polarity of this armature will depend upon the pole of the adjacent field-magnet, and will always be the opposite of that. When one-quarter of an entire revolution has been made, the ends of the armature will be at right angles to the poles of the field-magnet, and, being equally solicited by each pole, will have no polarity. When half a revolution has been made, the end that is now marked *s* will have been brought to face S, and it will therefore be of *n* in polarity; the magnetism will be completely reversed, and on account of this change of magnetism in the bar an electro-motive force will be generated in the surrounding coil. The terminals of the coil are soldered to a commutator upon the axis of revolution, and a system of conductors beyond provides a way for a current of electricity to where it is wanted.

The Siemens armature is represented in Fig. 8,

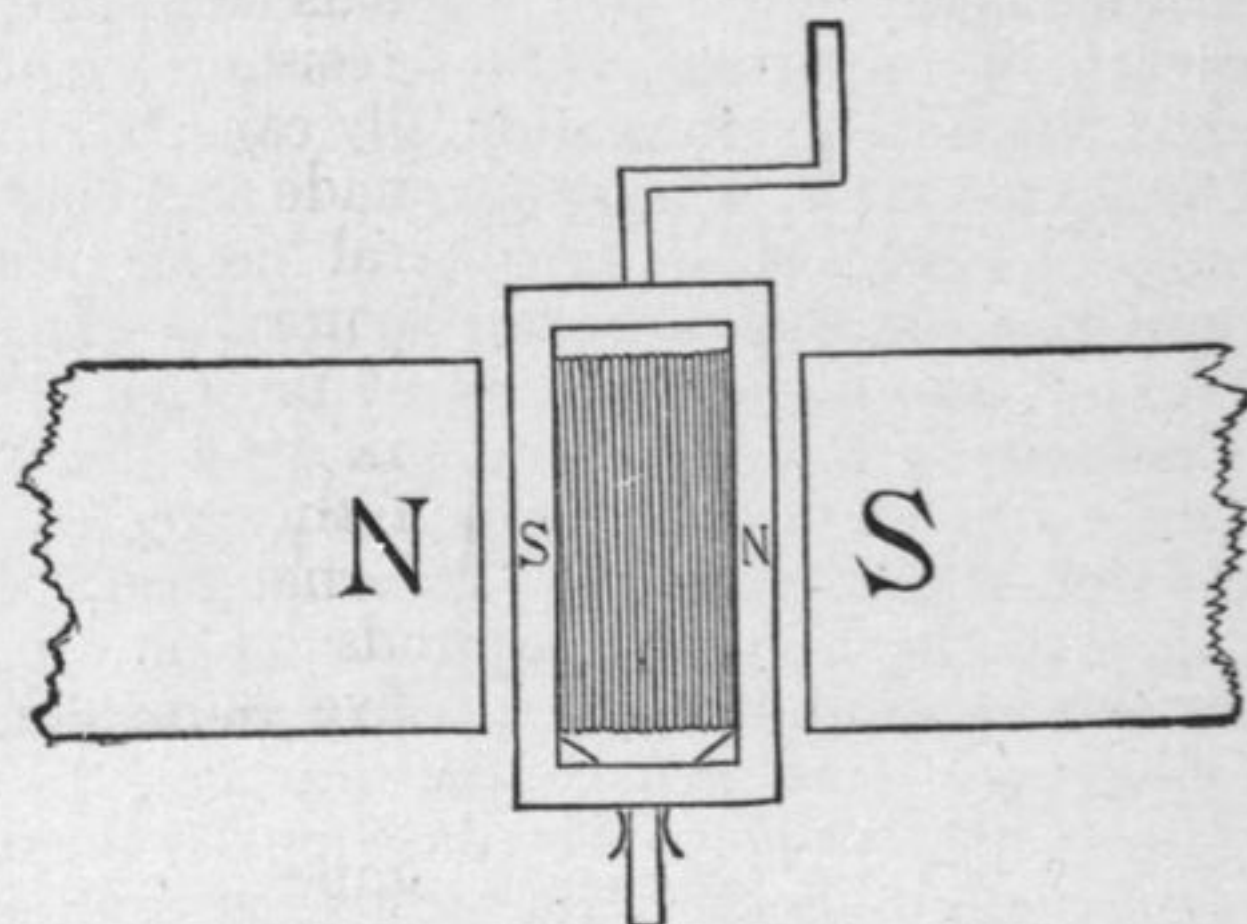


FIG. 8.

where N and S are the poles of the field-magnets, *n*

and s the armature, with its coil *within it*, and mounted so as to rotate on a longitudinal axis. Polarity will be given to this by induction, as shown; and as this is rotated the sides will alternately be brought to face each pole of the field-magnet, and thus completely reverse the polarity of the armature. This will set up to-and-fro currents in the coil, the ends of which are connected to a proper commutator, as in the first case.

The third form, or the gramme ring, is shown in Fig. 9. The ring is so mounted as to be rotated be-

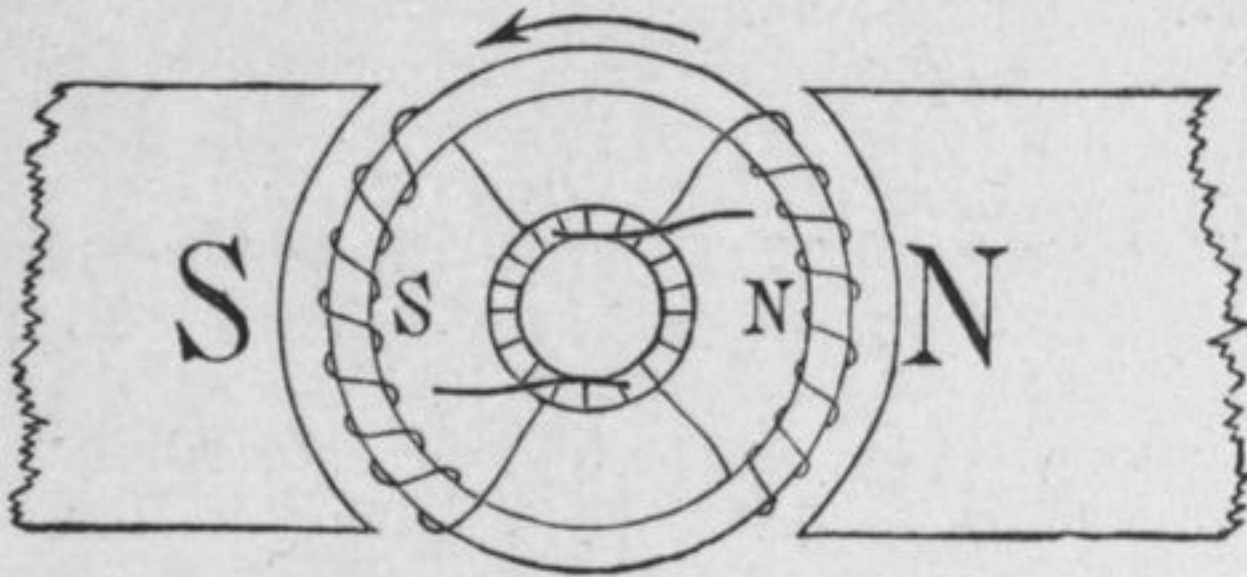


FIG. 9.

tween the poles of a powerful field-magnet S and N . These give inductive polarity to the parts of the ring adjacent to each pole, so that the outer part of the ring facing the pole N will have s polarity, while the inner part of the ring at the same place will have n polarity. This condition must evidently be reversed when the ring has made half a revolution, and hence there will be an electrical reaction within the coils while the motion goes on. In practice, several separate coils are fixed in each ring (sometimes thirty or forty), such an arrangement being highly advantageous. This third form of armature is the peculiarity of what is known as the Gramme machine. Each of these methods is capable of being varied in several ways. They also may be combined, these changes and combinations being the bases of numerous patents.

In every case where electricity is obtained by means of motion in a magnetic field, the electricity represents the mechanical energy expended, and is maintained at the expense of such energy. Suppose a large dynamo machine to have its external electric circuit open. The armature may be turned by the hands at considerable speed, but if, while it is still moving, the circuit be closed, it will at once come nearly to rest, as if a strong break had been applied, so that only a very small machine can be turned by hand. It requires a steam-engine or some other source of mechanical energy to maintain the proper speed; but the dynamo is such a perfect machine for the transformation of the energy that as much as 90, and even 95, per cent. of the expended energy appears as electricity. The amount that a given machine will produce depends upon its size, the strength of the field-magnets, the velocity of rotation, and the resistance.

MECHANICAL EQUIVALENT OF ELECTRICITY.—Inasmuch as electricity never appears save when energy in some other of its forms has been expended to produce it, it follows that there is a quantitative as well as a genetic relation between the energy expended and the electrical energy developed. The knowledge of this equivalent is important to those having a commercial interest in the transformation, and also to that class, still much too large, who appear to expect that a given amount of electricity is capable of doing almost any amount of work, that more can be got out of a machine than is put into it, provided only that what comes out be electricity. Energy is measured by the weight it can raise a given distance, which is expressed in foot-pounds or kilogrammetres. It is found experimentally that the heat energy required to heat a pound of water one centigrade degree will raise 1390 pounds one foot high if applied to that purpose in a suitable engine; 1390 foot-pounds is consequently the mechanical equivalent of heat. But electricity is most readily converted into heat, and again it is experimentally found that a unit current of electricity in a conductor of unit resistance will raise the temperature of a pound

of water .000525° centigrade. As the mechanical equivalent of one degree is 1390 foot-pounds, the equivalent of the above fraction is $1390 \times .000525 = .733$, that is to say the energy of a unit current of electricity in a resistance of one ohm is capable of raising .733 of a pound one foot high in one second. In one minute it is obvious that it could do 60 times as much work, or 44 pounds one foot high. Now a horse-power can raise 33,000 pounds one foot in a minute and

$$\frac{44}{33000} = \frac{1}{746},$$

a fraction that represents the relation of electrical energy to horse-power. As a rule, the horse-power of a given current may be found by multiplying the current strength C in amperes, by the difference in potentials E in volts and dividing the product by 746.

$$\frac{EC}{746} = \text{Horse-power.}$$

The product EC is technically known as so many *watts*. An example will serve to show the application. What is the horse-power of an electric circuit of 48 bichromate cells, each having an electro-motive force of 2 volts, and an internal resistance of .25 ohms with ten ohms in external circuit? Suppose the cells to be arranged tandem, then $E = 48 \times 2 = 96$. $R = 48 \times .25 = 12$ ohms internal resistance and

$$\frac{96}{12 + 10} = 4.36 \text{ amperes} = C.$$

$$\frac{EC}{746} = \frac{96 \times 4.36}{746} = .56 \text{ horse-power.}$$

If arranged for maximum current with 16 sets of 3 cells then $E = 16 \times 2 = 32$.

$$R = \frac{.25}{3} \times 16 = 1.3 + 1 \text{ ohm.}$$

$$\frac{32}{2.3} = 13.8 \text{ amperes} = C.$$

$$\frac{32 \times 13.8}{746} = .59 \text{ horse-power.}$$

This does not represent the available energy, but the total in the circuit; more than half of it being expended in the battery itself, heating it, only .25 horse-power being available. These figures show how impracticable it is to get any considerable amount of work out of a battery. It also shows that current strength is not the measure of the ability of electricity to do work.

COST OF BATTERY.—The cost of electricity, when generated by a battery, is very great, when compared with its cost when generated in a dynamo-electric machine, run by steam- or water-power. A pound of zinc at five cents costs twenty times as much as a pound of coal. A pound of coal yields about 8000 heat-units when burnt, while a pound of zinc will yield but about 1300 such units—only one-sixth that of coal—which makes zinc to be 120 times more costly for mechanical work than coal. In the best steam-engines only about 25 per cent. of the energy of the fuel is made available for work; and although an engine may transform 90 per cent. of its energy into work, yet for an equal amount of work the battery costs nearly 25 times as much as the engine. Add to this the cost of other chemicals, such as sulphuric acid and bichromate of potash, with the labor of replacing them as they are used up, and the rapid consumption of the zinc itself requiring frequent renewal, and the battery becomes not only costly but very troublesome.

It is a curious circumstance that electrical phenomena are nearly all reversible with the physical conditions that produce electricity. That is to say, as electricity may be produced by heat, as in the thermopile, so may electricity produce heat by transformation. As electricity may be produced by chemical action, as with a battery, by magnetism, and by the motions of matter, as in dynamo machines and friction, so may elec-

tricity be spent in doing chemical work in making a magnet, or doing mechanical work. The chief commercial uses to which electricity is applied at present are:

1. Electric lighting.
2. Electro-plating and electrotyping.
3. Telegraph and telephone.
4. Heating.
5. Mechanical work.

1. **ELECTRIC LIGHTING.**—The passage of a current of electricity through any conductor always results in heating that conductor, and the heat developed in any part of a circuit will depend upon the resistance of that part; the greater the resistance the higher will be the temperature with a current of given strength. The best conductors, such as copper and silver, may be fused and converted into vapor by a strong current, while in the heat in the so-called electric arc all substances, even the most refractory, are speedily vaporized.

Carbon is an element having a greater variety and range of properties than any other known substance. Its electrical resistance may vary from a fraction of an ohm in such sticks as are used for electric arc-lights to infinity as in the diamond, which is an excellent electric, friction developing upon it strong electrical excitation and the consequent attractive property. On account of the extremely high temperature needed to volatilize it—that its resistance decreases within limits as its temperature rises, and also that at about 2000° C. its radiations are of all wave-lengths, and gives the sensation of white light to the eyes—it is the substance chiefly employed in electric lighting.

It was about the year 1809 that Sir Humphrey Davy discovered that an electric current might be maintained between two sticks of carbon when they were separated by a short space. The carbons were placed horizontally in his experiment, and so high an electro-motive force had his battery that he was able to separate the points four inches. The luminous band between the points consists of incandescent particles passing from one electrode to the other, and the band itself is flexible and easily deflected. On account of the great heat, there is a rising current of air past it, which gives the band an upward curve or arc form, and on that account it was called the electric arc. When the carbons are arranged one above the other, as is common now, there is nothing of the sort to be seen; there is no proper arc, though the name is still retained. The resistance of the arc is generally no more than four or five ohms, but the high temperature developed shows a great expenditure of energy.

With the best machines now made it requires nearly a horse-power to maintain a single arc light. Now, it happens that the positive carbon is always heated to a higher temperature than the negative one; and, as has already been explained, whenever there is a physical difference between adjacent parts of an electric circuit there is an electro-motive force set up, so in this case there is an electro-motive force developed at the carbon points, tending to oppose that in the rest of the circuit, and it amounts to something like thirty volts for a strong light. In order, then, to maintain the arc, it is necessary to overcome this developed electro-motive force by a still greater difference of potential, so that in practice an electro-motive force of about fifty volts is employed for each light. When a series of arc lights is maintained in one circuit, the electro-motive force must be proportional to the number of lights. Thus, a Brush machine maintaining forty lights in one circuit must have an electro-motive force of $50 \times 40 = 2000$ volts, and generally is somewhat in excess of that. In an arc lamp where there is a difference of potential of 50 volts between the carbons, and a horse-power is expended in maintaining the light, the current strength will be found by applying formula,

$$\frac{E C}{746} = \text{horse-power (see p. 276).}$$

$$\left(\frac{50 C}{746} = 1 \right) = 14.9 \text{ amperes.}$$

THE INCANDESCENT ELECTRIC LIGHT.—When the carbon rods giving an arc light are brought together, the resistance to the current is reduced so much at that place that the points of the rods lose their brightness, and unless the current is an exceedingly strong one they will cease to be luminous. If now the rods be supposed to be reduced in thickness while the current passes, they would again begin to glow as the resistance became greater on account of the lessened diameter, and when it became of the thickness of a thread it would give out a light equal to a bright gas-jet. But red-hot carbon burns up in the air, being converted into carbonic acid gas, and is dissipated. If such a light from a thread of carbon is to be maintained, it must be protected from the air, which may be done by enclosing it in a glass receiver that has had the air removed from it. Incandescent electric lamps have been known and employed for demonstrative purposes in schools for many years, but all such were not adapted for house illumination, because they were costly, cumbersome, and without any durability.

The great advance in this kind of electric lighting that has taken place within a few years has not been due to any new electrical or optical discovery whatever, but to the reduction of the aforementioned principles to a more economical basis—

1st. By the improved dynamo-electric machines, giving a stronger, steadier current, and at a cheaper rate;

2d. By making the lamp itself smaller and the vacuum more perfect;

3d. By the production of a better quality of carbon, securing toughness, elasticity, and involatility; and

4th. By making them with much higher resistance than was formerly attempted.

Instead of charcoal, coke, or gas-retort carbon, it has been found that some specially prepared for the purpose is superior. For this purpose Edison used a fine quality of bamboo. A filament of this but little larger than a horse-hair is cut of proper length, placed in a mould, and then raised to a very high temperature in a furnace. The filament comes out properly shaped and carbonized, possessing also remarkable density, tenacity, and elasticity. It is then by special method made fast at its two ends to the copper terminals, and hermetically fastened into a small globular or pear-shaped glass receiver, which is hermetically sealed after the air has been as completely removed as is practicable. A standard lamp of this pattern has a filament six inches long bent into the form of a horseshoe. It may have a resistance of upwards of two hundred ohms when it is cold, and not more than half that when very hot. A current of one ampere or less may give a light equal to sixteen candles.

Other inventors use different materials for the filament. Thus Maxim carbonizes a strip of paper card-board; Swan, a cotton thread that has been subjected to a chemical treatment that makes it of the texture of parchment. As has before been stated, the resistance of carbon when in this form decreases when it is heated up to a certain limit, which is near to its point of vaporization, and hence all incandescent lamps have less resistance when lighted than when cold. About ten such lamps of sixteen-candle power may be obtained from one horse-power, in which case the electro-motive force, which would be measured by finding the difference of potentials at the two terminals of the lamp when lighted, may be no more than one hundred volts, and need be no more with a large number of lamps than with one; for, unlike the arc system described, the current is not sent through the whole of the lamps seriatim, but the lamps are fixed in cross circuits somewhat like the steps upon a ladder.

That the limit of efficiency in electric lamps has not been reached by either the incandescent or the arc systems the following considerations will show:

When any substance like iron or carbon is heated it will begin to be visible as a luminous body when its temperature rises to 977° Fahr., as was shown by Dr. John W. Draper in 1847. The rays that are emitted at that temperature are of such a wave-length as to give the sensation of redness to the eye, and they take their place at one extreme of the visible spectrum. As the temperature is made to rise, shorter and shorter waves are emitted *in addition to those already given out*, until not only all of the rays constituting the visible spectrum, but also a great quantity beyond the other extremity of the visible spectrum, when the body is said to emit white light. In other words, a body that is white hot is giving off rays of all wave-lengths, while the eye is capable of being affected by only a small fraction of them, and the greatest amount of energy is spent in producing rays that have no luminous property whatever, and so far are wasted. If it were true that such radiations as are competent to produce the sensation of light could be produced only by such superheating of a substance, than there would be no remedy; but it is not true that heating is an essential condition for luminosity. The phenomena of phosphorescence and fluorescence, such as are exhibited by some worms and insects, by Bailman's luminous paint, decaying wood, by the residual gases in Gusèler tubes, and in the aurora, all prove that high temperature is not an essential for the production of light, and there is great room for invention and the cheapening of light-producers by working from this so-called chemical end of the spectrum rather than from the heat end.

HEATING.—The heat that may be developed in an electric arc is so great that the most refractory substances may be either fused or volatilized. It is the highest temperature that can be produced artificially. It has therefore been thought that electricity might in some way be used as a source of heat. As a competitor with other sources it is evidently a matter of either convenience or economy. For common purposes only economy need be considered. If a steam-engine is to furnish the electricity, the energy must be transformed several times, the series being heat, mechanical motion, electricity, heat; in each stage there is inevitably some loss and it is apparent that it will be more economical to use the fuel at once as a source of heat rather than after the energy has been lessened by a series of changes. This relative cost must remain to the disadvantage of electricity until some cheaper method of developing it can be found than by turning a wheel, which is not probable. It is not to be expected that electrical energy can be much cheapened from its present figures, for with such dynamos as we now have as much as 90 per cent. of the expended mechanical energy appears as electrical energy, a degree of efficiency that surpasses most other kinds of transformations. Even the turbine waterwheel does not exceed it. The monopoly of a good waterfall will always keep the cost of the supplied energy very near what it would be if supplied by a steam-engine. If one imagines that some one may discover some cheaper method of producing electricity than we at present possess he should remember that it would be a competitor with coal, and the price of the latter would fall. Available energy can nowhere be had for nothing.

ELECTRICAL STORAGE OF ENERGY.—Where an ordinary battery cell is furnishing a current of electricity the zinc is dissolved in the liquid, which is generally sulphuric acid forming sulphate of zinc. If, after that has taken place for a time, a current of electricity having a higher electro-motive force than the cell could give was sent through the cell in a direction opposed to that the cell would give, the sulphate of zinc would be decomposed and the zinc would be deposited upon the surface from which it was removed, when the cell would be again ready to furnish a current as at first. If instead of the ordinary cell two strips

of sheet-lead be taken and rolled together, having a strip of coarse cloth between them to keep them from metallic contact, and these placed in a vessel containing dilute sulphuric acid, and a current of electricity passed between them as in the first case, hydrogen will be set free on one strip and oxygen on the other. The free oxygen at once combines with the lead of the strip, forming what is called lead peroxide, and this over the whole surface of the strip, which becomes physically unlike the other strip, a condition already explained as being essential for the development of electricity. When this coating has formed, if the cell be disconnected from the source of the current of electricity that has done the chemical work in it, and the two strips be connected by a wire—a strong current of electricity will be maintained until the original condition of the strips is attained. It should be noted that it is not the electricity that has been stored in the cell that is yielding the current, but it is the chemical energy of the cell that yields it, the chemical energy being the result of the original current. It is therefore not correct to speak of such a source of electricity as stored electricity. It is no more so than is an ordinary battery cell. It is more appropriate to speak of it as a *secondary cell*. Secondary cells are now generally made by filling the space between two plates of lead with the red lead of commerce, or by perforating the plates with holes and filling them with the same materials. The charging current deposits lead on one plate and peroxidizes the other. Such a cell has, when properly charged, an electro-motive force of about 2.25 volts, and as the plates are large—eight or ten inches square—and are so close together that the internal resistance is very small, less than the thousandth of an ohm, and is quite ignored in most computations. Such secondary cells are large and heavy when compared with ordinary battery cells. The industrial type weighs as much as fifty pounds, and frequently two or three times that amount. Their capacity is reckoned by the amount of electricity required to charge them to saturation. Now the quantity of electricity in a circuit is measured in amperes per second, and the unit is called a *coulomb*. A cell may require 500,000 coulombs or more to properly charge it. A dynamo that would give a current of twenty-five amperes would charge it in

$$\frac{500,000}{25} \text{ seconds} = 20,000 = 5\frac{1}{2} \text{ hours.}$$

The time of the discharge depends upon the resistance of the circuit provided. If it was allowed to discharge through a short, thick wire with such resistance as to admit a current of 25 amperes, it would obviously maintain that current for the same time that was required for charging it if there was no waste, but practically there is a rather large margin of waste, which, however, depends in a measure upon the external circuit provided for it. It could maintain a current of 10 amperes for about 14 hours under similar conditions:

$$\frac{500,000}{10} = 50,000 \text{ seconds} = 14 \text{ hours,}$$

but a cell charged with 500,000 coulombs will not give back but about 80 per cent. of its quantity, and hence would yield at that rate of 10 amperes for between 11 and 12 hours. As for the energy of the current, it must be remembered that it is measured by the product of the electro-motive force into the current strength, and hence the yield of such a cell will be at the rate of

$$\frac{2.25 \times 10}{746} = .03 \text{ of a horse-power.}$$

In other words, it would be able to do about 650,000 foot-pounds of work. One horse-power will in 11 hours do $33,000 \times 60 \times 11 = 21,780,000$ foot-pounds of work, and .03 of this is 653,400. Of course, such secondary cells may be coupled in series with the same advantages as the common battery cells, and thus the

electro-motive force adjusted to any requirement. It is customary to indicate the requirements of an incandescent electric lamp by specifying the number of volts necessary to make it yield the stated candle-power. Thus a sixteen-candle-power lamp might require 100 volts to make it yield that amount of light. If its resistance was 100 ohms it would have a current strength of one ampere when lighted. Such a lamp would require not less than 45 secondary cells to make to give its sixteen-candle light. At the same time, however, the same number of cells could keep an indefinite number of such lamps lighted. Suppose there were an hundred, then each would be provided with the same electro-motive force, and the battery would be providing a current of 100 amperes per second, and would be exhausting at that rate. Hitherto secondary cells have not been durable. When they are perfected in that particular they will be most valuable adjuncts to many electrical enterprises.

ELECTRICAL TRANSMISSION OF ENERGY.—In an ordinary electrical circuit the energy is uniformly distributed in it, and one may utilize it at any point of the circuit, whether it be only a few feet or a hundred miles or more away. The common Morse telegraph is one device for the transmission of energy, for the latter is employed to move an armature to produce concerted signals. The same current might be employed to turn a wheel or produce any other kind of mechanical motion. Such a device as is illustrated in Fig. 5, was invented nearly fifty years ago by Dr. C. G. Page, and contains in principle the electric motors of to-day. Soon after the invention of the Grove battery attempts were made to propel boats and cars by electricity. Page in 1850 made an electric locomotive which with its battery weighed $10\frac{1}{2}$ tons, and run it on a railroad in the neighborhood of Washington city at the rate of 19 miles per hour. He estimated the horse-power of his engine to be about 12, but we now know it was greatly overestimated. The writer tried in 1855 to make one magneto-electric machine furnish current to drive another one, but did not succeed. With some of the modern dynamos driven by steam- or water-power it is possible to drive another similar machine and get a yield in work of about 40 per cent. of the original expenditure. With such motors cars have been run, fields have been ploughed, and various other kinds of mechanical work performed. The distance to which it is possible to transmit energy in this way economically is not very great. A dynamo using sixteen horse-power has driven an electro-motor yielding six horse-power at a distance of 30 miles with an ordinary telegraph wire as a conductor. This is a recovery of 37.5 per cent. of the expended energy. In places where energy of water-power may be cheaply had, but where it is inconvenient to utilize it, it is possible to place a dynamo and lead a wire to the electro-motor in the convenient place. In this way it has been proposed to utilize the Falls of Niagara, where something like 9,000,000 horse-power is wasted; the conducting wires stretching out to various cities and towns where it is to be used.

Telpherage is the name given by the inventor, Prof. Fleming Jenkin, of Edinboro, Scotland, to a new method for employing electrical energy for transportation. The scheme consists in utilizing a series of small motors to run upon an elevated conductor, each motor capable of doing from one to two horse-power, and dragging a series of vehicles loaded with two or three hundred pounds. A variety of ways for doing this have been invented. One of them is to provide two parallel conductors of stout enough wire to sustain the weight of the loading. These are to be strung upon the ends of a cross-arm fixed upon the top of a post like two telegraph-wires, but without the ordinary fixtures for insulation, as they would interfere with and prevent the rolling of a grooved wheel upon it, which is one of the conditions of telpherage. One of these wires is for the outgoing and the other for the return-

ing telphers. The electricity for the circuit is provided at one end of the line by a suitable dynamo driven by steam- or water-power. The inventor describes a train as being 120 feet long and consisting of seven buckets and a locomotive motor, each of these when loaded weighing about 300 pounds. The buckets, or skips, as they are now called, hang below the line on two V-shaped wheels, supported by arms that project out sideways so as to clear the supports at the posts. The locomotive motor also hangs below the line, and is driven by two specially-made grip-wheels. The advantages of such a system are said to be that within its limits of working it is independent of grade, for lines can be carried over hills and across rivers; that it can go round sharp curves, and the road will not be subject to deterioration and right of way will be the same as for telegraph wires. The capacity of such a road, reckoned at 15 hundredweight for each alternate section of 120 feet, is $16\frac{1}{2}$ tons per mile, which may be run at the rate of 5 miles per hour. This would deliver goods at the rate of 925 tons in ten hours.

OTHER ELECTRICAL PHENOMENA.—In pursuing his investigations in radiometry, Crookes observed that as the vacuum became more and more perfect the stratifications in an ordinary Geissler tube became fewer in number, being separated from each other by longer and still longer spaces, until none were apparent. When one of the terminals of a tube was made into a disk, or concave surface, the effect of the excitation of it was to impel the residual-gas molecules from it with greater energy than they possessed before; that is to say, its velocity in its free path was greater after impact with such electrified surface; and if its free path is long, compared with what it is in air at ordinary pressure, the energy of its movements, instead of being distributed as pressure, manifests itself in other ways, such as making a light paddle-wheel to revolve, or making a disk of platinum red hot, or developing fluorescent phenomena by impact upon the sulphide of calcium or aluminum. Such phenomena show that the molecules of the electrified surface are intensely agitated, as they would be if they were heated in any way; and the same reactions may be produced by heating the terminals in the tube in any way. In an ordinary radiometer the heated vanes beat off the molecules with greater energy than they were struck, and the reaction makes the vanes to revolve. If the free path in a tube is very long, and only one terminal be attached to the electrifying source, which is generally an induction coil, the result is that the gaseous molecules, impelled from the excited surface to a considerable distance, may be seen to return towards the same terminal. If both terminals are attached, the different potentials induce motions of the matter between them, but not in such a sense as to make a straight-moving molecule to go in a curved line.

The first law of motion holds good for a molecule as well as for a body of visible magnitude, and tubes are constructed to show that such molecular movements cannot be made to go round a corner. The fluorescent phenomena are such as appear when the same substances are subjected to radiant energy, especially such as has the wave-lengths of the blue end of the spectrum. Such an effect might be expected when it is known that the violence of the gaseous impacts is great enough to produce luminousness of the molecules themselves, which must set up corresponding undulations in the ether adjacent to each one, and all in proximity to substances so constituted as to absorb and transform them into longer-period waves. The phenomenon, then, is due, not to a peculiar electrical action, but to the heat-vibrations set up, as has been explained.

It has been stated that electricity is developed upon the simple contact of dissimilar substances. The ordinary apparatus for proving it is costly, and re-

quires considerable skill to successfully use it. It may easily be done by connecting the terminals of a telephone to two different kinds of metals and connecting them by touching while the telephone is held to the ear, or, better still, if one of the metals be a tuning-fork, which, while it vibrates, is permitted to gently touch a piece of zinc or copper. The series of pulses will give a distinct sound. The changes in strength of an electric field may also be easily perceived by employing a telephone with a single wire, three or four feet long, attached to one terminal, and one end hanging in free air; any change in the electric field may be heard, especially if the changes recur with frequency enough to give a continuous sensation. By insulating the wire the end may be moved about as an explorer and thus the shape of the field determined. Prof. Trowbridge, of Harvard College, has been able to detect differences in potential in the ground produced by the buried terminals of a battery when the circuit was completed and broken by the pendulum of a seconds clock. The beats of the clock could be detected a mile away from the buried terminals by simply sticking the two terminals of a magneto-telephone into the ground at a distance of fifty feet apart. He suggests the possibility of thus telegraphing across a river by providing a battery-circuit on one side, with terminals a mile or two apart, and a short parallel telephonic-circuit upon the other side. Morse signals sent on the battery-circuit would be heard in the other circuit. Some years ago Edison discovered that friction between surfaces where one was an electrolytic substance was considerably lessened when an electric current was passing between them, and he has developed this into a new telegraphic method and a new telephonic method.

Mr. E. H. Hall has discovered that when a magnet is presented to a thin strip of metal, through which a current of electricity is passing, that the current is deflected. He has also discovered that the direction of the deflected current is different for different metals. Thus iron, cobalt, and zinc have the reaction in the same direction as the conductor itself would move if free to do so, while silver, copper, and some others deflect the current in the opposite direction. Sir William Thomson has declared this to be comparable with the greatest discoveries made by Faraday.

We are now familiar with a great variety of effects which electricity can produce in solids, liquids, gases, and even in vacuous space, and it is highly probable that other effects will be discovered, for no one thinks that the possibilities of electrical phenomena have been exhausted. But all should know that there are two kinds of possibilities—*qualitative* and *quantitative*. It is hazardous for any one to deny qualitative possibilities prior to experiment; neither so-called common sense nor mathematics have determining weight in the untested field. If they had been heeded in the past, some of the most important scientific and commercial interests would have had no beginning. On the other hand there is no better established fact in the whole range of science than what is known as the *conservation of energy*. That no collocation of matter can create it or annihilate it, and that it never appears in any form except an equal amount in some other form has been spent to produce it. A definite amount of electrical energy will do no more work than the same amount of heat energy or mechanical energy, yet there are some who expect a duty from some electrical device quite beyond that of the energy that is furnished to it. It follows that the possibilities of any electrical apparatus are quantitatively fixed by the supply of energy in any form that may be provided, and hence one may always know the maximum work possible. In all commercial enterprises it is energy that is paid for, and it is best that the sanguine investor should bear in mind that no more can be got out of an electrical machine than is put into it.

(A. E. D.)

ELECTROTYPING, the art of making copies in metal from types, stereotypes, or engravings, and making them ready for use in printing on paper or woven fabrics. While the art of making electrotypes appears to have been invented at almost the same time in London, St. Petersburg, and the United States, it was here that it was first brought to a commercial success. Joseph A. Adams of New York made and used an electrotype of an engraving in 1841. Daniel Davis of Boston first made and used electrotype plates in printing a book, and Mr. Wilcox of New York started the business of making electrotypes, or "electros," as they are commonly called. Mr. Wilcox and others made many improvements in the processes, and the art now ranks next to the art of printing.

The assembling of the types, leads, rules, engraved blocks, etc., or the composition of the form, is an art quite distinct from electrotyping. The composed matter, properly corrected, justified, and locked in the chase comes to the electrotype-foundry in the same condition as if prepared for the printing-press, except that special pains must be taken to secure great evenness in the face or surface of the types and firmness and rigidity in the chase. On receiving the forms at the foundry they are washed in water if new and not much stained, and in naphtha or benzene if soiled with ink, and carefully planed to bring the face of the type to an even and uniform surface. After being dried, the forms are carefully coated with a thin film of black lead, laid on by means a soft brush. Meanwhile, pure yellow beeswax is melted and poured into a shallow pan having a raised edge and made of brass. This is the moulding-pan, and holds the sheet of wax in which an impression is to be taken from the form containing the types or blocks to be copied. In pouring the hot wax into the pan care is taken to have the pan level and to prevent the formation of cracks and bubbles in the wax. Should any appear, they are touched with a hot iron and melted down smooth. When in cooling the hot wax reaches just the required consistency, it is brushed over with black lead and placed with the type-form in a powerful press. Pressure is applied to force the type into the wax till an impression is obtained, the amount of pressure varying with the character of the work. There appears to be no exact limit of pressure, experience alone deciding what it shall be in each case. After the impression has been obtained the moulding-pan is removed from the press, and if, on examination, the impression appears to be perfect, the sheet of wax is cut from the pan and made ready for the electroplating bath.

In the United States both hand and power tools are used in this part of the work. The first are—the steam-jacketed melting-kettle, a shallow brass pan called the moulding-case, and a steam-heated table on which the metallic plates on which the moulds are formed may be heated. The presses in which the impressions of the form are taken in the wax are of two kinds. Toggle-joint presses moved by screws controlled by hand-wheels are used for low powers, and hydraulic presses where more pressure is needed for deeper impressions. In all the presses the lift is upward, one style of press having a movable head for convenience in getting the work in place. Shelves or supporting rails are also provided at the side on which the forms or moulds may be placed. The toggle presses give a pressure of about 10 tons; the hydraulic presses will give as high as 80 tons.

Before the impressed mould can be placed in the electro-plating bath it must be "built up." By means of a hot iron tool called a "building-iron" and strips of wax the blank spaces in the mould between the pages or paragraphs are built up or raised in relief by flowing wax, precisely as in soldering soft metals, over the blank spaces.

On removing the form and mould from the press they are carefully separated, and the mould, now deeply impressed with the type and engravings, is made ready for the plating bath. By means of a hot iron, called the

"building-iron," and strips of wax the blank parts of the mould are "built up" or raised by spreading the soft wax over the blanks. The mould is then thoroughly coated with a finer quality of black lead to give it a metallic surface, on which the current of electricity is conducted to start the deposit of copper which forms in the bath. Two processes are employed, the wet and the dry. In the dry way the moulds are placed in a machine having an iron grid that travels backward and forward on top of the machine. Above this is a brush fixed to a vibrating arm. An apron is arranged below to catch the waste lead, and a hood is placed over the whole machine to retain the dust. In this machine the mould, well covered with lead, travels under the vibrating brush till it is covered with a thin and uniform film. After being coated with the dry powder the mould is removed from the machine and the superfluous dust is brushed off by hand. The next step is to clean out the fine dust lodged in the minute bowls or depressions of the letters, and the mould is submitted to a powerful blast of air, which effectually removes all the loose particles of black lead, leaving only a thin firm film on the mould.

By the wet process, which was invented by Silas P. Knight of New York, the moulds are placed on shelves in a chest and washed with a mixture of black lead and water delivered by a fine rose-nozzle.

The next step by the dry process is to "stop out" those parts of the mould that need not be copied in the electrotype. This is readily performed by painting over the blank portions with hot wax. The black lead is thus covered again with wax upon which the copper refuses to lodge. The face of the mould is then dusted over with fine powdered iron filings. Sulphate of copper is poured over the powder. The reaction that follows leaves a thin film of copper on the mould that serves to save time in the bath and forms a basis or starting-point on which the plating may begin. This operation may be repeated a number of times if a thicker film is required.

The electro deposition of the copper on the mould then follows. Batteries have been used until within the last few years, when the dynamo machines were introduced, and these machines are now being used in all electro-plating works. (See ELECTRICITY.) The copper film deposited in the bath is usually sufficiently thick for ordinary printing in from three to seven hours. For fine book and illustrated work longer time is given and a thicker film is obtained. The film is then taken from the bath and laid on an inclined board while hot water is poured over the back of the copper mould. This causes the wax to melt and frees the copper shell. The shell is then placed on an iron grid, and boiling potash is poured over it to remove all traces of the wax. It is then rinsed in clean water and brushed over with a solution of sal-ammoniac and chloride of zinc, and the face of the shell is brushed with a fine quality of French lac varnish.

The shell is then placed face downward in the backing-pan or metal dish in which it is to receive the metal backing. More of the solution of chloride of zinc is brushed over the back, and sheets of tin-foil are spread over the entire back, the tin serving as a solder to unite the copper with the type-metal. A pot of molten backing-metal (type-metal) has been in the mean while prepared, and the backing-pan containing the shell is then placed in the melting-pot and allowed to float on the hot metal till the tin-foil begins to melt, when it is removed and placed on a level table. The molten metal from the pot is then poured over the back of the shell till it is filled and brought up to the required thickness. When the metal sets the shell may be taken up. It is now an electrotype—a sheet of type-metal having a copper face bearing an exact copy of the types or blocks in the original form.

The electro is then washed and scoured, and taken to a circular saw and trimmed into shape to fit it for the printing-press. It is then rough finished by hand or brought into shape for the first cutting. It is then re-

examined by the finisher, and sent to the planer for the final finishing work, sawing straight, bevelling the edges, and routing.

Wooden blocks are then fastened with screws to the back of the electro to make the work "type-high," or as high as ordinary type in a form. In this final work shaving, sawing, and planing machines, both hand and power, are used. In 1878, Michael Crane of New York received a patent for casting curved electrotypes, or copper shells designed to fit the cylinder of a rotary press. Curved forms, or "turtle-backs," used in newspaper presses, are now copied by electro-plating, and within a short time the forms used in printing curtains and on fabrics have been successfully reproduced in electrotypes. The work and tools here described are the same as may be found in any first-class electroplating plant in the United States. (C. B.)

ELEVATOR, OR LIFT. An apparatus for hoisting or elevating goods or passengers from one level to another. In the United States the word elevator has come to mean all kinds of lifts and hoists, either movable or stationary, excepting those machines that come under the general names of *cranes*, *derricks*, *sheers*, and *winches*. It also includes structures for handling and storing grain and other loose material in bulk. An elevator may be a simple dumb-waiter moved by hand, or a vast structure hundreds of feet long, and holding many thousand bushels of grain. The high cost of labor and the value of land in cities has led to the invention of a great number of appliances to be used in lifting men and materials from one level to another. Some of these inventions are of considerable scientific interest, and have become of the greatest value in business and trade.

Elevators may be broadly divided into two classes—those for handling and storing materials, as a grain elevator, and those used for simply lifting, as a hotel or warehouse elevator, car elevator, ice elevator, hod elevator, canal elevator, etc. The hoisting elevators are divided into classes according to the power employed, as steam elevators, pneumatic elevators, and hydraulic elevators.

Grain elevators.—While a grain elevator now means a structure for storing grain, the original meaning of the word was an apparatus for lifting grain, oats, flour, corn, meal, etc., from one part of a mill to another. This apparatus consisted essentially of an endless belt or band provided with cups or buckets fastened to one side. The band was carried over two wheels, pulleys or drums, one above and the other below, and when at work it continually travelled in one direction over the drums. Loose wheat, corn, or other grain placed over the lower drum was lifted by the cups or buckets. As each bucket moved upward it scooped up and raised a small quantity of the grain. On reaching the upper drum, the buckets passed over the drum and throwing out the loads into a bin prepared to receive it, passed down empty on the other side. This simple piece of mechanism makes the principal feature of a grain elevator, and gives its name to quite another thing. Grain elevators are built of wood, some having outside walls of brick as a protection against the weather and fire. Where brick walls are used, the main wooden structure within is practically a separate building. This is made necessary by the shrinkage of the wood-work, that in the mass amounts to several inches, and which would tend to crush the brick walls, if connected directly with them. When brick is not used the outer surface of the wood-work is usually covered with slates. As an elevator is essentially a place of storage it is constructed upon a somewhat peculiar system. The first or lower story is formed of massive timbers set up on end and designed to form columns for supporting the bins above. Aisles are arranged between these columns for railroad tracks for the cars that enter the building, and for the conveyers used to move the grain horizontally from one part of the

building to another. Upon these columns are laid planks, one over the other, and crossing each other at right angles. Planks are laid one over the other in this way till the intended height is reached. The structure thus becomes a honey-combed mass, with solid wooden walls crossing at right angles, and leaving square or oblong spaces between the walls. These spaces or wells extend from the top to the bottom of the mass and form the bins. The bins are usually from ten to twenty feet square, or ten by twenty feet, and sixty feet deep. The lower end of each is provided with a hopper and gate for taking the contents out from below whenever desired. At the top all the bins are open, the roof of the building forming a hood over them all. At different points in the structure are placed the elevators proper, or, as they are sometimes called, the "lofters." These are endless belts studded with buckets, and they are usually of great size and strength. The material of the belt is india-rubber reinforced by heavy canvas. In an elevator at Milwaukee, 280 feet long and 80 feet wide, with a storage capacity of 1,500,000 bushels, the elevator belt is 280 feet long and 36 inches wide. The drums over which the belt turns are 140 feet apart, and the belt lifts, when all the buckets are full, 25 bushels at once. The elevator discharges the grain in a continuous stream into a weighing bin at the top-story of the building. After weighing in large lots, the grain is diverted by means of movable spouts into a bin ready to receive it. The grain falls by its own weight into the bottom of the bin, from which it may be drawn for delivery to car or boat.

In connection with the elevation of the grain, there is also in all elevators cleaning machinery. This is of two kinds—sieves or riddles, over which the grain flows in a stream, while the sieves are violently shaken from side to side, and blowers. The heavier refuse, sand, straw, etc., is extracted by the sieves, and the lighter dust is blown out by allowing the grain to fall in a thin film past the inlet of a powerful exhaust. The waste, after passing through the fan, is thrown out through pipes in the lower part of the building.

Elevators are placed beside railroads for storing grain for local consumption, or beside docks for unloading cars, storage and reloading into canal-boats or vessels, or from vessels into cars. In unloading grain from cars, the grain is shoveled out of the car into pits beside the track and in which the lower drum of the belt is placed. This unloading is usually done from the tracks under the building. Where elevators are placed on docks and the grain is raised from the holds of canal-boats or vessels, a movable apparatus, called an elevator leg, must be used. The belt and its drums are placed within a wooden frame-work, pivoted at the top and supported by ropes, and by this means the belt is swung outside of the building and lowered into the hold of the canal-boat. When the work is finished the elevator leg is drawn back into the building and protected by a long narrow door that covers the slot in the wall through which it moves.

In transferring grain from one bin to another a number of appliances are used. If the elevator is a small one, the grain is simply led by means of spouts from the bottom of the bin to the foot of the loft. It is then raised to the top of the building and diverted by means of the spouts into another bin. Grains are mixed in the same way by allowing the contents of two bins to run into the elevator, and then raising the mixture and placing it in another bin. In small elevators the grain for delivery is drawn from the bins and placed in bags. To convey these bags to the door, a belt conveyer is sometimes used. This is an endless belt stretched over drums and laid down flat and near the floor. At intervals are rollers for supporting the belt as it moves. The loaded bags of grain are thrown upon this belt while it is moving rapidly, and are moved or conveyed to the door. As the belt passes

over the last drum, the bags are shot off by the momentum into a spout that leads to the wagon in the street below. This same system of horizontal belts or conveyers is also used to move grain in bulk from one part of an elevator to another. The belts are of great strength and are often many hundreds of feet long, and move with great rapidity. The grain falling on a belt from the spout of a bin, or from an elevator, is carried along in a solid stream till the point of discharge is reached. As the belt turns over the last drum, the grain shoots ahead into a spout prepared to receive it. By breaking the belt at different points (by having a series of short belts in line) the grain can be taken off at a number of different points. Another form of conveyer consists of a round pipe of wood or metal, in which turns a long screw. The turning of the screw forces the grain along the pipe, and to draw it off, openings, closed by valves, are placed at intervals along the pipe. Belt conveyers are placed at the bottom of stationary elevators under the bins. Screw conveyers are sometimes placed in the upper story to move grain from the loft to the distant bins. They are also used in the holds of floating elevators.

The largest grain elevator in the world is said to be at Brooklyn, N. Y. It is known as Dow's, and forms a conspicuous landmark in the southern part of the city. This elevator consists of nine lofty brick stores, each containing a large number of bins, and a long wooden structure extending to the end of the dock below the stores. Above the stores are three wooden towers, each containing an elevator. On the dock is another tower with two elevator legs, and in the second story of the long building are four lines of belt conveyers. The grain is lifted from the canal-boats at the dock, weighed, screened, blown, and delivered upon the conveyers. It moves on these up the dock and under the main stores to one of the three lofts. It is then raised to the top of one of the towers and distributed by means of long pipes, run on the outside of the towers, to the bins. This elevator, when fully employed, can receive, store, and deliver 60,000 bushels of grain in 60 minutes.

The delivery of grain in bulk from elevators into cars or vessels is through hinged pipes leading from the bottom of the bins through the walls into the holds of the vessels that lay longside.

Floating elevators are wooden towers built in the hull of the vessel, containing one or more elevator legs. The object is not so much to store grain as to transfer it. They are usually placed between a ship to be loaded with grain and a canal-boat. The elevator leg is placed in the hold of the canal-boat and the pipe is lowered into the hold of the ship and the grain is elevated, passed through the screens and blowers, elevated again, and poured into the ship's hold. In some floating elevators two legs are used, one being much longer than the other, and intended to reach over one canal-boat to another outside. Grain is also stored in the hold of the elevator, and screw conveyers are used to move the grain from one part of the hold to another. The floating elevators are usually provided with a marine engine and propeller for moving them from place to place. They are all self-contained, carrying their motive power for the machinery on the deck in the rear of the tower. Floating elevators are largely used in New York harbor, where they form a singular feature of the scene along the docks.

Coal elevators.—Next in point of size and capacity, in dealing with large quantities of loose material, are the coal elevators. While they are called "coal dumps" they are strictly elevators, because the coal is elevated and delivered through pipes, and because they are practically large hoisting-machines. Examples may be seen at Bergen Point, Jersey City, and Hoboken, near New York. The cars loaded with coal arrive at tide-water only a few feet above high tide, and to unload the coal into vessels without handling, the cars must be raised above the vessel's decks. To accomplish this,

elevated structures are built upon the docks and connected with the railroad by means of inclined planes. Tracks are laid up the plane and on top of the elevator, and the cars are drawn up the incline by means of wire ropes. Pipes or chutes are provided for directing the coal into the holds of the vessels in the docks below. The cars are brought over the upper ends of these chutes and the loads are shot out into the vessels. The empty cars return by gravity down the incline. Where coal is to be taken from vessels and transferred to cars, as in many New England ports, coal elevators are used to both elevate and store the coal. The coal is hoisted by buckets to the top of the elevators and stored in bins or "pockets" (hence the word "coal-pocket"), or shot through pipes into cars under the elevators.

Ice elevators.—Between the grain elevator and the simple hoisting-machine or lift is a class of machines allied to both. In these, of which the ice elevator is an example, a chain, belt, or strap, of metal or fabric, is carried over two drums, and armed with spikes, claws, or boards. In the ice elevator the lower drum is placed under water and the upper drum at the top of the ice-house. The drums are turned by steam-power, and the chain, armed with spikes arranged in pairs, traverses up one side and down the other between an inclined railway. The cakes of ice are floated over the lower drum and are caught in the chain and dragged up the incline on the rails. Arriving at the top, the cakes slide off and run down inclined ways or tracks to the bottom of the ice-house. Similar apparatus are used to raise loose cotton in cotton-mills, and clay, drugs, and other loose materials, in mills and other works.

Car elevators.—Inclined planes or railways, where the cars are hoisted and lowered over the plane by means of ropes, are not strictly elevators. A car elevator is a hoisting-machine for lifting the car bodily upon a platform. An example can be seen at Hoboken, New Jersey. At this place there is a rocky bluff between the streets, built on the low land near tide-water and the streets on the hill. To connect the horse railroad systems of the two parts of the city an elevator is used to raise the cars and horses. An inclined railroad 430 feet long, with two tracks, is built upon the hillside. The incline has a rise of 104½ feet, and is closely connected with the tracks above and below. At the lower end the two tracks of the incline run into a deep pit in the ground. At the upper end they enter the upper part of a building containing the engines, hoisting apparatus, etc. On each track is a large car having six wheels, one side of the car being higher than the other, so as to make the top level. Three steel ropes are attached to each car. Two enter the building and pass round the drum of a winding-engine. The third rope passes over two large wheels at the top of the incline, and is connected with the other car. By this arrangement one car balances the other, one moving up while the other moves down. Tracks are laid on top of each platform. On arriving at the elevator the horse-car is driven upon the platform and locked upon the tracks, and the gates are closed. At a signal from the attendant the engine is started, and the car, horses, and passengers are raised or lowered to the other level, where the horse-car is driven off and goes on its way.

Passenger and freight elevators, called in England "lifts," are very largely used in the United States. They include everything in the way of a hoisting apparatus that has a platform or car moved up and down in a well or hoistway. The well is also sometimes called the elevator shaft or hatchway. Elevator shaft appears to be the most common name. If the car or cage is an open platform, and used only for freight, it is called the platform. When used for passengers, it is called the car, or sometimes the elevator.

The most simple form of freight elevator is the dumb-waiter, used in dwellings and apartment-houses. It consists of an enclosed shaft, in which is suspended

by a rope some simple box or cage, with sometimes a shelf hinged at the back. The rope passes over a pulley at the top of the shaft, and carries a counterweight, moving in an enclosed shaft, at the other end. The cage or elevator is drawn up or down by means of rope. In apartment-houses signal bells are provided for calling attention to the elevator from the street floor.

Hod elevators, or builders' elevators, are open platforms suspended by a rope, and designed to run in guides placed in the open stairways of new buildings. Steam-power is often used to raise the platform. Another form of builders' elevator consists of an endless chain carried over a pulley, supported by wooden horses placed on the upper floor of a building in process of erection. The lower end of the chain passes over a pulley in the cellar or hangs loosely. The hods, filled with brick or mortar, are hooked on to the chain, and are thus carried up or down. These hod elevators are usually operated by hand-power, two men turning a crank at the top. As the floors are raised the chain is lengthened, and the upper pulley is raised to the next floor.

The simplest form of freight elevator (beyond a rope-tackle and fall) is an open platform suspended between guides in an open shaft or hatchway. The wire rope used to lift the platform is wound round a drum connected by gearing with pulleys, over which belts are taken from the source of power in the building. A hand-rope suspended in the shaft and passing through the platform is used to control a belt-shifting apparatus. On pulling the rope from the car the belts are changed, and the power is applied to the winding-drum. Another movement of the rope shifts the belts, to cause the platform to move the other way. A second rope or hand-chain is provided for stopping the car. The drum-gearing and belt-shifting device may be placed on any story of the building, and is usually suspended from the ceiling, so as to be out of the way. In one form of this apparatus the winding-drum is connected with the shaft bearing the pulleys by means of a worm-gear. This gear, instead of being cylindrical and straight, is curved, to fit the surface of the circular gear. By this arrangement a firmer hold is secured, as more teeth are brought into play at once, and giving opportunity for greater speed and a more rapid motion.

When steam-power is used exclusively for hoisting, as in warehouses and retail stores, the power is applied directly to the elevator. For this purpose a variety of hoisting-engines are used. Some of them are simply double or single horizontal engines connected directly with a winding-drum. The power is only used to lift the load, descending loads being brought down by their weight; held in check by a brake or by the engine. In some instances, however, the engine is reversed by an ordinary link-motion, and the power is used both ways.

One of the best forms of engines for hoisting heavy freight is the double upright engine connected by a belt with the winding-drum. The platform is raised or lowered by means of a hand-rope. This is connected with a lever that controls a three-way valve admitting steam to both cylinders. The movement of the valve starts the engine in one direction, another movement stops it, and a third reverses the engine and starts it in the new direction. These engines all have brakes and safety appliances.

Hydraulic elevators.—The general use of water under pressure in cities, and the introduction of simple forms of steam-pumps, has led to the employment of water-power in elevators. These are called hydraulic elevators. They may be divided into three classes, according to the way in which the power is applied. The first of these are simple hydraulic lifts, in which the car or platform is placed over the hydraulic cylinder, and resting directly on the piston-rod. In the second class the car is supported by a rope, the rope

being connected by means of a pulley-block with the piston-rod. In the third class a series of pulleys are employed, so that a slow movement of the piston-rod may be converted into a rapid movement in the car.

Hydraulic lifting elevators.—These elevators are hydrostatic presses. An upright cylinder is set up in the lower part of the building under the elevator shaft. The piston-rod passes through the upper cylinder head and supports the car. Water under pressure is admitted below the piston, and its upward movement raises the car. For lofty buildings the cylinder is made telescopic, expanding as it is filled with water, and thus lifting the load to a greater height. The objections to this kind of hydraulic elevator are its tendency to leak at the telescopic joints, and the deep excavation that must be made under the building to hold the cylinder. For short lifts, say of twenty feet or less, and where power is of more value than speed, this class of elevator is very useful. It is often used in docks and in iron and steel furnaces, and in warehouses to raise goods from the basement to the street. They are then called sidewalk elevators. Where the hydrostatic press is used to lift a tank containing water, in which a boat may float, it is called a canal elevator. An example can be seen at Anderton, England.

Hydraulic hoisting elevators.—In this class the car is supported by a wire rope that is connected with a simple form of hydraulic engine. Two methods are used in connecting the rope with the source of power. In one it is direct, in the other sheaves or pulleys are employed. In the first plan the cylinder is placed upright, and stands in a well or shaft adjoining the elevator. The rope is fastened to the top of the car, and is carried upward to a pulley at the top of the shaft. It then passes downward to a pulley at the upper end of the piston-rod of the hydraulic cylinder, and through this upward to the top of the building, where it is securely fastened. The cylinder is of comparatively small diameter, and is as long as one-half the whole height of the lift. If the pressure of the street mains is sufficient, the water may be used directly in the cylinder. If the pressure is low, two tanks must be provided, one at the top of the building and one in the cellar. A steam-pump must also be provided to lift the water from the lower to the upper tank. If the tanks are used, a pipe is laid from the upper tank to a three-way valve near the bottom of the cylinder. From this valve pipes extend to the top of the cylinder and from the top of the cylinder to the bottom, and also from the bottom to the lower tank. Supposing the car to be at the bottom of the shaft the piston will be at the top of the cylinder, resting on a column of water that fills the entire cylinder below it. On pulling the rope the exhaust-pipe at the lower end of the cylinder is opened, and the water is permitted to escape into the lower tank (or the drain, if the street mains are used direct). At the same time the water from the upper tank is admitted to the cylinder at the top, above the piston, and by its pressure forcing it downward, and thus raising the car. When the car is at the top the piston has sunk to the bottom of the cylinder, which is now filled with water. A pull on the hand-rope changes the valves, closing the exhaust, shutting off the supply from the upper tank and opening the connection between the upper and lower ends of the cylinder. The weight of the load now tends to lift the piston, and under this influence the water moves through the pipe from the upper to the lower end of the cylinder. As this pipe is small, the water cannot be transferred from above to below the piston very rapidly, and this tends to retard the too rapid descent of the elevator. The apparatus is now in the same position as before, one complete movement of the elevator consuming only enough water to fill the cylinder once. To counterbalance the weight of the car, weights are placed in the cylinder above the piston. Automatic devices are provided for stopping the car

at top and bottom of the shaft. The column of water at all times, above or below the piston, also acts as a safety-brake to prevent the car from falling when stopped at the top, or at any floor.

By an improvement recently applied to this class of elevators, they can be operated without the aid of an attendant. Electrical connections are made with the interior of the car and with the door on each floor with the valve of the cylinder. A small hydraulic motor, controlled by an electro-magnet, is used to give sufficient power to move the valve. On pressing a button in the car the motor is started and the valves set to lift the car. On pressing a second button it is stopped, while pressure on a third reverses the motion. Automatic locking devices are applied to all the doors of the well so that the doors cannot be opened from the outside till the car arrives opposite the door, nor can the car be moved till after the door has been closed again.

In the other plan of connecting the car with the hydraulic engine the cylinder is short, and to obtain speed and a larger movement of the car, multiplying sheaves are employed. In one form of elevator the cylinder is upright, and a cross-head or massive bar is placed at the end of the piston-rod, and from each end of this is hung a series of sheaves. Below, on each side of the cylinder, is a second pair of sheaves, and the lifting ropes are taken through these. By this arrangement a movement of the piston of one foot causes the car to travel five, ten, or more feet, according to the ratio between the multiplying sheaves.

In another arrangement of this system the cylinder is horizontal, and the cross-head carrying the sheaves travels back and forth upon ways or guides.

Hydro-pneumatic system.—In this system the lifting apparatus is the same as in hydraulic elevators just described, the difference being in the employment of compressed air in connection with the hydraulic cylinder. Two tanks are prepared, either in one construction divided by a diaphragm, or placed close together, and, in addition to the hydraulic pump, an air-compressor is provided, the compressor being directly connected with the same motor that operates the pump. The design is to compress air in a tank to a considerable pressure, and to employ this pressure to move the motor. When it is desired to lift the elevator the rope is pulled by the attendant, and a valve is opened that admits the compressed air from the tank in which it is stored into the tank containing the water. Immediately after the valve is opened admitting the water into the hydraulic cylinder. The pressure of the air upon the surface of the water in the tank drives it into the cylinder, and thus the air-pressure is the indirect motive power. When the load is lifted the rope is pulled, and the air-valve and the water-valve are closed, and the piston stands still, the water in the cylinder acting as a firm support for the elevator. To lower the car the rope is pulled again, when valves are opened, allowing the compressed air over the water in the tank to pass into the cylinder above the piston. The hydraulic valve is, at the same time, opened to permit the water in the cylinder to return to the tank. It will be seen that the pressure is thus balanced on each side of the cylinder, the pressure of the air being equal to that of the water, the weight of the car serving to destroy this balance in part, and to move the piston till all the water is driven back to the tank, and the mechanism is restored to its original position. The air above the piston may be then exhausted into the atmosphere, or into the air compressor. As it has considerable pressure it reduces the power needed to work the compressor, and it is returned to its storage tank in an economical manner. By this arrangement the air is used over again continuously, and free air is required only to compensate for waste. By an ingenious arrangement of the valves the pressure of the air controls the steam compressor. The compressor starts automatically whenever the

pressure in the tank is reduced, and continues to work till the maximum pressure is reached, when it stops automatically. By this arrangement the amount of the load controls the consumption of water used and power required. A light load only demands a light pressure on the water, and when enough pressure is obtained the elevator starts, and no more power is consumed. This form of elevator is reported to be very rapid in its movement.

Automatic elevator.—In a new form of elevator intended only for light freight, the hand-rope is replaced by a fixed rod. This rod can be moved up or down to start or stop the car by means of hand-levers placed at every floor. The load is put on the car and the lever is moved, when the car travels up or down alone to its destination. At each floor clogs or stops are placed in the rod, and by rotating the rod one of these stops may be brought into a position to meet the car. A lever is provided on each floor for rotating the rods and also an indicator for showing which stop is brought into action. The moving car meets the stop and lifts the rod, thus bringing itself to a stop. An alarm is also sounded to announce its arrival.

Safety appliances.—The universal use of elevators in the United States has brought out a great number of appliances for preventing the fall of the elevator in case the rope breaks, to prevent overwinding and to close the hatchways (to prevent the spread of fire and accidents) when the elevator is not in use. To prevent overwinding a stop is placed on the hand-rope, and the car in rising meets this and pulls on the rope, and thus stopping the engine or shutting off the water. Brakes are employed in all steam-engines to hold the car in one position, and in hydraulic elevators the column of water in the cylinder forms a secure support for the car. For checking the fall of the car, in case the rope breaks, a variety of clutches and stop-motions are employed. Some of these are controlled by springs that, as soon as the strain on the rope is slackened, cause bolts to fly out and engage in teeth placed on the guide-posts of the elevator shaft. Brakes are also brought into play by governors. A too rapid descent of the car throws out the arms of the governor and this puts on the brake. Cams, eccentrics, and wedges, designed to bite or clasp the guides, are also used. Automatic devices for opening and closing the hatchway covers are also largely used, together with apparatus for closing the covers at night when the elevators are not in use. (C. B.)

ELGIN, a city of Kane county, Illinois, is on Fox River, 36 miles W. of Chicago, on the Chicago and North-western Railroad, the Chicago, Milwaukee, and St. Paul Railroad, and the Fox River Branch of the former. It has 6 hotels, 3 banks (2 national), 3 weekly and 3 daily newspapers, 12 churches, 9 schools, and an academy. There is also a hospital for the insane, with fine building and grounds. The most important industry is the manufacture of watches, which is conducted on a very extensive scale by the National Watch Company. There are also 2 foundries, a large book-publishing-house, canning-works, flour-mills, lathe-manufactory, agricultural-implement-manufactory, etc. Fox River is here crossed by 2 bridges, and furnishes abundant water-power for the industries of the place. Besides being an important manufacturing city, it is the centre of the dairy interests of Illinois. Elgin was settled in 1835 and incorporated in 1855. Population, 8737.

ELIOT, CHARLES WILLIAM, an American educator, was born in Boston, Mass., March 20, 1834. He was educated at the Boston Latin School and Harvard College, graduating in 1853. In the next year he was tutor in mathematics, and in 1858 he was made assistant professor of mathematics and chemistry and held this position till 1863. He was professor of analytical chemistry in the Massachusetts Institute of Technology from 1865 to 1869, and in the latter year was elected president of Harvard University. In this position his

career has been distinguished by administrative ability, zeal in the cause of higher education, and an earnest effort to make the college curriculum perfectly fitted to prepare the students for the highest demands of American life and citizenship. His influence has reached far beyond the bounds of Harvard, and has stimulated into new vigor every institution for higher education in the United States. His annual reports as president have been eagerly sought and read by all friends of college education, and, though their suggestions have been criticised by the more conservative, their ability has been unquestioned. Besides these, reports and some essays on educational topics and two manuals of chemistry.

"ELIOT, GEORGE." See CROSS, MARY ANN.

ELIOT, JOHN, D.D. (1754–1813), an American Congregationalist minister and antiquarian, was born in Boston, May 31, 1754. He graduated at Harvard in 1772, studied theology, and was ordained pastor of the New North Church, Boston, as successor to his father, Nov. 3, 1779. He remained in this charge till his death. With his friend, Rev. Dr. Jeremy Belknap, he founded the Massachusetts Historical Society and contributed liberally to its collections and library. He was also a member of the American Academy of Arts and Sciences. His publications are chiefly the result of original research in New England history and biography; among them are an *Ecclesiastical History of Massachusetts and Plymouth*, and an *Account of John Eliot*. He also published a *New England Biographical Dictionary* (1809). He died at Boston, Feb. 14, 1813.

ELIOT, SAMUEL, LL.D., an American teacher and historian, was born in Boston, Dec. 22, 1821. He graduated at Harvard College in 1839 with the highest honors, spent two years in a counting-room, and then went to Europe. While in Rome in 1845 he formed a plan of writing a history of liberty, and after his return published in Boston in 1847 a portion of his projected work, in which he treated of early European liberal movements. In 1849 he issued two volumes on *The Liberty of Rome*, which appeared again in revised form in 1853 under the title *The History of Liberty: Part I. The Ancient Romans*. Two volumes on *The Early Christians* were added in the same year. Three other parts of this great work were projected, to treat of the papal ages, the monarchical ages, and the American nation. He was constantly engaged in teaching, and, besides private pupils, he gave gratuitous instruction to classes of young workingmen and organized a charity school for street children. He also prepared in 1856 a *Manual of United States History from 1492 to 1850*, which has since been brought down to 1872. In 1856 he was appointed professor of history and political science in Trinity College, Hartford, and was president of the college from 1861 to 1864. He was university lecturer on history in Harvard College from 1871 to 1873, head-master of the Boston Girls' High School from 1872 to 1876, and superintendent of Boston public schools from 1878 to 1880. He is president of various literary and charitable institutions in and near Boston.

ELIZABETH, a city of New Jersey, county-seat of Union county, on Elizabeth River, and on Staten Island Sound and Newark Bay, 13 miles W. S. W. of New York. The city has been developed by the union of two former towns—Elizabethtown (the capital of New Jersey from 1755 to 1757), founded in 1685 on the high ground of what is now the western part of the city, and Elizabethport, which lies on the bay and sound. The city is handsomely laid out, with broad, regular, and well-shaded streets. It is at the junction of several branch railways with the main line of the Pennsylvania Railroad (United Railroads of New Jersey) and of the Central Railroad of New Jersey. Elizabeth is noted for its schools and the wealth and refinement of its society. Elizabethport is an important point for the shipment of coal, and is the

site of large manufactories, including potteries, foundries, extensive sewing-machine-works, etc. Street-railways connect the city with Newark. Elizabeth has county and city buildings, an orphan asylum, an old ladies' home, a high school, an academy, 2 young ladies' boarding-schools, besides 2 Catholic academies, 4 parish schools, and 3 convents. There are 6 public-school buildings. The banks are 5 in number (3 national), and 3 daily and weekly newspapers. The city was chartered in 1865. Population in 1870, 20,832; in 1880, 28,229.

ELIZABETH CITY, a port of entry and the county-seat of Pasquotank co., N. C., is on Pasquotank River, 44 miles S. of Norfolk, Va., with which it is connected by the Elizabeth City and Norfolk Railroad. It has 3 hotels, 2 banks, 1 daily and 3 weekly newspapers, 5 churches, and 3 schools. It has 3 grist-mills, 4 saw-mills, a planing-mill, a cotton-factory, a sash- and door-factory, a carriage-factory, and 2 ship-yards. It was settled in 1800, and incorporated in 1850. Its property is valued at \$1,500,000, and it is free of debt. Population, 2315.

ELIZABETHTOWN, the county-seat of Hardin co., Ky., is on the Louisville, Nashville, and Great Southern Railroad, 42 miles S. of Louisville, and is the eastern terminus of the Elizabethtown and Paducah Railroad. It has a fine court-house, a bank, 2 hotels, 8 churches, a weekly newspaper, a saw-mill, and flour-mill. It is one of the oldest towns in the State. Population, 2526.

ELKHART, a city of Elkhart co., Ind., is at the confluence of the St. Joseph and Elkhart Rivers, 101 miles E. of Chicago. It is on the Lake Shore and Michigan Southern Railroad, at the junction of the Air-line division with the main road, and on the Cincinnati, Wabash, and Michigan Railroad. There are 3 iron bridges over the adjoining streams. Elkhart has a fine city-hall, 4 hotels, 2 national banks and 1 other bank, 2 daily and 5 weekly newspapers, 12 churches, and 6 fine school-houses. The industrial works comprise a musical-instrument-factory, grist-mills and planing-mills, 4 paper-mills, 2 board-mills, 2 carriage-factories, a harrow-factory, 2 starch-mills, a foundry, and the car- and locomotive-shops of the Lake Shore Railroad. The city was settled in 1832 and incorporated as a city in 1875. It is well laid out and presents a handsome appearance. It is lighted with gas and has a park. The property is valued at \$3,000,000; its public debt is only \$7000. Population, 6953.

ELLENVILLE, a village of Ulster co., N. Y., is on Sandburg Creek, on the Delaware and Hudson Canal, and is the terminus of the Ellenville branch of the New York, Ontario, and Western Railroad. It has 3 banks (2 national), 2 hotels, 3 weekly newspapers, a seminary and 2 graded schools, 6 churches. It is lighted with gas and supplied with water from a reservoir on the adjacent mountain. Its streets are broad, well shaded, and finely flagged. It has glass-works, cutlery-works, tannery, pottery, soap-works, and minor industries. It was incorporated in 1858. Population, 2750.

ELLERY, WILLIAM (1727-1820), an American statesman, was born at Newport, R. I., Dec. 22, 1727. He was the son of Lieut. Gov. Ellery, and graduated at Harvard College in 1747. He was at first a merchant, but in 1768 was made clerk of a court, and in 1770 began to practise law. In 1776 he was chosen a delegate from Rhode Island to the Continental Congress, and signed the Declaration of Independence and the Articles of Confederation. He continued to be a member of Congress till 1785, except in the years 1780 and 1782, and served on the marine and other important committees. He suffered great loss of property while the British occupied Newport in 1777. In 1786 he was chosen by Congress commissioner of the Continental loan-office for Rhode Island, and was afterwards chief-justice of the supreme court

of that State. He exerted himself to procure the abolition of slavery throughout the United States. In 1790 he was appointed by Pres. Washington collector of Newport, which position he held till his death, Feb. 15, 1820.

ELLET, CHARLES, JR. (1810-1862), an American engineer, was born at Penn's Manor, Bucks co., Pa., Jan. 1, 1810. He was brought up on a farm, but, obtaining employment in the construction of the Chesapeake and Ohio Canal, at first as a rodman, he turned his attention to mathematics and engineering. He went to Europe, and studied at Paris privately, following the course of the Ecole Polytechnique. Returning to America, he was employed on the Utica and Schenectady Railroad, then on the Erie, and afterwards was chief-engineer of the James River and Kanawha Canal. In 1842 he planned and built the wire suspension-bridge across the Schuylkill River at Fairmount, Philadelphia, the first structure of its kind in this country, and considered at the time a triumph of engineering skill. In 1845 he announced that a railroad suspension-bridge could be built across the Niagara River below the Falls, and two years later planned and constructed the preliminary bridge of 759 feet span, the wire cables of which were afterwards used in the bridge built there in 1855 by John A. Roebling. In 1846 Mr. Ellet became president of the Schuylkill Navigation Company, and was afterwards engaged in important engineering works. In 1848 he built a suspension-bridge of 1010 feet span over the Ohio at Wheeling, which was blown down in 1854. (See article BRIDGES, Vol. I., pp. 642-4.) After improving the navigation of the Kanawha River Mr. Ellet carefully examined the channels of the Ohio and Mississippi Rivers, and prepared an elaborate work on the navigation of those rivers. He was one of the first to advocate the use of steam-rams, proposing to the Russian government in 1854 thus to destroy the fleet attacking Sebastopol. At the commencement of the Civil War in 1861 he presented his plans to the United States government, but received no encouragement from the Navy Department. He submitted to Gen. McClellan a plan for the capture of the Confederate army, and when it was rejected wrote two pamphlets in which he severely criticised that general's conduct of the war. After the famous conflict of the Monitor and the Merrimac in March, 1862, he was commissioned by the War Department as colonel of engineers, and sent to protect the Mississippi gunboats against the Confederate rams. In a short time he turned nine powerful light-draught steamboats into rams, which were placed under his command. With four of these he joined the fleet under Commodore Davis, and on June 6, 1862, when they approached Memphis, eight Confederate gunboats and rams came out to meet them, while thousands of spectators gathered on the shore to watch "the battle of the rams." In the end seven Confederate vessels were destroyed or disabled, and only one escaped. The next day the city of Memphis was surrendered by the civil authorities. During the battle Col. Ellet was shot in the knee by a musket-ball, and, being already in feeble health, died from the effects of the wound, at Cairo, Ill., June 21, 1862. His publications were—*An Essay on the Laws of Trade* (1839); a paper on the *Physical Geography of the Mississippi Valley, with Suggestions as to the Improvement of the Navigation of the Ohio and other Rivers*, published by the Smithsonian Institute (1851); *The Mississippi and Ohio Rivers, with Plans for the Protection of the Delta from Inundation* (1853); a pamphlet on *Coast and Harbor Defences, or the Substitution of Steam Battering-Rams for Ships of War* (1855). He also published many scientific papers.

ELLICOTT, CHARLES JOHN, D.D., an English bishop, was born at Whitwell, near Stamford, April 25, 1819. He was educated at Oakham and Stamford Schools, and at St. John's College, Cambridge, where he graduated with honors in 1841, and became Fellow

of his college. He obtained the first member's prize in 1842, and the Hulsean prize in 1843. In 1848 he was appointed to the small living of Pilton, in Rutlandshire, which he held until 1858, when he was appointed professor of divinity in King's College, London. In 1859 he became Hulsean lecturer, and in 1860 Hulsean professor of divinity at Cambridge; in 1861 was made dean of Exeter, and in 1863 bishop of Gloucester and Bristol. His *Critical and Grammatical Commentaries* upon the Epistles of St. Paul, which began to appear in 1854, and his *New-Testament Commentary* (1877), have put him into the front rank of biblical scholars. He is also the author of *Historical Lectures on the Life of our Lord Jesus Christ* (1860), which formed the Hulsean lectures for 1859. He was one of the company of revisers of the English New Testament.

ELLIOTT, ROBERT WOODWARD BARNWELL, D. D., an American bishop, was born at Beaufort, S. C., Aug. 16, 1840. He graduated in 1861 at South Carolina College, and was an officer in the Southern army throughout the civil war. He served (1861-62) on the staff of Gen. Lawton, as an aide-de-camp; was wounded in the second battle of Bull Run; and was adjutant-general to Gen. McLaws, 1864-65. He took deacon's orders in the Episcopal Church in 1868; became a presbyter in 1871, and in 1874 was consecrated bishop of Western Texas, having his cathedral church at San Antonio.

ELLIOTT, STEPHEN, LL. D. (1771-1830), an American botanist, was born at Beaufort, S. C., Nov. 11, 1771. He graduated at Yale College in 1791, and devoted himself to literature, natural science, and the cultivation of his estate. In 1796 he was elected to the legislature, and continued to be a member till 1812, when he became president of the State bank. In 1813 he founded the Literary and Philosophical Society, and in 1814 delivered the first annual address before it. In furtherance of its object he delivered a gratuitous course of lectures on botany. In 1819 he received the degree of LL. D. from Yale College, and in 1820 was elected president of South Carolina College, but declined the position. His most elaborate work was *The Botany of South Carolina and Georgia* (2 vols., 1821-24), in preparing which he was greatly assisted by James McBride, M. D. (1784-1817), of Pineville, S. C. Dr. Elliott aided in establishing the medical college of South Carolina at Charleston in 1825, and was appointed professor of natural history and botany. In 1827, in conjunction with Hugh S. Legaré, he established the *Southern Review*, for which he wrote in all thirteen articles. He died suddenly at Charleston, March 28, 1830. He left a number of works in manuscript, and his collection of objects in natural history was one of the most extensive of his time.

ELLIOTT, STEPHEN, D. D. (1806-1866), an American bishop, son of the preceding, was born at Beaufort, S. C., Aug. 31, 1806. His father having removed to Charleston in 1812, he was taught there by Mr. Hurlburt, and entered Harvard College in 1822, where he remained only a year. He graduated at South Carolina College in 1825, studied law, and began practice in Charleston. He also contributed to the *Southern Quarterly Review*, which his father had founded, and advocated the political doctrines of State sovereignty, to which he adhered throughout life. He afterwards removed to Beaufort, and in 1833 turned his attention to theology and was ordained deacon in 1835. He had scarcely entered on the charge of the parish of Wilton, S. C., when he was elected professor of evidences of Christianity and sacred literature, and also chaplain, in South Carolina College. He was tall and dignified in appearance, graceful in his manners, and earnestly devoted to the work of education. He was ordained priest June 22, 1838. In 1840, when the diocese of Georgia was formed, he was chosen bishop, and was consecrated at Savannah, Feb. 28,

1841. He devoted himself to the arduous duties of his position, carefully avoiding extremes in doctrine and worship. He gave earnest attention to the religious needs of the colored population, establishing missions and sending missionaries among them as far as possible. In the earlier part of his administration he sacrificed his private fortune in his efforts to establish a female high school at Montpelier, Ga., and he afterwards united with Bishops Otey and Polk in an attempt to establish a great Southern university, but this project was frustrated by the outbreak of the Civil War. During the war he gave cordial support to the struggle in which his State had engaged, and sent his sons to fight in the Confederate armies. He prepared the pastoral letter issued by the council of the bishops of the Protestant Episcopal Church in the seceded States, held at Augusta, Ga., in Nov., 1862. When the war was ended he devoted himself with renewed energy and faith to his labors for the church. He died suddenly at Savannah, Ga., Dec. 21, 1866. During his life some of his sermons had been published separately, and in 1867 fifty were selected and published in New York under the editorial care of Rev. J. H. Hopkins, Jr., with a memoir by T. M. Hanckel.

ELLIS, ALEXANDER JOHN, F. R. S., an English philologist and orthoepist, was born at Hoxton near London, June 14, 1814. In 1825 his name was changed by royal license from Sharpe to Ellis. He studied at Shrewsbury and Eton; graduated with high classical and mathematical honors at Trinity College, Cambridge, in 1837. He also studied law in the Middle Temple. In 1864 he was chosen a F. R. S., and he has at various times held offices of honor in the learned societies of England. Among his numerous works are *The Alphabet of Nature* (1845); *Essentials of Phonetics* (1848); *A Plea for Phonetic Spelling* (2d ed., 1848); *Early English Pronunciation* (in parts, 1869, sqq.); *Treatises on Greek and Latin pronunciation*; *Speech in Song* (1878), *Basis of Music*, *History of Musical Pitch*, besides many tracts and other writings on phonology, mathematics, and music. He has also owned, edited, and published the *Phonetic News*, a journal devoted to improved methods in spelling. His masterly translations of Ohm's *Spirit of Mathematical Analysis*, and of Helmholtz's *Sensations of Tone as a Physiological Basis for the Theory of Music* (with valuable notes by the translator) are of very high importance. Mr. Ellis is a man of multifarious learning and remarkable powers of analytic thought. His belief that modern music may be rendered in tune has led him to take infinite pains to devise arrangements by which instruments with keyboards may be made to produce perfect accords. In this he is incorrect (see article EAR), yet his labors are entitled to high consideration.

ELLIS, GEORGE EDWARD, D. D., an American Unitarian minister, was born in Boston, Aug. 8, 1814. He graduated at Harvard College in 1833; studied at the Cambridge divinity school, and in 1840 was ordained pastor of a church in Charlestown, Mass. He held this charge till 1869, and was also professor of doctrinal theology in the divinity school at Cambridge, 1857-64. He was for some years editor of the *Christian Register* and also one of the editors of the *Christian Examiner*. His writings include biographies of Ann Hutchinson, William Penn, and John Mason in "Sparks's American Biography"; *The Half-century of the Unitarian Controversy* (1857); *The Aims and Purposes of the Founders of Massachusetts* (1869); *A Memoir of Jared Sparks* (1869); *A Life of Count Rumford* (1871); *History of the Battle of Bunker's Hill* (1875); and *The Red Man and the White* (1883).

ELLIS, ROBINSON, an English classical scholar, was born at Barming, Kent, Sept. 5, 1834. He was educated at Walthamstow, at Elizabeth College, Guernsey, and at Rugby, and was elected to a scholarship at Balliol College, Oxford, in 1852. After graduating he was elected a fellow of Trinity College, Ox-

ford, and continued there till 1870, when he was appointed professor of Latin in University College, London. In 1876 he returned to Oxford. He has published a critical edition of the text of Catullus (1867, 2d ed., 1878), a commentary on the same (1876); and a translation into the metres of the original (1877); a critical edition, with commentary, of the *Ibis* of Ovid (1881); and various philological articles in English, German, and American periodicals.

ELLSWORTH, the county-seat of Hancock co., Me., is on Union River, a few miles from the ocean, and 26 miles S. E. of Bangor. It has 4 hotels, 2 banks, a weekly newspaper, 5 churches, and several schools. It has a foundry, a woollen-mill, lumber- and grist-mills, and a machine-shop. It is lighted with gas. Its property is valued at \$1,535,000; its public debt is \$69,000. It was settled in 1763, incorporated in 1800 as a town, and in 1869 as a city. Population, 5052.

ELLSWORTH, OLIVER (1745–1807), an American statesman and jurist, was born at Windsor, Conn., April 29, 1745. He was educated by Rev. Dr. Bellamy, and after spending two years at Yale College went to the college of New Jersey in Princeton, where he graduated in 1766. Although he had been educated with a view of entering the ministry, he left theology after a year's study for the law. In the latter he was trained by Gov. Griswold and Judge Root. He was admitted to the bar at Windsor in 1771, and a few years later removed to Hartford. Here he enjoyed a lucrative practice, and as an advocate stood at the head of the Connecticut bar. In 1775 he was elected to the General Assembly, and in October, 1777, was chosen by this body a delegate to the Continental Congress, but did not take his seat till a year later. He served on the committees on marine and on appeals. He was also a member of the Governor's council, holding by yearly election from 1780 to 1784, and in the latter year he was appointed a judge of the superior court. In 1787 he was a member of the convention which framed the Constitution of the United States, and was reckoned among the ablest advocates of States' rights in that body. He was afterwards a member of the State convention of Connecticut which ratified the Federal Constitution. He became a determined Federalist. In the first congress under the new Constitution, Ellsworth was one of the senators from Connecticut, and was appointed chairman of the committee to organize the judiciary of the United States. He was watchful over public expenditures, and was pronounced by John Adams the firmest pillar of Washington's administration in the Senate. The mission of John Jay to England was due to his suggestion, and when the treaty then negotiated met with serious opposition in this country Ellsworth was one of its foremost defenders. Pres. Washington appointed him chief-justice of the supreme court in 1796. By his dignity, impartiality, and firmness, as well as his ability and learning, he proved himself worthy of the high position. His opinions were concise and perspicuous, and were noted for their cogency of reasoning. In February, 1799, on account of the complications caused by various acts of the French government, Pres. Adams appointed Chief-Justice Ellsworth, with W. R. Davie and W. V. Murray, envoys extraordinary to France. Although he had not been hopeful of the results, he succeeded in negotiating a treaty with Napoleon, who was then first consul. This treaty had secured indemnity for French depredations on American commerce, but the article relating to this subject was expunged in the Senate. Ellsworth was already suffering from severe disease, and he visited Bath, England, but without receiving much benefit from its mineral waters. When he returned to America in 1800 he resigned his office of chief-justice. He was, however, elected again a member of the Governor's council, which acted as a supreme court of errors in Connecticut. In May, 1807, when the judiciary of the State

was reorganized, he was appointed chief-justice of the State, but declined the position on account of failing health. He died at Windsor, Nov. 26, 1807. Throughout his career he was noted for his high moral and religious character, as well as his intellectual force and wisdom in the conduct of affairs.

ELM. If the English name "elm" be derived from the Latin *ulmus*, the ancient Plinian name, this would indicate that it is not aboriginal in England. But philologists are of opinion that the name is common originally to

Latin and the Teutonic languages, and not derived from either into the other. The elm is now one of the commonest and most useful timber trees in Great Britain. Botanically, America seems to be the home of the elm, some half dozen good species having been identified in the district bordering or east of the Mississippi River. No species has been found on the Pacific coast. The most northern species is the *Ulmus Americana*, or white elm, and is the species most generally referred to in our literature as the elm. It is exclusively used for ornamental purposes, especially in New England, for a shade tree, and is often called "the New Haven elm." It often reaches a height of 100 feet, with a circumference of 12 feet, and is a tree of striking beauty, chiefly on account of its slender sub-pendulous branches, which are widely extended. Of late years its beauty has been marred by the rapid increase of a small European beetle, *Galeruca californiensis*, which was first reported in America in 1837. The beetle deposits its eggs on the leaves in May, which hatch in a few days, and the larvæ eat out the whole of the cellular matter of the leaves, leaving little more than the principal nerves and midrib. As soon as full grown they descend to the ground by the trunk of the tree, at the base of which they enter the pupa state, and a few days after form a new generation of beetles. In this stage of their existence they may be so easily destroyed that the insect will not be a serious enemy wherever earnest efforts are made to protect the trees from it. Another serious insect enemy to the tree is the elm-borer, *Saperda tridentata*, which often destroys great numbers of trees. Another European enemy is the twig-borer, *Scolytus destructor*, but it does not as yet seem to have appeared in America, though very destructive in Europe. The elm is never found in forests, but usually in bottom-lands along streams or in the good soil collected in ravines. The timber is used in wagon-work and in shipbuilding, but not to a very great extent, as its place, as compared with the elm in the Old World, is taken by other trees of more value. Still, large quantities are exported from Canada, the value being estimated at from a quarter to half a million of dollars annually, and in commercial importance elm ranks second only to oak among the Canadian hard woods. The variety known as the rock elm is the most highly appreciated. When thoroughly dry it gives 666 feet to the ton of 2000 lbs., as against basswood 1000 and beech 571. The next best known species of America is the red or slippery elm, *Ulmus fulva*, or *Ulmus rubra* of Michaux. The name "slippery elm" is derived from the mucilaginous character of the inner bark, which is one of the most popular emollients for poultices. The Indians used a drachm of the bark to every pound of bear's fat, heating them a few moments together, and then straining the fat, which was thus permanently preserved from rancidity. Another interesting species is the wahoo, *Ulmus alata*, whose common name probably indicates some use in Indian economy now unknown. The bark is, however, hemp-like and tough, and an excellent rope for bagging cotton is made from it. It makes but a small tree, usually about 30 feet high and 3 or 4 feet in circumference, while the red or slippery elm reaches 50 or 60 feet by 4 or 5. The bark is covered with corky, wing-like excrescences, much as in the sweet gum, and hence the name *alata*—winged. The Thomas elm, *Ulmus racemosa*, has somewhat racemose flowers, and was discov-

ered in the early part of the present century by David Thomas of New York. The branches have also somewhat the corky character of the wahoo. *Ulmus opaca*, with small thick leaves, was discovered in 1818 by Nuttall on the Red River. All of these have nearly the same character as regards their several uses. (T. M.)

ELMENDORF, JOHN JAY, born in 1827, is descended from one of the old Dutch families which settled on the banks of the Hudson River. He received his degree of bachelor in arts from Columbia College, N. Y., in 1846. While pursuing scientific studies at the College of Physicians and Surgeons in his native city, and a theological course at the General Theological Seminary, N. Y., he was also tutor in mathematics, in the absence of the professor of that department, at Columbia College. In 1853 he established a free church in what was then a suburb of New York, and continued rector of the same until he was called to the professorship which he now (1882) holds. During this period he received his degree of S.T.D. from his own college. He published his monograph on Sir T. More (cited in App. to Ueberweg, *Hist. Phil.*, vol. ii. p. 518), and, besides various occasional tracts, his *Rites and Ritual*, an outline of the principles of ceremonial as applied to the sacrament of the altar by the Church of which he is a priest.

In 1869 he was called to be professor of mental philosophy and English literature at Racine College, Wis., which chair he has ever since occupied. Besides various essays on philosophical subjects in general, applying the principles of Kant to special questions (e. g., "Nature and Freedom," in the *Transactions* of the Wisconsin Academy of Science and Arts; "Miracles" and "Prayer," in the same publication and in the *Church Eclectic*, Feb. and March, 1880, June, 1881; "Hallucinations, Delusions, etc.," in the *American Church Quarterly*, July, 1882), he published, in 1876, his *Manual of the History of Philosophy*, an outline of principles and references intended to accompany lectures upon the same subject.

ELSTER, KRISTIAN (1841-1881), a Norwegian novelist, was born March 4, 1841. His first work, *Tora Trondal*, is full of issues that have never before been essayed in Norwegian elegant literature. His next work, *Farlige Folk* (1881), was a complete revelation of the author's great and rare genius. In the form of a fascinating story it deals tenderly but earnestly with the most vital religious, political, and social questions of the day. Before this work appeared in print the author died, April 11, 1881. After his death some short stories which he left in manuscript were published by Alexander Kjilland in a volume entitled *Solskyer* (1882). Mr. Kjilland has prepared the volume with a biographical sketch of Elster.

ELYRIA, the county-seat of Lorain co., O., is at the junction of the Northern and Southern divisions of the Lake Shore and Michigan Southern Railroad, and at the crossing of the Cleveland, Tuscarawas Valley, and Wheeling Railroad, 25 miles W. from Cleveland, and 7 miles S. of Lake Erie. It is between the two branches of the Black River, which, each falling over a perpendicular ledge 44 feet high, unite half a mile below the town. It has a fine courthouse, 2 banks (1 national), 3 hotels, 2 weekly newspapers, 8 churches, good public schools, and a public library. It is lighted with gas and has good waterworks. The chief industries are the manufacture of cheese, grindstones, screws, and tobacco. It was first settled in 1817. Population, 4777.

ELZE, FRIEDRICH KARL, a German literary critic and historian, was born at Dessau, May 22, 1821. After preliminary training in the gymnasium of that place, he pursued classic studies in the Universities of Leipsic and Berlin. In 1843 he turned rather to the study of modern languages, especially English, and afterwards made several journeys to London and Edinburgh. For many years he was a professor in the gymnasium at Dessau, but in 1875 he was called to the newly

founded chair of English philology in the University of Halle. He has done much to extend among his countrymen a knowledge of English literature, and especially of Shakespeare, Scott, and Byron. His first publication was *Englischer Liederschatz* (5th ed., 1869); in 1857 he issued a critical edition of *Hamlet*, which has since been superseded by his edition of 1882 (Halle and London), in which he has retained the old spelling. In 1853 he established a journal called *Atlantis*, to promote acquaintance with English and American life and literature, but this was suspended at the end of its second year. He has published critical editions of some other early English dramas and biographies of Sir Walter Scott (1864), Byron (1870), and Shakespeare (1876), the last being especially well done. For twelve years he was editor of the *Shakspeare-Jahrbuch*, and a selection of his contributions to this publication appeared under the title *Essays on Shakspeare* (London, 1874). Among his other publications are *Die englische Sprache und Literatur in Deutschland* (1864); *Eine Frühlingsfahrt nach Edinburgh* (1860); *Nach Westen* (1860), which contains translations of English and American poems; *Der englische Hexameter* (1867); *Vermischte Blätter* (1875), a selection of his literary essays; *Notes on Elizabethan Dramatists* (1880), and a volume of poems (1881).

EMANCIPATION is the act by which a person who was once in the power of another is rendered free. A minor who is permitted by his parents to govern and control his own actions is said in law to be emancipated. His earnings thereafter in such case belong to him and not to his parents. The term is, however, usually employed to indicate the act of giving freedom to a slave. Emancipation was in the Roman law accomplished by manumission.

In the territory now occupied by the United States slavery existed from the earliest colonial times. In the year 1620 a Dutch trader landed at Jamestown in Virginia a cargo of twenty negroes, who were sold to the planters and are supposed to have been the first slaves introduced into the colonies. The number, however, rapidly multiplied, and at the period of the Revolution there was not a colony from New Hampshire to Georgia which did not number negro slaves among its population. Several attempts were made in early colonial times to abolish slaveholding in the colonies. The assembly of Pennsylvania passed an act to this effect in 1712, which was, however, abrogated by the king in council. Other similar efforts were from time to time made, but with a like result. In 1776 the continental congress resolved that "no slaves be imported into any of the thirteen united colonies." The convention summoned in 1789 to frame the constitution of the United States was of the same opinion. It resolved unanimously that the clause be inserted in the constitution prohibiting the importation of slaves into this country after the year 1808.

The State of Pennsylvania was the first to take definite action for the abolition of negro slavery. On March 1, 1780, her assembly passed an act entitled "an act for the gradual abolition of slavery," by the terms of which it was in substance provided that the master of every slave in the commonwealth should, within a time certain, register the name, age, and description of all his slaves; otherwise they were to be deemed free; and, further, that no children of any slave thereafter born in the commonwealth should be considered as in a state of servitude, but that on the contrary they should be considered free.

Massachusetts was but one day later. On March 2, 1780, the constitution of that State was adopted embodying the following clause: "All men are born free and equal, and have certain natural, essential, and unalienable rights, among which may be reckoned the right of enjoying and defending their lives and liberties; that of acquiring, possessing, and protecting property; in fine, that of seeking and obtaining their safety and happiness." This declaration was after-

wards pronounced to have abolished slavery in Massachusetts forever. The example of Massachusetts in wholly emancipating its slave population was followed in 1792 by New Hampshire and in 1793 by Vermont. The remaining Northern States followed the example of Pennsylvania by passing laws for the gradual abolition of slavery much after the same fashion. This was accomplished in Connecticut in 1784, in Rhode Island in the same year, in New York in 1799, and in New Jersey 1804. Maine, in 1819, embodied in her constitution principles inconsistent with the existence of slavery. Ohio, Indiana, Illinois, Michigan, Wisconsin, and Iowa contained no slaves by virtue of the provisions of the act of Congress of July 13, 1787, known as the Ordinance for the Government of the North-western Territory. (See CUTLER, MANASSEH.)

In the Southern States, prior to the War of the Rebellion, slavery continued as a domestic institution, and emancipation could only be effected by the voluntary act of the master. The policy of those States led to many restraints upon such emancipation, which have now happily passed into matters rather of curiosity than of practical importance. Slaves being considered as property, no emancipation could be effected by the master, either by deed or will, as against his creditors, if, at the time of the emancipation, the person making it had not sufficient money to pay his debts. Where emancipation was in such cases effected the creditor of the emancipator might, notwithstanding, levy upon the slave and sell him anew into bondage. Where a testator emancipated his slaves by will, his widow was, nevertheless, entitled to her thirds of his personal estate therein, provided he did not leave other sufficient property to satisfy her claim. In South Carolina, Alabama, Mississippi, and Georgia no slave could be emancipated without the consent of the legislature, and in Georgia any master endeavoring to emancipate his slave without such consent was subjected to a penalty of five hundred dollars. In North Carolina a slave could, in early times, be emancipated only for meritorious services, to be admitted and allowed by the county court. By later laws, however, the master was authorized in any case to present a petition to the county court asking leave to emancipate his slave. The petition being allowed by the court, the master was then enabled, upon entering bond with surety for the slave's good behavior, to emancipate him. The freedman was, however, bound immediately after to leave the State and never to return thither. In Tennessee the law was substantially to the same effect, a discretion being, however, vested in the courts as to whether the emancipation was consistent with the interest and policy of the State. In Mississippi every emancipation had to be effected by an instrument under seal, attested by two witnesses and acknowledged in open court. In addition, satisfactory evidence had to be adduced to the general assembly that the slave had done some meritorious act for the benefit of his master, or rendered some distinguished services to the State. A special act of assembly had then to be procured sanctioning the proposed emancipation, otherwise the prior proceedings were inoperative. In Kentucky, Missouri, Virginia, Maryland, and Arkansas greater facility was afforded for emancipation. It was in those States provided that slaves might be emancipated either by deed or will, provided they were not infirm or diseased so as to be unable to provide for themselves. In Virginia an emancipated slave remaining in the State twelve months after he became actually free forfeited his freedom. In Louisiana slaves might be manumitted either by deed or will, but in no case could this be done where the slave in question was less than thirty years old, unless he had saved the life of his master, his master's wife, or one of his children.

Wherever statutory provisions existed in reference to the emancipation of slaves, it was necessary to comply strictly with such provisions. Such compli-

ance was a condition precedent to a slave's freedom. Where emancipation by deed or will was lawful it was need that the intention to free the slave, in order to be operative, must be expressed in direct and unequivocal terms. Hence a mere permit to a slave "to go about his lawful business" was not held to amount to an emancipation. In some few cases it was held that the bringing of an action by the master against the slave, or the devise of property, real or personal, to the slave by the master, implied manumission. This was not, however, the law in Louisiana.

Upon the breaking out of the War of the Rebellion an agitation at once arose in the Northern States looking to the emancipation of the slaves in the southern part of the country. This was deemed by many a proper war measure admirably calculated to crush the rebellion and to restore peace to the nation. Pres. Lincoln, however, anxious if possible to bring about a reconciliation, and fully aware of the importance of the step which he was pressed to take, hesitated for a long time. At length, on Sept. 22, 1862, he issued a proclamation setting forth that he proposed on the first day of January of the ensuing year to declare all persons held as slaves within any State or designated part of a State, the people whereof should then be in rebellion against the United States, free thenceforward and forever. Accordingly, on Jan. 1, 1863, the rebellion still continuing, the president issued a further proclamation, reciting that above set forth, and declaring that by virtue of the power in him vested as commander-in-chief of the army and navy of the United States in time of actual armed rebellion against the authority and government of the United State, and as a fit and necessary war-measure for suppressing said rebellion, he did thereby order and declare that all slaves in the States of Arkansas, Texas, Louisiana (with the exception of certain parishes), Mississippi, Alabama, Florida, Georgia, South Carolina, North Carolina, and Virginia (the forty-eight counties designated as West Virginia and some others only excepted) were and henceforward should be free. The forces of the United States, both by land and by sea, were instructed to recognize and maintain the freedom of said persons. "And upon this act, sincerely believed to be an act of justice, warranted by the Constitution upon military necessity, I invoke (said the President) the considerate judgment of mankind and the gracious favor of Almighty God."

It was not, however, until somewhat later that the emancipation of all the slaves in the country was finally effected. On Feb. 1, 1865, Congress passed a resolution that a thirteenth amendment to the Constitution be proposed to the legislatures of the various States in the terms following:

SECTION 1. Neither slavery nor involuntary servitude, except as a punishment for crime, whereof the party shall have been duly convicted, shall exist within the United States or any place subject to their jurisdiction.

SECTION 2. Congress shall have power to enforce this article by appropriate legislation.

The proposed amendment was accordingly submitted to the various legislatures, and was duly ratified in Illinois, Rhode Island, Michigan, Maryland, New York, West Virginia, Maine, Kansas, Massachusetts, Pennsylvania, Virginia, Ohio, Missouri, Nevada, Indiana, Louisiana, Minnesota, Wisconsin, Vermont, Tennessee, Arkansas, Connecticut, New Hampshire, South Carolina, Alabama, North Carolina, and Georgia, in all twenty-seven States, or three-fourths of those constituting the Union. On Dec. 18, 1865, a proclamation was issued certifying that the consent of the requisite number of States had been obtained, and the amendment was accordingly declared part of the Constitution of the United States. (L. L., JR.)

EMBURY, PHILIP (1729-1775), the pioneer of Methodism in America, was born at Ballygaran, Limerick, Ireland, Sept. 21, 1729. His parents were na-

tives of Germany, and he became a carpenter. Having been converted in 1752, he joined Wesley's society, and was made a local preacher in 1758. He emigrated to New York in 1760, and pursued his trade there. At the instance of Barbara Heck he began preaching there in 1766. On account of the strict laws against nonconformity the meetings were held at first in his own house, but afterwards in a rigging-loft in William street, which has since been known as the birthplace of American Methodism. In 1768 the first Methodist church was erected in John street. He worked on the building as a carpenter, and made the pulpit with his own hands. He preached the first sermon in it Oct. 30, 1768, and continued preaching without salary until the arrival of ministers sent by Wesley. He then removed to Camden, Washington co., N. Y., where he worked during the week as a carpenter and preached on Sundays. He organized a Methodist society at Ashgrove, near Camden, which was the first in the bounds of the Troy conference. He died, from an accident while mowing, at Camden, N. Y., August, 1775. He was buried in the neighborhood, but in 1832 his remains were moved to Ashgrove churchyard, and in 1866 to Cambridge, N. Y., where a monument, erected by Troy conference, commemorates his services.

EMERSON, RALPH WALDO (1803-1882), an American poet and philosopher, was born in Boston, May 25, 1803. He was a descendant of the founder of the Christian Church in Concord, Rev. Peter Bulkeley, who came to New England from the little parish of Odell, or Woodhill, in Bedfordshire, England, where the first clerical ancestor of Mr. Emerson, so far as we know, Rev. Edward Bulkeley, D. D., was rector from about 1580 to 1620. Rev. Peter Bulkeley was Dr. Bulkeley's son, born at Odell, Jan. 31, 1583; succeeded his father as rector in 1620; was driven away by Archbishop Laud about 1633; came to Cambridge, Mass., in 1634; settled in Concord in 1635, and died there March 5, 1659. Rev. William Emerson, of Concord (born May 21, 1743, died Oct. 20, 1776), was the grandfather of R. W. Emerson, and the first occupant of the famous "Old Manse," in Concord, where Emerson wrote *Nature* and Hawthorne his *Mosses*. Through this grandfather, who left an only son, Rev. William Emerson, of Harvard and Boston (born May 6, 1769, died May 12, 1811), R. W. Emerson traced his descent from Rev. Joseph Emerson, of Mendon, who married, in 1665, at Concord, Elizabeth, the daughter of Rev. Edward Bulkeley, and granddaughter of Rev. Peter Bulkeley, above mentioned. These three Bulkeleys, ancestors of R. W. Emerson, were clergymen at Odell and Concord, in lineal succession, from 1580 to 1696, when Rev. Edward Bulkeley died; his Emerson ancestors were ministers in Malden, Concord, and Boston for nearly one hundred years, terminating at his father's death in 1811; through a female ancestor he descended from Rev. Samuel Moody, of York, Me., who preached from 1698 to 1747, and through another ancestor, Rebecca Waldo, he descended from Peter Waldo, one of the early Reformed Christians known as Waldenses. His ancestors in all directions, therefore, were clerical persons for more than two centuries before his birth. His first ancestor of the name in New England, Thomas Emerson, of Ipswich, Mass., was a baker and farmer there as early as 1638; but two of Thomas Emerson's sons were ministers, and Thomas seems to have belonged to a younger branch of the family of Ralph Emerson, of Durham, who, in 1535, was ennobled by Henry VIII., and received by grant the heraldic arms which have been used since 1640 by the descendants of Thomas Emerson in America. The Bulkeleys were a family still more ancient in England, claiming descent from one Robert Bulkeley, who, in the reign of King John, was lord of the manor of Bulkeley, in the county palatine of Chester. The Rev. Peter Bulkeley had for his second wife Grace, daughter of Sir Richard

Chetwode, of Odell, and was related to Oliver St. John, Cromwell's solicitor-general, whom Bulkeley called his "nephew." These genealogies are mentioned to show that the ancestors of the poet Emerson were technically "gentlemen" for many generations, and specially scholars and clergymen in those generations that dwelt in New England.

R. W. Emerson's father, Rev. William Emerson, of Boston, was born at Concord, in the "Old Manse," and his mother (the grandmother of R. W. Emerson) was Phebe Bliss, daughter of Rev. Daniel Bliss, minister of Concord from 1739 to 1765. This lady, after her first husband's death in 1776, married his successor, Rev. Ezra Ripley, minister of Concord from 1778 to 1841, and it was at Dr. Ripley's house that Rev. William Emerson, of Boston, spent his youth. He married Ruth Haskins, of Boston, a little before 1800, and had eight children, six of whom, five sons and a daughter (who died early), survived their father's death in 1811. R. W. Emerson was the second in age of these sons. At the death of their father he was minister of the First Church in Boston, a highly honorable position among the clergy of Massachusetts, to which he was called from the little town of Harvard in 1799. Ten years before that date Rev. William Emerson had taught the grammar school in Roxbury, where Rev. Charles Lowell, father of the poet Lowell, was one of his pupils. Dr. Lowell describes the father of R. W. Emerson as a "handsome man, rather tall, with a fair complexion, his cheeks slightly tinted, his motions easy, graceful, and gentleman-like, his manners bland and pleasant; he was an acceptable preacher; his delivery was distinct and correct, and was evidently the result of much care and discipline." His son in 1849 wrote of him: "He inclined obviously to what is ethical and universal in Christianity, very little to the personal and historical. I think I observe in his writings, as in the writings of Unitarians down to a recent date, a studied reserve on the nature and offices of Jesus. They had not made up their own minds on it. It was a mystery to them, and they let it remain so." This describes well the state of mind in which Rev. William Emerson's two eldest sons, William and Waldo, came to their theological studies about 1823. William, the elder, went abroad to study in Germany, and there, finding himself involved in doubts and perplexities, he visited Goethe at Weimar, and laid his difficulties before the old poet, who advised him to quiet his conscience, go home, and preach, whatever his doubts might be, and not frustrate the hopes of his family. William Emerson returned to America, but not to preach; he laid the case before his brother Waldo, who said afterward, "I was very sad to hear it, for I knew how much it would grieve my mother;" but he could not advise his brother to go into a pulpit, and William became a lawyer instead.

Although the death of his father had left Waldo Emerson poor, he had friends who provided for his education, and he was carefully instructed in the Boston Latin School and at home, where an aunt, Miss Mary Emerson, undertook to train his mind and direct the course of his studies, which she was well fitted to do by the acuteness and vigor of her own mind. A friend, Miss Sarah Bradford, afterwards Mrs. Ripley, set young Emerson, at the age of eleven, the task of finishing a translation of the fifth Eclogue of Virgil, which is the earliest known verse composed by the future poet. Miss Bradford wrote him (May, 1814): "You love to trifle in rhyme a little now and then; why will you not continue this versification of the fifth Bucolic? you will kill two birds with one stone: improve in your Latin as well as indulge a taste for poetry." The boy undertook the task, and produced some creditable lines. His aunt, when he grew older and had read something of Plato, caused him to write her a letter as if to Plato, which she answered in the name of that philosopher; and she also intro-

duced him to the *Pensées* of Pascal and other books which boys of his age seldom read. He entered Harvard College in 1817, at the age of fourteen, and there came under the instruction of Caleb Cushing in mathematics, of Edward Everett in Greek, and of George Ticknor in belles-letters. His rhetorical professor was Edward Channing. He was devoted to eloquence in public speakers and heard all the Boston preachers and orators he could—Dr. Channing, Harrison Gray Otis, John Quincy Adams, and especially Daniel Webster. In 1835, writing to his friend Carlyle in London about Webster, Emerson spoke of him as "that great forehead which I followed about all my young days, from court-house to senate chamber, from caucus to street. I owe to him a hundred fine hours and two or three moments of eloquence." In his old age Emerson once said: "I have heard three Americans who spoke better than any of their contemporaries—Dr. Channing, Webster, and Wendell Phillips. I could never find in the hymns what I heard Dr. Channing read from them. Webster was never a heavy or a dull speaker—when he was sober." In 1834 he supported Webster as against Gen. Jackson, whom Emerson styled "a most unfit person in the presidency, doing the worst things; the worse he grew, the more popular." Leaving college in 1821, Emerson at first joined his brother William in a school for girls in Boston. He continued in this occupation for several years, but in the meantime, in 1823, began to study theology with a view to following his father's profession and that of his ancestors. He had not distinguished himself for scholarship in college, but he was a serious student, and had a gift of eloquence which soon made itself manifest. His father's church had been in Chauncy Place, not far from Dr. Channing's, and the doctor's house was near where Mrs. Emerson and her children lived in Boston.

Young Emerson then began to study divinity (nominally with Dr. Channing, whose sermons he had long heard, and who "possessed the mysterious endowment of natural eloquence," as Emerson once said). His chief instructor in divinity was at Cambridge, however—Andrews Norton, then a professor in the Unitarian theological school, whom Emerson described in 1835 as "one of our best heads, once a theological professor and a destroying critic, who lives upon a rich estate at Cambridge, and frigidly excludes Carlyle's 'Diderot' from his *select journal*, calling it 'another paper of the Teufelsdröckh school.'" This critic was an exact scholar, who could teach the young men much that they wished to know; and Emerson said in after years that he profited more by Norton in theology than by any other professor. His studies were interrupted by ill-health and by the necessity of teaching for his own support, and he was excused from very rigid examination on the books he read and the lectures he heard. "If the professors at Cambridge had examined me then," he used to say, "perhaps they would not have let me preach at all." He was "approbated" as a preacher by the Middlesex County Association of Congregational ministers in 1826, and in 1827 began to preach steadily as a candidate in various pulpits. In 1828 he took the place of his grandfather, old Dr. Ripley, in the parish church at Concord for a few weeks, and early in 1829 he was invited to settle in the Second Church of Boston, where Rev. Henry Ware, Jr., was the pastor. Mr. Emerson became his colleague, and soon found himself in fact the pastor of the church, Mr. Ware having duties as a professor at Cambridge after 1830. He held this position from March 11, 1829, to Dec. 22, 1832.

In September, 1829, he married Miss Ellen Tucker, of Boston, who soon became an invalid, and died in February, 1832. A year after his marriage he became sole pastor, and then in a letter to a kinsman he made this remark: "I stand alone, but there is, of course, no real change in my relations. The work was great

enough before, and it is not more now." He had devoted himself with much zeal to sermon-writing, and in July, 1829, had written to his aunt Mary in excuse for the brevity of his letter: "I am striving hard to-day to establish the sovereignty and self-existent excellence of the moral law in popular argument, and *slay the Utility swine*; and so must run." It was apparently this sermon which Mr. Alcott heard him preach in Dr. Channing's church in the autumn of 1829—the first time his friend had listened to him. The subject was "The Universality of the Moral Sentiment," and Mr. Alcott was struck, as he has since said, "with the youth of the preacher, the beauty of his elocution, and the direct and sincere manner in which he addressed his hearers." He was much admired in the pulpit, but not by all who heard him, the wife of his friend, George Ripley, thus describing him on one occasion: "Waldo Emerson came last Sunday and preached a sermon for George, with his chin in the air, in scorn of the whole human race." His Boston ministry was passed chiefly in a house in Chardon Street, near Bowdoin Square, where the young minister and his delicate wife set up housekeeping in October, 1830, and where his mother and his brothers, one or more of them, generally lived with them. His brother Edward, who graduated at Cambridge in 1824, had studied law in Boston with Daniel Webster, and was tutor in 1827–28 to his son, Fletcher Webster. His youngest brother, Charles, who graduated in 1828, also taught school for a while, and then studied law; but both these brilliant young men died early—Edward in 1834, and Charles in 1836. Emerson admired his brothers greatly, mourned for them profoundly, and has borne witness to their character and talents in verse and prose. To Carlyle he wrote of his brother Charles's death in words which may in some respects be applied to himself: "Your last letter (in April, 1836) found me a mourner, as did your first. I have lost out of this world my brother Charles, the friend and companion of many years, the inmate of my house, a man of beautiful genius, born to speak well, whose conversation for these last years has treated every grave question of humanity and has been my daily bread. He built his foundation so large that it needed the full age of man to make evident the plan and proportion of his character. He postponed always a particular to a final and absolute success, so that his life was a silent appeal to the great and generous." The death of his wife, in 1832, had been a severe blow to Waldo Emerson, and after giving up his Boston parish he resolved to leave America for a time.

On this first voyage to Europe he sailed up the Mediterranean before visiting England, and spent the spring months of 1833 in Italy and France, going as far east as Malta, and passing some time in Sicily. Early in May, 1833, he was in Florence, where he met Horatio Greenough, the sculptor, and dined with Landor, then "living in a cloud of pictures at his Villa Gherardesca." The favorable impression then made upon him by Landor was never effaced, though Carlyle, and Landor himself, did what they could to change his mind. When Carlyle wrote to him in 1840, "Of Landor I have not got much benefit," Emerson replied, "I suspect you of very short and dashing reading in his books," but added, "His speech, I remember, was below his writing." An English friend in Italy had given Emerson a letter to Carlyle, then living in his wife's house in Scotland; and so, in July, 1833, after some weeks in Paris, he went to London, and towards the end of the summer visited Carlyle at Craigenputtock, sixteen miles from Dumfries, where, in a sort of exile, "amid desolate heathery hills, the lonely scholar nourished his mighty heart."

In sight of Wordsworth's country in August, 1833, Carlyle and Emerson "sat down and talked of the immortality of the soul." Had Goethe been living,

Emerson "might have wandered into Germany also." He visited Coleridge and Wordsworth, and saw Wellington at the funeral of Wilberforce. Returning to New England, he resumed his scholastic life, and soon took up his residence in Concord, where his kindred were living.

In October, 1834, he went with his mother to live at the "Old Manse" with his grandfather, Dr. Ripley, which continued to be his home for a year or more, and until after his marriage to Miss Lilian Jackson, of Plymouth, in 1835. Then he bought and fitted up a house which had been built by a Boston merchant, on the Lexington road in Concord, and went there to live in October, 1835. It is on the eastern side of the village, and not far from where Alcott and Hawthorne afterwards dwelt side by side. There, with the exception of two visits to Europe—in 1847 and 1873—Emerson always afterwards lived, and there he died, April 27, 1882. All his four children were born there—his eldest son, Waldo, in October, 1836—and all his books were written there, except the first one, *Nature*, which was composed in the "Old Manse." His first-born son died in this house in 1842, and, in the pathetic poem which he wrote soon after, Emerson described with a few touches the locality in which his house stands:

"His daily haunts I well discern—
The poultry-yard, the shed, the barn—
And every inch of garden ground
Paced by the blessed feet around;
From the road-side to the brook,
Whereunto he loved to look;
Step the meek birds where erst they ranged,
The wintry garden lies unchanged;
The brook into the stream runs on;
But the deep-eyed boy is gone."

Three other children of Emerson survive him—Ellen, Edith (Mrs. W. H. Forbes), and Edward, the latter a physician in Concord and the heir to his father's manuscripts and books. There are also ten grandchildren living, most of whom bear the name of Forbes. All his children were of the second marriage.

The volume lately published by Prof. Norton containing the correspondence between Emerson and Carlyle, from 1834 to 1880 (Boston, 1883), is the fullest revelation yet made of the friendship between these men, and of the affectionate side of Emerson's life; of which, also, the letters give many indispensable particulars. Of the visit made by Emerson to Carlyle at Craigenpultock in 1833, which has been so often described, Mrs. Carlyle herself wrote to Emerson five years later:

"If there were nothing else to remember you by, I should never forget the visitor who years ago, in the Desert, descended on us, out of the clouds as it were, and made one day there look like enchantment for us, and left me weeping that it was only *one* day. When I think of America, it is of you; neither Harriet Martineau nor any one else succeeds in giving me a more extended idea of it."

The early letters throw light on the infancy of "Transcendentalism" in New England, and reveal the fact that Emerson and Dr. Hedge invited Carlyle in April, 1835, to come to Boston and edit there a proposed review, *The Transcendentalist, or Spiritual Inquirer*, which never came to anything, but of which *The Dial*, in 1840, was the first visible manifestation. Dr. Channing told Miss Peabody, in March, 1835, "that he lay awake all night because he had learned in the evening that some young men proposed to issue a journal, to be called *The Transcendentalist*, as the organ of a spiritual philosophy;" and Dr. Frothingham, whom Emerson describes as "a worthy, accomplished man, more like Erasmus than Luther," said to Emerson, "You cannot express in terms too extravagant my desire that your friend Carlyle should come to Boston." After such a glow of anticipation in 1835, it is painful to read what Emerson wrote

to Carlyle in 1842, after *The Dial* had existed for two years: "I submitted to what seemed a necessity of petty literary patriotism, and took charge of the thankless little *Dial*, without subscribers enough to pay even a publisher, much less any laborer. It has no penny for editor or contributor—nothing but abuse in the newspapers, or at best silence; but it serves as a sort of portfolio to carry about a few poems or sentences which would otherwise be transcribed and circulated." In reply to an invitation from Emerson to write for the *Dial*, Carlyle, in August, 1842, rather ungraciously said: "I love your *Dial*, yet it is with a kind of shudder. You seem to me in danger of dividing yourself from the fact of this present universe—in which alone, ugly as it is, can I find any anchorage—and soaring away after ideas, beliefs, revelations, and such like, into perilous altitudes, as I think. Alas! it is so easy to screw one's self up into high and ever higher altitudes of transcendentalism; easy for you, for me, but whither does it lead?" To which Emerson generously replied: "For the *Dial* and its sins I have no defence to set up; we write as we can, and we know very little about it."

When the *Dial* had just begun (July, 1840), we find that in his diary for August 2 John Quincy Adams (for whom Emerson had cast his first presidential ballot, and whose eloquence he greatly admired) wrote thus: "After failing in the every-day vocations of Unitarian preacher and schoolmaster, Emerson starts a new doctrine of Transcendentalism, declares all the old revelations superannuated and worn out, and announces the approach of new revelations." Emerson's "failure," such as it was, in the two vocations named by Adams had taken place from seven to fifteen years earlier; for he never taught school after he began to preach, and he voluntarily withdrew from a pulpit where he was desired, in 1832, and never returned to preaching as a profession. In 1834, after his return from Europe, he began to create for himself and others the new profession of lecturing, which gave him an independent pulpit of his own. Despondent Carlyle, writing to him from Chelsea (Aug. 12, 1834), had said: "At last we have lived to see all manner of Poetics and Rhetorics and Sermonics—one may say, generally, all manner of *Pulpits* for addressing mankind from—as good as broken and abolished." But Emerson went on lecturing in Boston from 1835, while he was yet living a widower in the "Old Manse" at Concord, till a year or two before his death; and in April, 1836, he wrote to Carlyle: "The pulpit in our age certainly gives forth an obstructed and uncertain sound, and the faith of those in it, if men of genius, may differ so much from that of those under it as to embarrass the conscience of the speaker, because so much is attributed to him from the fact of standing there. In the Lyceum nothing is presupposed. The orator is only responsible for what his lips articulate. Then what scope it allows! I cannot remember that there are any other mouth-pieces that are specially vital at this time, except Criticism and Parliamentary Debate. I think this of ours would possess, in the hands of a great genius, great advantages over both." By 1837 he had persuaded Carlyle to attempt lecturing in London, and almost induced him to come to New England and give courses of lectures, as he was himself doing every winter. Emerson had thus made a profession for himself—not always agreeable, either, for in October, 1835, he spoke of "public lecturing" to Carlyle as something "I could recommend for medicine to any gentleman who finds the love of life too strong in him." But, whether pleasant or odious, he felt bound to continue it, writing to Carlyle in 1837:

"There are in this country so few scholars that the services of each studious person are needed to do what he can for the circulation of thought, to the end of making some counterweight to the money force and to give such food as he may to the nigh starving youth. So I religiously read lectures every winter, and at other times whenever sum-

moned—last year 'The Philosophy of History,' twelve lectures; and now I meditate a course on what I call 'Ethics.'

In June, 1835, Carlyle had so far been converted by Emerson as to say:

"It does seem next to certain to me that I could preach a very considerable quantity of things from that Boston Pulpit, such as it is" (the lecture platform), "were I once fairly started. If so, what an unspeakable relief were it, too!"

Failing to bring his friend bodily to Boston and Concord, Emerson then undertook to get Carlyle a hearing in America through his books. In the spring of 1836, before printing his own first volume (*Nature*), he had helped forward an American edition of *Sartor Resartus*, of which 500 copies were printed in Boston. The book went to a second edition soon after *Nature* was published (in September, 1836), and a year later 1200 copies of *Sartor* had been sold in America, while *Nature* was ten years in selling 500 copies. The *French Revolution* and Carlyle's *Miscellanies* were brought out in Boston editions by Emerson in 1838, and before the summer of 1839, in money and American printed volumes, Carlyle had received from Emerson for this American reprinting £250. In acknowledging the receipt of this sum, Carlyle said:

"Thanks to you and the books, and to Heaven over all, I am for the present no longer poor, but have a reasonable prospect of existing. Not for these twelve years—never since I have had a house to maintain with money—have I had as much money in my possession as even now."

While Carlyle was struggling with poverty from 1820 to 1840, Emerson, after the years of his boyhood and youth, found himself with a modest competence which he inherited, and could increase his income up to the limit of his wants by the exercise of his profession as lecturer. His books for many years were as unsuccessful as those of Carlyle; nor had he until past middle-life Carlyle's faculty of writing for the magazines. His first printed pamphlet was an address at the two hundredth anniversary of the founding of Concord (by his ancestor, Rev. Peter Bulkeley, in 1635). This was printed at Concord, and is now very rare. The first edition of *Nature*, printed by James Munroe (Carlyle's Boston publisher) in September, 1836, is also long out of print. He then published nothing but pamphlets until February, 1841, when the first series of *Essays* appeared in Boston, and was soon after republished in London with a commendatory preface by Carlyle. Privately, Carlyle wrote most warmly about this volume:

"Ah me! I feel as if in the wide world there were still but this one voice that responded intelligently to my own; as if all the rest were hearsays, melodious or unmelodious echoes; as if this alone were true and alive. These voices of yours, which I censure sometimes for having no body, how can they have a body? They are light rays darting upward, in the east; they will yet make much and much to have a body."

Four or five years earlier, before he had read anything of Emerson's except his letters, so friendly and wise, Carlyle had written, in answer to an invitation from Emerson to visit him:

"Truly, Concord, which I have sought out on the map, seems worthy of its name; no dissonance comes to me from that side, but grief itself has acquired a harmony; in joy or grief a voice says to me, Behold there is one that loves thee; in thy loneliness, in thy darkness, see how a hospitable candle shines from far over seas, how a friendly heart watches! It is very good and precious for me. How gladly would I run to Concord. It is far within the verge of probabilities that I shall see Mrs. Emerson's face and eat of her bread, one day."

This expectation vanished after a few years, and all the hospitality of Emerson could not draw Carlyle

away from London. The latter was alternately urging his American correspondent, now to be quiet, not to publish too fast, and again to produce some work of history or biography which would faithfully represent his genius. Thus, in 1839, Carlyle wrote:

"I long to see some concrete Thing, some Event, Man's Life, American Forest, or piece of Creation, which this Emerson loves and wonders at, well *Emersonized*—depicted by Emerson, filled with the life of Emerson, and cast forth from him then to live by itself."

To such exhortation Emerson replied, in 1840:

"Almost all my life has been passed alone. Within three or four years I have been drawing nearer to a few men and women whose love gives me in these days more happiness than I can write of. . . . I incline to write philosophy, poetry, possibility—anything but history. I dot evermore in my endless Journal a line on every knowable in nature; but the arrangement loiters long, and I get a brick-kiln instead of a house. My Journals are full of disjointed, dreamy audacities, unsystematic, irresponsible lampoons of systems, and all manner of rambling reveries."

In an earlier letter he had said—and this remained true of him through life—

"I think I shall never be killed by my ambition. I behold my failures and shortcomings with an equanimity which my worst enemy might be glad to see. My whole philosophy, which is very real, teaches acquiescence and optimism. Only when I see how much work is to be done, what room for a poet—for any spiritualist—in this great, intelligent, sensual, and avaricious America, I lament my fumbling fingers and stammering tongue."

Again he wrote: "I do not belong to the poets, but only to a low department of literature, the reporters—suburban men."

This was by no means the estimation in which the few readers and the many hearers of Emerson held him in 1840. He did not make himself known as a poet until some years later, when his verses, published in the *Dial*, had attracted the notice, not only of newspaper wits and critical reviewers, but of admirers and imitators; but he had become widely celebrated as an orator and radical thinker. With his native generosity he brought out the poems of his fantastic friend Jones Very in 1839, before he attempted to collect his own; and he encouraged his younger friend, Thoreau, in 1838-39 to write verses, some of which Emerson published in the *Dial*. But the Boston lectures of 1835-37, and the publication of *Nature*, had drawn attention to Emerson's philosophic position, for which, however, few cared in those days. His Phi Beta oration of 1837 had given high hopes of his eloquence and critical powers; but the Divinity School address, in the summer of 1838, was the first of his writings which made him generally known. Its occasion was very simple, and no great expectation or excitement seems to have attended its delivery. The Divinity College which had invited him to address its alumni was a small school of theology maintained by the Unitarians of Massachusetts, which had been founded less than twenty years before, and in which Andrews Norton had been a distinguished professor, as Moses Stuart still was in the opposing school of theology at Andover. Prof. Norton had retired from his chair soon after 1830, but was living near by Divinity Hall, and still exercised a friendly oversight of the school at Cambridge. The delivery of the address was followed by a great stir in the Unitarian body in and around Boston, Mr. Norton being the most agitated by its heresies. Theodore Parker, then preaching in a suburb of Boston, a few miles from Cambridge, heard Emerson on that occasion, and soon wrote to his classmate Ellis, then in Europe:

"You know Emerson was to preach the sermon before the class. I heard it. It was the noblest of all his performances; a little exaggerated, with some philosophical untruth, it seems to me; but the noblest, the most inspiring

strain I ever listened to. It is printed (Aug. 7, 1838), but not published. 'I took six,' as Major Crockett said of the ice-creams at the President's table, and I send you one. It caused a great outcry—one shouting 'The Philistines be upon us!' another, 'We be all dead men!' while the majority called out 'Atheism!'"

Parker again wrote to Ellis (Oct. 15, 1838): "Emerson's address has made a great noise. Mr. Norton opened the cannonade with a broadside aimed at Emerson, Cousin, Carlyle, Schleiermacher, Shelley, and 'a paper called the *Western Messenger*.' This provoked several replies—one of singular beauty from Theophilus Parsons, one from the iron pen of Brownson, in the *Post*, and one from J. F. Clarke in defence of the article in the *Messenger*. . . . Ministers preached on Emerson's sermon. Henry Ware delivered a sermon on the 'Personality of God,' which, it is said, Emerson denies; and the students of the Divinity School come out, cap in hand, and say, *Peccavimus omnes*, and the last class in particular, and request Henry Ware to publish his sermon. Chandler Robbins speaks mildly, as his manner is, and calls the common rant of denouncing Emerson 'a vulgar clamor,' and 'the popular roar.' All this makes a world of talk. For my own part, I see that the sun still shines, the rain rains, and the dogs bark; and I have serious doubts whether Emerson will overturn Christianity this time. The charm of all is that Abner Kneeland (your old friend) got Emerson's address, and read it to his followers one Sunday, as better infidelity than he could write himself." (Kneeland was a free-thinker, lately sentenced to jail for blasphemy, and for whose pardon Dr. Channing and Theodore Parker had petitioned.)

A few months later Parker reports to Ellis a scene in the Boston Association of Unitarian Ministers, where the question was debated whether Emerson was a Christian:

"Dr. Greenwood, of King's Chapel, said he was not, but defended his position rather poorly. John Pierpont maintained he was an atheist, a downright atheist. But nobody doubted he was a virtuous and most devout man—one who would enter heaven when they were shut out. Of course they were in a queer predicament. Either they must acknowledge a man may be virtuous and yet no Christian (which most of them thought it a great heresy to suppose), and religious, yet an atheist—which is a contradiction—or else affirm that Emerson was neither virtuous nor religious, which they could not prove. Dr. Walker and Dr. Frothingham thought he should be called a Christian if he desired the name. Dr. (Francis) Parkman is one of the most charitable of men; he loves all men—even Bancroft (the historian) and Brownson—but he hates all their new notions. It is quite evident there are now two parties among the Unitarians: one is for progress, the other says 'our strength is to sit still.' Dr. Channing is the real head of the first party; the other has no head. The oyster, which never moves, has none and needs none."

These citations show how deeply the word of Emerson had stirred the waters. The controversy went on, and while Emerson declined to take part in it, by a manly letter to Henry Ware, his friends stood forward in his behalf. George Ripley undertook to answer Prof. Norton's *Latest Form of Infidelity*, and did so in a pamphlet which Parker, in September, 1839, pronounced "strong, clear, and very good," adding: "He will not say all that I wish might be said; but after we have seen that, I will handle certain other points not approached by Ripley." This Parker did under the name of "Levi Blodgett," and there were more replies and rejoinders; to all which Emerson answered nothing. But he was disturbed by the clamor, and wrote to Carlyle in 1838, a little regretting that he had asked his Scotch friend to join his fortunes with an American so unpopular as he then found himself. Carlyle replied with equal generosity, and said, among other things:

"I am older in years than you, but in humor I am older by centuries. What a hope is in that ever young heart, cheerful, healthful as the morning!"

But meantime Emerson was going on to make himself still more unpopular by connecting himself with the Abolitionists, who were greatly hated, and with the social reformers like Bronson Alcott, who favored

a vegetable diet, life in communities, and withdrawal from the yoke of civil government. In the spring of 1840 Mr. Alcott, having failed with his Boston school in spite of the warm defence which Emerson had made for him, removed to Concord and took to labor in field and garden for his support. In October, 1840, Emerson wrote to Carlyle:

"We are all a little wild with numberless projects of social reform; not a reading man but has a draft of a new community in his waistcoat pocket. I am gently mad myself."

And in May, 1841, he again wrote:

"One reader and friend of yours dwells now in my house, Henry Thoreau, a poet whom you may one day be proud of—a noble, manly youth, full of melodies and inventions. We work together day by day in my garden, and I grow well and strong."

The same year the Brook Farm Community began its career, with George Ripley at its head and Hawthorne for one of its laborious members. Indeed, while Emerson and Thoreau were hoeing in the garden at Concord and Alcott was a wood-cutter near by, Hawthorne was milking cows and planting corn at Brook Farm. The next year he also went to live in Concord, whither Ellery Channing and Margaret Fuller had gone before him, and the Transcendental brotherhood was established in Emerson's neighborhood. They met frequently at his house and held their conversations by his fireside. "The house," wrote Emerson to Carlyle, "is not large, but convenient and very elastic. The more hearts, and especially great hearts, it holds, the better it looks and feels." Here the hunted slave and the unpopular reformer found shelter, and here the friendly guest had his time to himself—a privilege which Emerson exacted on his own behalf. When he invited Alcott, and, still earlier, Carlyle, to come and live with him, he wrote thus:

"If you will come here like a noble brother, you shall have your solid day undisturbed, except at the hours of eating and walking; and as I will abstain from you myself, so I will defend you from others."

Thoreau lived with him upon these terms, and it was from Emerson's house that he went forth in 1845 to build his hut beside Walden Pond in the midst of his friend's pine wood. It was Emerson's dream to build a lodge of his own on the opposite shore of the pond, with an outlook towards the New Hampshire mountains, and there to study and meditate in the midst of nature.

He had been pursuing his studies in many directions since leaving the pulpit, and, among other things, had conquered the German language. He wrote to Carlyle before 1840: "I have contrived to read almost every volume of Goethe—and I have fifty-five—but I have read nothing else in German." He had always cultivated biography, and in the spring of 1835 said: "I found much indulgence last winter in reading some biographical lectures which were meant for theories or portraits of Luther, Michael Angelo, Milton, George Fox, Burke, etc." To these he afterwards added those lectures on Plato, Swedenborg, Shakespeare, etc., which he included in courses read at Concord and Boston before 1847, and in that year and the next delivered before audiences in England and Scotland. They were published in 1850 under the title of *Representative Men*, but the lectures of 1835 were never published as a whole. It was his custom always to read as lectures what he afterwards printed as essays, but he by no means printed all his lectures, of which, between 1830 and 1880, he gave a hundred in his own town of Concord. In all he must have written two hundred lectures at least. Quite early in his career as lecturer (1836) he writes:

"I have written this year ten lectures; I had written as many last year, and for reading both these and those at

places whither I was invited, I have received this last winter about \$350. Had I, in lieu of receiving a lecturer-fee, myself advertised that I would deliver these in certain places, these receipts would have been greatly increased."

Afterwards he adopted this method in part, and for some years his chief income was derived from lecturing. In one of his earlier letters to Carlyle (May, 1838) Emerson describes frankly his way of life, including his income and domestic surroundings, of which he gives this picture:

"I occupy, or *improve*, as we Yankees say, two acres only of God's earth, on which is my house, my kitchen-garden, my orchard of thirty young trees, my empty barn. Besides my house, I have, I believe, \$22,000, whose income in ordinary years is 6 per cent. I have no other tithe or glebe except the income of my winter lectures, which was last winter \$800. Well, with this income, here at home, I am a rich man. I stay at home and go abroad at my own expense. I have food, warmth, leisure, books, friends. Away from home, I am rich no longer. I never have a dollar to spend on a fancy. As no wise man, I suppose, ever was rich in the sense of freedom to spend, because of the inundation of claims, so neither am I, who am not wise. But at home I am rich—rich enough for ten brothers. My wife Lillian is an incarnation of Christianity, and keeps my philosophy from Antinomianism; my mother, whitest, mildest, most conservative of ladies, whose only exception to her universal preference for old things is her son; my boy, a piece of love and sunshine, well worth my watching from morning to night; these and three domestic women, who cook and sew and run for us, make all my household. Here I sit and read and write with very little system, and, as far as regards composition, with the most fragmentary result; paragraphs incomprehensible, each sentence an infinitely repellent particle. In summer, with the aid of a neighbor, I manage my garden; and a week ago I set out on the west side of my house forty young pine trees to protect me or my son from the wind of January. The ornament of the place is the occasional presence of some ten or twelve persons, good and wise, who visit us in the course of the year."

With the changes that time brought this picture would serve for the next forty years; but after 1878 he gave up lecturing abroad, though not the hospitality of his house.

As a citizen, the Concord philosopher was exemplary at all periods of his life. He served on the school-board of Boston in 1831, and for many years afterwards held the same office in Concord. He could sympathize with his socialist or separatist friends in their denunciation of society, and sometimes say, as he did:

"Even here it behooves every man to quit his dependency on society as much as he can, as he would learn to go without crutches that will soon be plucked away from him."

But he never detached himself from those mutual good offices of town and neighborhood which make up the social life of New England, seldom failed to vote in town-meeting, and scrupulously took part in many public assemblies, where he neither spoke nor listened to much profit. He allowed himself to be mobbed now and then at anti-slavery meetings, though nothing could be more annoying to him than public controversy. When Harriet Martineau in 1837 brought him forward in her book on America as a champion of free thought he wrote to Carlyle:

"Meaning to do me a signal kindness (and a kindness quite out of all measure of justice), she does me a great annoyance—to take away from me my privacy and thrust me before my time (if ever there be a time) into the arena of the gladiators to be stared at. I was ashamed to read, and am ashamed to remember."

Yet he never avoided the disagreeable duties of publicity if the cause of a friend or of the poor and persecuted was in question. As he said of one of his neighbors, so Emerson "returned from courts or congresses, to sit down with unaltered humility, in the church or in the town-house, on the plain wooden bench where honor came and sat down beside him."

The literary and philosophical work of Emerson was chiefly done between 1836, when he published *Nature*, and 1870, when he delivered at Harvard University his course of lectures on the "Natural History of the Intellect." Before 1836 he wrote little which has been published, and after 1872 he wrote scarcely anything, though he printed several books. He spoke of his first book, *Nature*, at the time, "as an entering-wedge for something more worthy and significant, only a naming of topics on which I would gladly speak and gladly hear." He continued to speak on these topics all his life, having become, as he said of a friend, "that good despot which the virtuous orator is." Until his visit to England in 1847-48, he was much inclined to mysticism in that extreme or pure form which is seen in *Nature*. Thus he wrote in 1836:

"In God we meet, therein we are, thence we descend upon Time, and these infinitesimal facts of Christendom and trade and England, Old and New. Make the soul now drunk with a sleep, and we overleap, at a bound, the obstructions, the griefs, the mistakes of years, and the air we breathe is so vital that the Past serves to contribute nothing to the result."

It was such sentences as these which Carlyle told him in 1840 were "an utterance of what is purest, youngest in your land, pure, ethereal as the voices of the morning." To the same effect the old poet Rogers said when he first read one of Emerson's Cambridge orations: "It is German poetry given out in American prose."

The English visit changed perceptibly his point of view, rather than his manner of seeing and saying. He recognized now that there was a worldly or practical side which he had only seen by glimpses before, though he had from infancy a keen eye for whatever came under his notice. When he seated himself in Concord in 1835, he became a farmer in a small way, and gradually increased his acres, by the purchase of woodland chiefly. As a farmer he was watchful and sensible, even as he was in pruning his sentences and bettering his style. To a friend who had ditched his land and grafted his orchard he wrote:

"Our clover grew well on your patch between the dikes, and Reuben Brown adjudged that Cyrus Warren should pay \$14 this year for my grass. Last year he paid \$80. All your grafts of this year (1843) have lived and done well. The apple trees and plums speak of you in every wind. This sun without showers will perchance spoil our potatoes."

In all things he was a close observer, and when in Liverpool, Dec. 1, 1847, the day fixed for reducing all the varying clocks of England to Greenwich time for the railroads, he noted the fact, and that the Liverpool clocks were put forward just twelve minutes. In Manchester, two months later, he heard Cobden speak at a great Free Trade meeting, followed by "old Peyronet Thompson, the father of Free Trade, who spoke in a very vigorous rasp-like tone;" while George Thompson, who "brought up the rear," was "merely a piece of rhetoric, and not a man of facts and figures and English solidity like the rest." "I admire the English," he adds, "and I think never more than when I meet Americans; as, for example, at Mr. Bancroft's American soirée, which he holds every Sunday night. Great is the self-respect of Mr. Bull; he is very short-sighted, and without his eyeglass cannot see as far as your eyes to know how you like him, so that he quite neglects that point. The Americans see very well—too well." He noted in England "the vulgar hatred and fear of France and the jealousy of America that pervade the newspapers;" but he did not the less reprove the odious faults of his own country; particularly its oppression of the negro in slavery, and the cowardly submission to public opinion which kept Americans otherwise virtuous from denouncing this sin. In addresses on emancipation given at Con-

cord in 1844 and at Waltham in 1845, Emerson attacked slavery with no feeble weapon :

"It is certain that, if it should come to question, all just men, all intelligent agents, must take the part of the black against the white man. Then, I say, 'Never is the planter safe; his house is a den; a just man cannot go there except to tell him so.' Nature fights on the other side; and as power is always stealing from the idle to the busy hand, it seems inevitable that a revolution is preparing, at no distant day, to set these disjointed matters right."

In less than sixteen years after these words were uttered the predicted revolution came, and at the end of twenty years every slave in America was free.

In 1844 he had touched upon another crying evil, the seizure of colored sailors of Massachusetts when they went into the ports of Carolina :

"Gentlemen, I thought the deck of a Massachusetts ship was as much the territory of Massachusetts as the floor on which we stand. It should be as sacred as the temple of God. If such a damnable outrage can be committed on the person of a citizen with impunity, let the Governor break the broad seal of the State; he bears the sword in vain. The great-hearted Puritans have left no posterity. The rich men may walk in State street, but they walk without honor; and the farmers may brag their democracy in the country, but they are disgraced men."

From 1844 till the close of the civil war Emerson took an active part in the anti-slavery agitation, holding an opinion the exact opposite of Carlyle's on the enslavement of the blacks. This difference, though publicly manifested only after 1844, had existed much earlier; for in 1835 Emerson had shown his sympathy with the Abolitionists in Boston at the time they were mobbed and an attempt was made on Garrison's life; while Carlyle in 1837 had written to Emerson in the same scoffing tone about "Mungo the stupid slave" that he afterwards took in the *Latter-Day Pamphlets*. He even declared to Theodore Parker in 1843 that Emerson held the negro in the same estimate as himself; which Parker disputed, and afterwards sent Carlyle the emancipation address of 1844 to disprove. In 1850-52, after Daniel Webster had declared against the Abolitionists, Emerson, who had greatly admired him, denounced Webster as false to his country and to justice in a speech which he made at Cambridge. The college students went down to hear Emerson, and hissed him—the first time, perhaps, he had ever been received with hisses, though by no means the last time, for in the Boston anti-slavery convention of January, 1861, where Emerson spoke, there was a mob, and it was with difficulty he could make himself heard. When the civil war began a few months later, he took sides warmly with the North, and favored emancipation as a war measure. When Pres. Lincoln issued his first emancipation proclamation, in September, 1862, Emerson heartily supported it; indeed, he had addressed Lincoln, Seward, Stanton, and a great audience of public men at Washington six months before, pointing out to them that emancipation was the demand of civilization.

"That is a principle; everything else is an intrigue. Thus, while slavery makes and keeps disunion, emancipation removes the whole objection to Union. And this action, which costs so little, rids the world at one stroke of this degrading nuisance, the cause of war and ruin to nations."

No doubt this address aided Lincoln in reaching his slow conclusion that slavery must be abolished under the war power of the Constitution; and when he had issued the decree, none praised him more heartily for it than Emerson. In a funeral eulogy of Lincoln, in April, 1865, Emerson called him "a heroic figure in the centre of a heroic epoch," and said of his eloquence :

"His brief speech at Gettysburg will not easily be surpassed by words on any recorded occasion. This and one other American speech—that of John Brown to the court that tried him—and a part of Kossuth's speech at Birming-

ham, can only be compared with each other, and with no fourth."

This habit of Emerson, to stand forth and give public expression to the opinion of himself and others upon great national questions, began as early as 1838, when he addressed a letter to Pres. Van Buren protesting against the wrongs then endured by the Cherokee Indians at the hands of the Government. His anti-slavery speeches; his remarks on the attack made upon Charles Sumner in 1856; his speech in behalf of the Kansas farmers in the same year; his eulogies of John Brown in 1859; his speech of welcome to Kossuth at Concord Bridge in 1852; his speech at the centennial celebration of Concord Fight in 1875, and many other such brief addresses, are examples of this habit. These addresses were not collected until the year 1883, when most of them appeared among Emerson's collected works. Other occasional addresses, such as that on Burns, on Scott, on Carlyle, etc., belong properly among his literary papers; but his distinct political writing was considerable, and may be said to have begun with his first published work, the historical address in 1835 at the two-hundredth anniversary of the planting of Concord. He was an active citizen also in practical ways, and was punctual in his attendance at the town-meetings, where he often took part in debates. He liked to carry his English visitors to the Concord town-house and show them the village assembly in session on election-day. Yet he had sympathized to some extent in the no-government theories of his friends Alcott and Thoreau; and when they were taken to jail in 1842 for refusing to pay taxes to a government that sustained slavery, Emerson visited them, and perhaps paid the tax of Mr. Alcott, though this is said to have been done by Samuel Hoar.

The career of Emerson as an author may be said to have fairly begun in 1840 with the publication of the *Dial* and the preparation of his first book of essays for the press. His *Nature*, and the two or three orations previously printed, had been but occasional utterances, attracting notice, if at all, from the opinions they set forth and the circumstances of their publication. But his contributions to the *Dial* were distinctly literary in their character, and the *Essays* made a book which commanded attention in other countries than his own. It was published in March, 1841, having been long in preparation; was reprinted in England, with a preface by Carlyle, in the summer of 1841, and was much read there; to some extent also in France and Germany. In 1844 he published a second volume of *Essays*, which was at once reprinted in England, where, in the meantime, the *Dial*, which came to an end in 1844, had found a few readers. When he visited England, three years afterward, he wrote home to Thoreau, who had been one of his most active contributors :

"The *Dial* is absurdly well known here. We at home, I think, are always a little ashamed of it. I am; and yet here it is spoken of with the utmost gravity, and I do not laugh."

He continued to publish his friends' books more rapidly than his own—Carlyle's *Chartism* in 1842, his *Past and Present* in 1843, and in the same year a volume of poems by Ellery Channing, which he not only aided in publishing, but reviewed in the *Democratic Review* of New York, to which magazine Hawthorne and Whittier were then contributing frequently. He caused John Sterling's poems to be reprinted in America, and finally, in 1847, published the first volume of his own *Poems*, many of which had already appeared in the *Dial*. In 1849 his *Nature* was reprinted in a volume with *Addresses and Lectures* from "The American Scholar" of 1837 (the first Phi Beta oration) to "The Young American" of 1844. In 1850 appeared *Representative Men*; in 1852 his *Memoirs of Margaret Fuller*; and in 1856 *English*

Traits. In November, 1857, the *Atlantic Monthly* began, and for some years Emerson contributed often to its pages, as he had infrequently to the *Massachusetts Quarterly Review* from 1847 to 1850. In 1860 he published *The Conduct of Life*; in 1864 *Society and Solitude*; in 1867 a second volume of poems, entitled *May-Day*; in 1874 a collection of poetry by other authors, called *Parnassus*; and in 1876 a new selection of his own *Poems* and a collection of essays, called *Letters and Social Aims*. This was the last book which he printed, though he continued to furnish essays for the magazines until 1881, which have, since his death, appeared in one of the volumes of the new edition. His projected philosophical work, *The Natural History of the Intellect*—which he had been preparing for thirty or forty years, and which he partly threw into chapters for a course of university lectures at Cambridge in 1870—was never brought by him to a form suitable for publication, and must remain a fragment, if it is ever printed by his literary executors. They have published a new edition of his verses, with additional poems and fragments of poems which he left in manuscript. Among these unpublished verses is a college poem which he prepared for a Phi Beta anniversary at Cambridge nearly fifty years ago, and portions of a long work, which he called *The Discontented Poet, a Masque*, but from which he afterwards detached passages and printed them separately. Since his death his correspondence with Thomas Carlyle has been published (not quite complete) (Boston, 1883), edited by Prof. Norton, of Cambridge. His literary executor, J. Elliott Cabot, is writing a biography which will include passages from his diary and letters, and may be published in 1885. Other writings of his will be published hereafter, the amount of manuscript left by him being nearly as great as all that he published in volumes during his lifetime. He wrote little or nothing during the last ten years of his life, but devoted much time to revising and editing what he had written, and his biographer had been chosen, and some part of his life written, before his death in 1882. A memoir by Dr. O. W. Holmes, containing some of his letters, appeared in 1884.

Emerson may be considered in several aspects, for he was a man of varied and, in some degree, contradictory powers. He was a poet, a philosopher, an orator, a critic, and the head, if not the founder, of a school of thought and action, with disciples in both hemispheres. In this power of influencing the thought of others he resembled Goethe, to whom also he bore other resemblances, though widely differing from him in some of the most fundamental points of character and genius. Like Goethe he was a man of positive genius, which displayed itself in verse and prose, but most of all in the masculine power of fertilizing other minds by its influence—exerted not directly through elaborate works, but by a subtle and pervasive spirit, analogous to what Matthew Arnold terms the *Zeitgeist*, but often in direct opposition to the apparent spirit of the times. Like Goethe he lived to old age, saw his country and the world pass through a great political revolution, and could look back over a broad field of literary and philosophic activity; and, like Goethe, he was originally and chiefly a poet—that is, an idealist seeking naturally the image of beauty, and expressing himself easily in metrical form; though he lacked the constructive and artistic spirit so characteristic of the great German poet. On the other hand he wrote prose better than Goethe, though less copiously and systematically; and he possessed, too, the critical faculties of insight and discrimination in a remarkable degree. He lacked in some measure Goethe's broad wisdom and talent, by which he appeared as a perfect man of the world while holding the highest literary rank in Europe; but, as a compensation for this, Emerson was more perfectly related to the family and to the State as a citizen and an

observer of all the social laws that guard domestic life. In this respect he resembled the other great European poet of that age, Wordsworth, who, standing apart from Goethe on the moral and religious side, yet influenced literature almost as forcibly, at least among those who speak the English tongue. Emerson may be said to stand, as a poet and as a man, between Wordsworth and Goethe—exhibiting likewise a distinct American quality in his genius, which before his time no literary man had shown.

It has not been customary to speak of Emerson as a poet, but rather as a philosopher or literary man in general, passing lightly over his poems as something odd and peculiar that must be tolerated but need not be understood nor generally read. Even Carlyle, when they first appeared, was compelled to apologize for them, promising to make them nearly all intelligible, if his friends would let him read them aloud and explain them. Yet it is certain that Emerson, whose judgment of men was so discriminating as to be called "fatal," regarded himself a poet, and he once said: "I am not a great poet, but whatever there is of me at all is poet." He was well aware, however, of his want of facility in metrical expression, and that his poetic faculty was seldom under the control of his will; so that he wrote verse fitfully and at long intervals—beginning, as we have seen, at the age of 11—then from 21 to 30 writing but little which he thought worth preserving—but from 35 to 50 writing verse frequently and with delight; after which he wrote little poetry, but among the later pieces were some of his best. As now published by his executors, a single volume of some 300 pages contains his poetical work; but several of the poems he printed in his first collection (of 1847) are here omitted, and there remain in manuscript many verses which may yet be deemed worthy of publication, though he did not so regard them. Although Matthew Arnold in a recent essay on Emerson speaks slightly of his poems, there is increasing testimony to their high value, not only as expressions of his philosophy, but as genuine poetic utterances—often oracular and dithyrambic, but belonging to that class of poems which is never forgotten though it may never become popular. There is much variety in his poems, notwithstanding the mystic and enigmatical character which many of them have; and passages of pure and charming description, of delicate satire, of lyric melody, and of plain sententious force are frequently found. No modern poet, and few of former times, have written so nobly of love as Emerson, who, like the Persian poets, elevates the human passion into a divine sentiment and even a mystery of religion. Thus he says in the fragments printed since his death:

"I saw the hid beginnings
When Chaos and Order strove,
And I can date the morning prime
And purple flame of Love.
When the purple flame shoots up,
And Love ascends his throne,
I cannot hear your songs, O birds,
For the witchery of my own."

He returns again and again to this theme, devoting one of his longest poems to the three aspects of love which he calls the "Initial, Dæmonic, and Celestial," and again summing up the whole matter in that epigram on "Eros" which first appeared in the *Dial*:

"The sense of the world is short,
Long and various the report—
To love and be beloved;
Men and gods have not outlearned it,
And, how oft soe'er they've turned it,
'Tis not to be improved."

In epigram Emerson is the most successful of recent poets, and he often uses this form; indeed many of his poems are but a succession of epigrams, with here and there a wild melodious verse thrown in. It would

not be easy to condense into a quatrain more meaning and persuasion than lurk in these four lines which he calls "Sacrifice:"

"Though love repine and reason chafe,
There came a voice without reply—
'Tis man's perdition to be safe,
When for the truth he ought to die."

Many of Emerson's lines are on the way to become proverbial, if not already so, like that one from "The Problem:"

"He builded better than he knew,"

and the close of "The Rhodora:"

"Beauty is its own excuse for being."

On the whole we must say that he is a high and rare poet, perhaps to be recognized hereafter as a great one. As a critic of other men's poetry he is among the best, and his collection or common-place book, called *Parnassus*, is more interesting than any other of its kind.

Emerson's immediate success and his first impression upon the world was as a prose-writer. Yet in prose as in verse this was produced by the instantaneous combination of force and beauty, thought and grace of diction, in what he wrote. Hence his style is inextricably blended with his philosophy like light and heat and chemical action in the rays of the sun; and as it is hard to define his philosophy in set terms, so is it to describe the excellence and the defects of his prose. When to this undefinable quality of his writing were added the graces of his oratory, a high and charming effect was the result. James Russell Lowell, who as a youth listened to some of his first lectures in Boston, has quoted as applicable to the young orator the praise of Sir Philip Sidney by Matthew Roydon:

"Was ever eye did see that face,
Was ever ear did hear that tongue,
Was ever mind did mind his grace,
That ever thought the travel long?
But eyes and ears and every thought
Were with his sweet perfections caught."

The fitness of this quotation was at once seen by those who had heard Emerson at his best; and yet he had not the manifest arts nor the ordinary eloquence of an orator. His gestures were not always graceful, nor his elocution regular; but the expression of his face, of his whole bearing, and the searching, thrilling tones of his manly voice, won from the hearer at once that prize of oratory, the whole soul of his audience, so that they followed him where he chose to lead them. They might not understand his meaning, but they were charmed and captivated by his periods, and the deep meaning which he evidently found in them. He took pleasure also wherein he gave pleasure, and very early in his correspondence with Carlyle he said: "I have a certain delight in speaking to a multitude," nor did he ever quite lose the delight even in his years of age and forgetfulness. It was as the vehicle of his thought, however, that he valued eloquence, and he sought no profit from his hearers that he did not return to them fourfold. In his writing he favored short and simple sentences; avoiding the cumbrous periods that were in vogue before his time, and following the example of Channing in breaking up the long sentence into several briefer ones. He wrote readily, yet revised and rewrote with infinite pains before he published anything—often keeping an essay in hand ten or twenty years before printing it, or allowing it to be verbally reported. His sermons, all written before 1835, were pillaged to enrich his lectures and essays.

The earliest expression of Emerson's philosophic insight—for it is hardly just to speak of his philosophic system—is his first little book, *Nature*; and from this delicate and world-embracing idealism he never departed, though he reinforced its poetic beauty with much plain ethical wisdom in later years. It had

something in common, both on its metaphysical and its ethical side, with the transcendentalism of Kant; but nothing could be farther from the method of Emerson than the dry critical analysis of Kant. To suggest spiritual truth in images of beauty, and with love as its inspiration, was Emerson's ideal of a philosopher, and hence his admiration for Plato. Yet the Puritan was strong in him also; and he insisted, as rigidly as Milton or Calvin, on moral excellence and the deeds as well as the dreams of virtue. Nor did he fail to adorn, by his own noble and amiable life, the philosophic profession; and all men, whether they accepted his teachings or not, were struck with the beauty of his conduct in every emergency and towards every condition of men. He had the knightly and the saintly virtues, along with the poetic genius and the scholastic habit. In every relation of love and friendship, in all the duties of the family, the community, and the individual, he was so nearly faultless that the voice of those who knew is one unbroken chorus of praise. His writings are sometimes taxed with a coldness and distance towards the ordinary affairs of men and women which never appeared in his daily practice. A loving son, a devoted husband, a kind and wise father, a faithful friend, a good neighbor, an active and useful citizen—he passed through life solitary in his thought, but social and beneficent in all his affections. It is too early to assign his rank among philosophers and men of letters, as some have endeavored; but the deep impression which he made upon his age bespeaks for him an enduring fame among those who have enriched literature and made life better worth living. He died after a short illness, but a long period of decaying memory and advancing age—all which he endured sweetly, firmly, and in the confident hope of personal immortality. He is buried on a hill-top in Concord, amid oaks and pine trees, and near the graves of Thoreau and Hawthorne. (F. B. S.)

EMERY is an impure variety of corundum, mixed chiefly with magnetic oxyd of iron. On See Vol. VIII. account of its extreme hardness, it has p. 157 Am. been long used in the arts for grinding and ed. (p. 171 polishing hard stones, metals, and glass, Edin. ed.) but its mineralogical character was not determined until 1846, when Dr. J. Lawrence Smith, of the United States, then in the service of the Turkish government, investigated its occurrence and the various geological and mineralogical facts connected with it. At that time it was obtained only from the Island of Naxos, and the Greek government had granted a monopoly of it to an English merchant. Dr. Smith found it in six other localities in Asia Minor and the Greek archipelago, thus breaking up the monopoly and reducing the price from \$140 to \$50 a ton. His exact statement of its geology and of its associate minerals, made first to the French Academy of Sciences in 1850, eventually led to the discovery by Prof. C. T. Jackson of a vein of emery at Chester, Mass., in 1863, and afterwards to discoveries in other parts of the United States. Dr. Smith gives (*American Journal of Science*, Vol. xcii., p. 89) the following analyses of emery taken from different localities:

Locality.	Alumi- na.	Oxyd of iron.	Lime.	Silica.	Water.	Specific gravity.
Kulah.....	63.50	32.25	0.92	1.61	1.90	4.28
Samos.....	70.10	22.21	0.62	4.00	2.10	3.98
Naxos.....	58.53	24.10	0.86	3.10	4.73	3.75
Ephesus.....	60.10	33.20	0.48	1.80	5.62	4.31
Chester 1.....	44.01	50.21	.....	3.13		
" 2.....	74.22	19.31	.....	5.48		

Taking the effective hardness of the sapphire of India as 100 he assigns the following degrees of hardness to the different varieties of emery analyzed above: Kulah, 57; Samos, 56; Naxos, 46; Ephesus, 42; Chester 1, 33; Chester 2, 45. The minerals always associated with emery are diaspore, emerylite, chlorite, and magnetic and titaniferous iron.

EMIGRATION. (See IMMIGRATION.)

EMMONS, NATHANAEL, D. D. (1745–1840), an eminent American theologian, was born at East Had-dam, Conn., April 20, 1745. He graduated at Yale College in 1767, and was ordained pastor of the Congregational church at Franklin, Mass., in 1773. He remained pastor of this congregation till his death, though after 1827 he was assisted by others. Besides his pastoral labors he trained for the ministry eighty-seven students, and was one of the founders of the Massachusetts Missionary Society. He was also editor of a missionary magazine, and labored actively for the cause of foreign missions. He published many works in his lifetime, and after his death they were collected and edited, with a memoir, by Rev. Jacob Ide, D. D. (7 vols., Boston, 1842), and again by Prof. E. A. Park (6 vols., Boston, 1861). Dr. Emmons died in Franklin, Mass., Sept. 23, 1840. His system of theology was a modified Calvinism. In opposition to the doctrine of original sin, which had prevailed among the so-called orthodox divines, he maintained that the exercise of the will is necessary to either sin or holiness. He also maintained that God is the efficient cause of every act and thought of man, while yet man is in every moral act perfectly free. His sermons were noted for their dignity of style and power of thought, and in them, as well as in his theological treatises, he discussed the profound problems of "fate, free-will, fore-knowledge absolute." He was one of the framers of the creed required to be subscribed by every professor in the Andover Theological Seminary.

EMORY, JOHN, D. D. (1789–1835), an American bishop of the Methodist Episcopal Church, was born at Spaniard's Neck, Queen Anne co., Md., April 11, 1789. He was educated at a classical school in that neighborhood, then at Lancaster, Pa., and finally graduated at Washington College, Chestertown, Md. His parents were members of the Methodist Church, and he had received religious training, but in 1806 he experienced what he considered a spiritual renovation. By his father's desire he had studied law, and was admitted to the bar when only nineteen years of age. His sense of duty soon led him to enter the ministry, and in 1810 he joined the Philadelphia Methodist conference. He served in Wilmington, Del., Washington, Philadelphia, and other places. In 1816 he was chosen delegate to the General Conference, and, except in 1824, was a member of every subsequent conference till his death. In 1820 he was sent as a delegate of the American Church to the British Wesleyan Conference. In 1824 he was appointed book-agent and editor in New York, and succeeded in freeing the Methodist Book Concern from the difficulties with which it was surrounded. He established a publication fund, and founded the *Methodist Quarterly Review*, in which for some time he was the principal writer. In 1832 he was chosen bishop, and, besides his other duties, labored especially to promote the educational interests of the church. He was influential in bringing Dickinson College, at Carlisle, Pa., under Methodist control, and in establishing the Wesleyan University at Middletown, Conn. Besides his articles in the *Methodist Review*, he had, in 1817, a pamphlet controversy with Bishop William White, of Pennsylvania, on *The Personal Assurance of the Holy Spirit*, and in 1830 he published a *Defence of the Original Organization of the Methodist Episcopal Church*. His writings were collected and published, together with a biography, by his son, Rev. Robert Emory, at New York (1841).

EMORY COLLEGE, located in the town of Oxford, Newton co., Ga., 40 miles east of Atlanta, was incorporated by an act of the general assembly of the State Dec. 10, 1836, during the administration of William Schley, governor. The charter-members of the board of trustees were all Methodists, nine of them being itinerant preachers. The act of incorporation was liberal, giving all the authority needful for founding and conducting a college of high grade. The trustees met

and organized Feb. 6, 1837. They purchased a large tract of land near Covington, Ga., the county-town, and procured a charter for Oxford; the village that subsequently grew around the college. By special act of the State legislature "all drinking- and gaming-places" are excluded from the village, and have been from the beginning. Every deed to property in it came originally to private holders through the trustees, and has a "forfeiture clause" in it setting forth that "the selling or permitting to be sold on said premises of intoxicating liquors" shall forfeit the title. There has never been a liquor- or gambling-saloon in the village.

The first faculty was elected at a meeting of the trustees held Dec. 8, 1837, and was composed as follows: Ignatius A. Few, president; Archelaus H. Mitchell, professor of moral and mental philosophy and belles-lettres; Alexander Means, professor of natural sciences; George W. Lane, professor of ancient languages; Harry B. Lane, professor of mathematics and civil engineering. These men began with much zeal, great faith, and little money. Unpretentious and inadequate buildings were erected; there was hardly a thought of endowment; they depended for the most part on patronage; and for forty-four years the college had a hard struggle, meantime doing good and honest work. The list of beneficiaries has always been large, averaging one-fourth of the whole number, and often one-third. Methodist itinerant preachers were the real fathers and founders of the college, and from the beginning their sons have been, by college law, entitled to free tuition. In this way hundreds of the pastors have been able to give their sons a liberal education. In the course of years the principle was extended to other denominations, and for a long time preceding 1882 the sons of all "pastors" have received tuition free of cost. Soon after the Civil War, to meet the wants of the impoverished people, several free scholarships were given for the benefit of laymen. By 1860 a considerable endowment had been collected; during the war a large amount of "Confederate money" was given to the college agents for endowment purposes. At the close of hostilities the endowment was so impaired by the destruction of property and by bankruptcies incident to the collapse of the Southern Confederacy that the total productive endowment barely reached \$20,000. Some years prior to 1860 large and commodious buildings were erected; but about 1870 it became necessary, on account of the faulty construction of the main building, to take it down and build others. This was done, after great exertion, during the panic of 1873. Bishop George F. Pierce was the chief agent in raising the necessary funds for all these buildings.

During all these vicissitudes, as the records and the alumni show, a good standard of scholarship was maintained. About the year 1881, Mr. George I. Seney, president of the Metropolitan Bank, New York, became interested in the "cause of education in the South," and of his own motion gave to Emory College \$75,000 to increase its endowment, \$5000 to help pay a debt, and the cost of "Seney Hall," a large and elegant building finished during the summer of 1882, the whole amount being \$125,000. (During the same period he gave \$125,000 to Wesleyan Female College, Macon, Ga., and \$10,000 to Lucy Cobb Female College, Athens, Ga.—his generous gifts awakening the gratitude of the whole South.) At the beginning of 1882 the productive endowment of Emory College amounted to \$100,000. The annual catalogue for this year showed the names of 241 students, a faculty of 12, and an alumni list of 690. The students came from ten States, one Territory, and two foreign countries. In addition to the course of study common to colleges of high grade, Emory College has introduced vocal music and book-keeping. In the beginning of 1882, through a system of boarding-houses peculiar to the institution, nearly one hundred young men were maintaining themselves at a cost of \$8 per month, many of them making enough money during the vacation, embracing the months of

July, August, and September, to meet their expenses the ensuing year.

The following have been presidents of the college: Rev. Ignatius A. Few, D. D., LL. D.; Rev. A. B. Longstreet, D. D.; Rev. Bishop George F. Pierce, D. D., LL. D.; Rev. Alexander Means, D. D., LL. D.; Rev. J. R. Thomas, D. D., LL. D.; Rev. L. M. Smith, D. D.; Rev. O. L. Smith, D. D.; Rev. Atticus G. Haygood, D. D. (in office 1882).

The graduates of the college are found in all the Southern States. The majority of the graduates in professional pursuits are teachers; lawyers, preachers, physicians coming next in the order named. The college has furnished two U. S. Senators—Hon. Thomas M. Norwood of Georgia, from the class of 1850; Hon. L. Q. C. Lamar of Mississippi, from the class of 1845. A number have been members of the House of Representatives. Many of its alumni were among the officers in the Confederate army, and many died in its service. Among the most distinguished of the alumni is Rev. Young J. Allen, D. D., LL. D., of the class of 1858, a leading missionary in China, who began in December, 1881, a system of high schools in Shanghai, preliminary to the establishment of a thoroughly equipped Christian college under the care of the Methodist Episcopal Church, South. The college has always been characterized by a profound religious spirit singularly free from sectarianism. Its sessions have been continuous since its foundation except during 1863, 1864, and 1865, when the exercises were broken up by the war between the States. Few colleges in the Southern States have so promising a future. The spirit of its management and of its students is progressive and national. (A. G. H.)

EMPIRICISM. This word, derived from the Greek *ἐμπειρία*, "experience," is used in three senses. In the first it relates to the sect or school of medicine founded at Alexandria at the beginning of the third century B. C., by Philinus of Cos, and developed by Serapion. This school professed to reject all reasoning, and to make medicine consist only in the results of experience. It flourished for a very brief period, and had little or no influence,—its teachings being substantially a series of minute and subtle reasonings to prove the vanity of reasoning. In the second sense it is applied not only to medicine considered as an art, but to other things, to indicate that what is done is not the result of scientific deduction or reasoning, but is simply a following out what has been done before. A popular and expressive phrase for this is "to work by rule of thumb." In the third and most usual sense empiricism is used as equivalent to charlatanry or quackery, implying a mixture of ignorance and knavery in various proportions.

This vulgar empiricism is common to all times and all countries, for it is an attempt to satisfy a desire which is so universal that it has been claimed to be instinctive. This is the desire for a specific remedy, in case of pain or disease, based on the idea that diseases are specific entities, and is expressed in the phrase that "every disease must have its remedy."

Skilled physicians have ceased to seek for such specifics since the discoveries of modern physiology and pathology have shown the impossibility of success. Every case of disease is a problem by itself, yet the desire and the attempt to satisfy it remains, and a practice founded on it is alike agreeable to the patient and the practitioner. "To the one, if there be faith in the specific remedy or method, it administers a most cheering and effectual remedy; to the other it saves the trouble of thought; hence we may readily understand how many may enthusiastically receive and practise a system of empiricism independently of all sordid motives, and if the perceptive faculties predominate over the reason however wisely educated, that often talented persons may be carried away by a false system."

Some empiricists have but one specific, as hydropathists; others have, or attempt to find, a different

specific for each disease, as was the case with the empirical school of Alexandria, and is the case with homœopathists. All empirics constantly appeal to *experience* in proof of their doctrines. An especial characteristic of empirics of all grades is the animosity displayed by them in their writings towards regular medicine. "It is also a general characteristic of empiricism that it appeals from the judgment of the educated profession to that of the uneducated public. This is in fact an essential element of the pure quackeries, being indispensable to their success. Attempts made from time to time to put quackery away by vilification or direct persecution have probably done more to encourage and promote it than anything else. The slightest persecution can be skillfully transmuted into a crown of martyrdom, and they assume the attitude before the public of being champions of truth and of political freedom, and the victims of professional dislike excited solely by pecuniary interest. Every man duly authorized has the undoubted moral right to practise his art to the best of his judgment. He should, however, be no party to the public expression of vaunts and assumption of superiority to any sect. Let him believe and practise as he thinks right, and publish the results, not as a sectarian but as a catholic member of the universal school of scientific investigation." A form of empiricism which especially flourishes in the United States is that which accepts each man's opinion of the nature of his disease and provides a remedy according to the name he gives it. This includes the so-called "patent medicines," of which, however, very few are really patented, since to do this it is necessary to reveal their composition. They come under the general definition of "nostrums," i. e., "medicines the ingredients of which are kept secret for the purpose of restricting the profits of sale to the inventor or proprietor." Many of these nostrums are composed of inert and harmless ingredients, and the purchasers are simply cheated. Some of them, however, are dangerous poisons—such, for instance, as those advertised and sold for the purpose of procuring abortion. Advertisements of these are not uncommon, religious and family journals being a favorite medium, and their uses are generally well understood. The liquid forms usually contain oils of savine, tansy, or rue, and the chief ingredients of the potions which are sold for this purpose are solid extracts of the same substances together with ergot and aloes.

Some empirics pride themselves on their want of education, as, for instance, the so-called Indian doctors, Chinese doctors, etc., who boast that their remedies are eminently free from all speculation and hypothesis. Closely allied to these are the root doctors, herb doctors, etc. There is an absurd idea among the people that vegetable medicines are safer than those derived from the mineral kingdom, and there was at one time a law in the State of New York prohibiting all persons not regularly licensed to practise medicine from giving any medicines except those of a vegetable origin, which were the products of our own soil. This forbade a person from giving a dose of salts or of magnesia, but authorized him to administer the deadly stramonium, hemlock, etc. The widest and most lucrative field of quackery is that of patent medicines, which are sold in immense quantities. The favorite theory with the advertisers of these remedies is that all diseases are the result of impurity of the blood, and this impurity of the blood may be removed by one remedy which is the great panacea. It is a significant fact that in some instances the powers of secret medicines have been so highly esteemed that large sums of money have been given for a revelation of their composition, but as soon as the mystery disappears the charm disappears also and the remedy before regarded as so important is promptly consigned to oblivion.

One reason for the temporary success of the charla-

tan is that he takes care to hold out a prospect of cure without interfering with the pleasures and appetites of his patient. A skilled physician tells a person affected with a chronic disease that to recover his health he must practise self-denial, must be temperate and abstemious, keep regular hours, give up the use of tobacco, devote fewer hours to his business, etc. In such a case the patient is often inclined to regard the remedy as worse than the disease. If, then, he finds his symptoms described in the advertisement of an electrical or of a shampooing doctor, or of certain pills or bitters, promising speedy cure without change of diet or habits, he is very apt to try it.

The popular ignorance which promotes quackery is not so much the ignorance of what is known in medicine as of what is not known, of the fact that there is much that is beyond the reach of our present means of investigation, much that is doubtful and uncertain, and that a skilled physician who is honest must in many cases acknowledge his ignorance. (J. S. B.)

EMPORIA, the county-seat of Lyon co., Kan., is on the south bank of the Neosho River, and at the intersection of the Atchison, Topeka, and Santa Fé Railroad with the Missouri, Kansas, and Texas Railroad, 61 miles S. W. of Topeka. It has a fine courthouse, 2 opera-houses and public halls, 2 national banks, 1 daily and 3 weekly newspapers, 10 churches, a Franciscan convent, the State Normal School, with fine building, built in 1880, a high school, 4 graded schools, gas-works, and Holly system of water-works. Its manufactures comprise flour, furniture, carriages, soap, and woollen goods. It is surrounded by a good agricultural and stock-raising district. Population, 4631.

ENCYCLICAL. An ecclesiastical term, derived from the Greek, and meaning literally "in a circle." It is used of a letter sent to many persons or to a whole order of men. The first example, in church history, of an encyclical or circular letter, is found in the Acts of the Apostles, ch. xiv., where the apostles assembled at Jerusalem instructed the converts from heathenism that they were not bound by the law of Moses. The use of encyclicals has been for many ages confined, in the Roman Catholic Church, to the sovereign pontiff. There is a slight distinction between an encyclical letter and apostolic letters, although they are sometimes used in the same sense. Both sorts of communications are restricted to the pope, but the former, which is always in the singular number (*Epistola Encyclica*), is addressed exclusively to the governing body in the church, or the hierarchy; whereas the latter, which are always used in the plural number (*Litteræ Apostolicæ*), are addressed as well to the inferior orders of the clergy and to the laity. They are always in Latin, and sealed with the Fisherman's Ring. (R. S.)

ENDICOTT, JOHN (1588–1665), a Puritan colonial governor of Massachusetts, was born in Dorchester, England, in 1588. When a number of English gentlemen in 1628 purchased from the Plymouth Company a tract of land near the Merrimack River, Endicott was chosen to lead a band of settlers there. He arrived at Naumkeag, or Salem, on Sept. 6, 1628, and in the next year, when a royal charter was obtained, was appointed by the Massachusetts Bay Company governor of their colony. This colony was composed of Puritans who claimed to belong to the Church of England, and were not separatists like the Pilgrims of Plymouth. Still they did not use the Book of Common Prayer, and when a few insisted upon it Endicott sent them back to England and secured quiet. He also cut down the May-pole that had been erected at Mount Wollaston, or Merry Mount, and administered a sharp rebuke to Thomas Morton, a roystering fellow, who had settled there and sold ammunition and strong drink to the Indians. In 1629 the government of the colony was entirely transferred to New England, and John Winthrop, "the Father of Boston," became governor in 1630. Trouble with

the Indians having arisen, Endicott was sent with 90 men to attack the Pequots, and this expedition led to a war in which that tribe was exterminated. Endicott objected to the cross in the English flag as savoring of popery, and had it removed. He was made deputy-governor in 1641, and governor in 1644, when he removed from Salem to Boston. In 1645 he was made major-general of the troops of the colony. From 1649 till his death he was governor, except for two years in which he was deputy-governor. In 1652 he established a mint, which continued to coin money till the charter of the colony was abrogated in 1685. He was a stern Puritan, resolute to maintain with the sword what he believed to be the cause of God and truth. He persecuted the Quakers, and in a formal proclamation denounced the practice of wearing long hair. He was well educated, talented, keen in discernment and prompt in action, and under him the colony prospered. He died at Boston, March 15, 1665.

ENGELMANN, GEORGE (1809–1884), an American physician and botanist, was born at Frankfort-on-the-Main, Germany, Feb. 2, 1809. He was educated in his native city, then studied medicine and natural science in the universities of Berlin and Heidelberg, and emigrated to the United States in 1832. He settled first at Belleville, Ill., but in 1835 removed to St. Louis, where he practised his profession. He also founded *Das Westland*, a German periodical, which treated, in an interesting manner, American life and institutions. Amid the duties of his profession he gave much attention to botany, and published many monographs on the plants of North America. There are few descriptive works on that subject in which the authors do not acknowledge their indebtedness to Dr. Engelmann. He died at St. Louis, Feb. 13, 1884. His principal publications were "North American Cuscutineæ," in *Silliman's Journal* (1842); "Cactaceæ of the United States," in the *Proceedings of the American Academy of Arts and Sciences* (1852); "Supplement to Dr. Gray's Plants of the Rocky Mountains," in *Silliman's Journal*, vols. 33, 34; "Cactaceæ," in Emory's *Mexican Boundary Survey* (1859); "Cactaceæ," in Whipple's *Survey* (1856). In conjunction with Dr. Gray he published "Plantæ Lindheimerianæ," in the *Boston Journal of Natural History*, vol. v. Among his monographs were *The Genus Cuscuta* (1867); *The Cactus Flora of the Rocky Mountains* (1868); *North American Species of Juncus* (1868); *Notes on the Genus Yucca* (1873); *Notes on the Agave* (1875); *Oaks of the United States* (1876); *Revision of the Genus Pinus* (1880); *The Genus Isoetes in North America* (1882).

ENGLAND. The lull in political affairs which followed the overthrow of Mr. Gladstone's reforming ministry in 1874, and the accession of the Conservatives to power, was of brief duration. From the torpor and indifference which succeeded an epoch of rapid change, the nation was roused, by events that took place in the distant East, to a degree of passion and excitement unknown in English political life since the repeal of the Corn Laws. In 1875 Bosnia and Herzegovina rose in rebellion against the Turk. In the following summer a report reached England that in putting down the beginnings of a similar rising in Bulgaria the Turks had been guilty of the most shocking cruelty. This report was treated in Parliament by Mr. Disraeli, the Prime Minister, with ill-judged levity, and characterized by him as coffee-house gossip. But others were not so easily satisfied. The representatives of the press made their way to Batak, and found among the miserable survivors and in the charred ruins of this and other villages the most heart-rending evidence of the storm of savage fury that had passed over the ill-fated district. The publication of details, verified by eye-witnesses, produced the deepest impression in England. Meetings held in every important town gave voice to the general sentiment of horror

at these barbarities, and of sympathy with their victims. It was indeed subsequently alleged that the outburst of pity and indignation which, in the autumn of 1876, threw every daily care and interest of the English people into the background, was the result of a fictitious agitation set on foot by politicians out of office with the view of making capital for their party. This shallow and credulous representation is on a level with the old Continental theory that the vehemence of the English people against the slave-trade, in 1814, was an elaborate piece of commercial hypocrisy. Those who were in England in 1876, and who had the opportunity of moving among people of all grades of life, know how spontaneous, how widespread, and how passionate was the cry of indignation against the Turk, and how ardent the desire to employ the influence of England in rendering such outrages impossible in the future. The fault of the English at the present day is certainly not a deficiency of feeling when the sense of wrong is touched, but rather an over-excitability which is apt to spend itself before sufficient knowledge has been gained to result in useful action. In the case, however, of Turkey, the experience of 1876 did once and for all make an end of the illusions which had existed in England, since the Crimean War, as to the virtues of the Turk, and brought home to the nation, for the first time, the fact that five-sixths of the inhabitants of the so-called Turkey-in-Europe were not Turks at all, but Christians, and that the liberation of these races from Turkish misrule constituted the real Eastern question. Though the government of Lord Beaconsfield (Disraeli), following the same policy which had made Castlereagh the foe of Greek independence in 1821, and shutting its eyes and its heart to everything except the supposed danger to British interests in the extension of Russian power, declined to enter into any effective concert for the protection of the Christian subjects of the Sultan; there was now too strong a feeling in the country in favor of these Slavonic people and against their Turkish oppressors for the government to promise its assistance to the Porte in the event of war with Russia, though Lord Beaconsfield, according to his own statement, would have taken this course if public opinion had not prevented him. A conference was held in Constantinople in December, 1876, and attended by Lord Salisbury on behalf of Great Britain. Here all the proposals for reform made by the Great Powers were rejected by the Sultan. Lord Salisbury returned to England; Ignatieff, the Russian plenipotentiary, shortly followed him, and a protocol was signed at London on March 31, 1877, in which the Powers declared that in case of the failure of the Porte to improve the condition of its Christian subjects, they reserved to themselves the choice of means best fitted to secure that end. To this declaration the Porte replied by a protest. On the 26th of April Russia declared war, alleging as its grounds the failure of the conference and the rejection of the protocol. Lord Derby, the Foreign Secretary, replying in the name of his government to the statement of Russia, expressed disapproval of the war, and declared that the action of the Czar would "neither alleviate the difficulty of reform nor improve the condition of the Christian population throughout the Sultan's dominions." Resolutions brought forward by Mr. Gladstone, in the House of Commons, asserting that England had just cause of dissatisfaction and complaint in the conduct of the Ottoman Porte were rejected by a large majority. The government informed Russia that it would consider British interests threatened if any interference should take place with the Suez Canal, if Egypt should be made the scene of hostilities, or if Constantinople should be occupied for any considerable time: if its interests were not so menaced it would remain neutral. The Russian ambassador gave satisfactory assurances on these points, and shortly afterwards made Lord Derby acquainted with the terms of peace which Russia proposed to

insist upon at the end of the war. No exception seems to have been taken to the terms by the cabinet. The Queen's speech at the prorogation of Parliament, on August 15, acknowledged the friendly disposition shown by the Czar's government, and expressed a desire to aid in the restoration of peace, if suitable opportunity should occur, on terms compatible with the honor of the belligerents. It was not until the autumn of 1877, when the obstinate defence of the Turks at Plevna, and the repeated victories won by them over blundering Russian generals, had excited some surprise and admiration, that a war-party sprang up in Great Britain, and that its leaders called for an alliance with the Turks. The fall of Plevna, on December 10, and the rapid advance of the Russians that followed it, caused a change in the tone of the English government. Parliament was summoned in January—a month before the usual time—and the Queen's speech, after announcing that communications had been made to the Czar in favor of peace, and that the conditions of British neutrality had not yet been infringed, continued in the following ominous words: "I cannot conceal from myself that should hostilities unfortunately be prolonged, some unexpected occurrence may render it incumbent upon me to adopt measures of precaution. I trust to the liberality of Parliament to supply the means that may be required for that purpose."

On the 20th of January the Russians occupied Adrianople; on the 23d orders were sent from London to Admiral Hornby to sail at once for the Dardanelles; on the 24th the government gave notice that they would ask for a vote of £6,000,000 for naval and military purposes. It was now known that there were dissensions in the cabinet; that Lord Carnarvon had resigned, and that Lord Derby, who, after the Premier, was the most important member of the ministry, had tendered, but afterwards withdrawn, his resignation. The vote of £6,000,000, as a direct menace of war, was opposed in the Commons by the leaders of the Liberal party; but, while the debate was proceeding, telegrams arrived from Mr. Layard, ambassador at Constantinople, which gave the impression that, in spite of an armistice, the Russian forces were on the point of entering the capital. A panic followed; the opposition to the proposals of the government collapsed, and the money was granted. It subsequently turned out that the movements of Russian troops, which had given rise to the ambassador's alarmist reports, were in accordance with the stipulations of the armistice, which were not themselves unusual or unreasonable ones. The British fleet was now ordered to Constantinople, but, on its being stated by Prince Gortschakoff that if this step was taken the Russian army would enter the city, the fleet was directed to anchor about thirty miles off; and it was subsequently agreed that if the Russians refrained from occupying Gallipoli no British troops should be disembarked on either side of the Dardanelles. Nevertheless, it was felt at this time that the two countries were within a hairbreadth of war, and that the merest accident might result in hostilities. The danger from the close approach of the rival forces happily passed over; but danger enough remained in store from the growth and violence of the war-party in England, and from the difficulty of accommodating the Russian terms of peace with the claims which England justly enough put forward to a share in the settlement of the Eastern question. The treaty of San Stefano was signed by Russia and Turkey on March 3. It was agreed by the Czar's government that a congress of all the powers should be held at Berlin to take this treaty into consideration; but while Great Britain demanded that each and every article of the treaty should be submitted to the congress, Russia declared that it could only accept discussion on those portions of the treaty which affected general European interests. It would have been vain for England to attend a congress

on these terms. The prospects of a peaceable settlement seemed faint, and the ministry, under the powers granted by an act for dealing with "occasions of great emergency," called out the reserve forces. Lord Derby now resigned office. His chief stated that the reason for this resignation was a difference of opinion as to calling out the reserves. Lord Derby declared that this was neither his sole nor his principal reason, adding that he could not divulge the other reasons until the propositions of the government relating to them were made known. It subsequently appeared that the proposition had been made in the cabinet to send a secret expedition from India to seize upon Cyprus and some harbor in Syria, with or without the Sultan's permission, as a basis for operations in the event of war against Russia, and that this proposed invasion and seizure of the territory of a friendly state had caused Lord Derby's resignation. He was succeeded in his duties by Lord Salisbury. A vigorous declaration against the treaty of San Stefano was published from the foreign office, and a contingent of native troops was ordered from India to Malta (April 17). Count Schouvaloff, ambassador at London, now went off to St. Petersburg to lay his views and those of the British government before the Czar. He returned on the 20th of May, and a few days later it was announced that the prospects of the meeting of a congress had materially improved. Early in June it was known that Russia had accepted the principle of a discussion of the entire treaty of San Stefano. The British ministry had triumphed; and in the midst of universal congratulations Lord Beaconsfield and his foreign secretary set out to represent Great Britain at the congress. Scarcely had they reached Berlin when, through the mischievousness of a copying-clerk, a secret agreement, signed by Lord Salisbury and Count Schouvaloff, was made public, which covered almost all the points nominally reserved for the consideration of all the great powers. There was, in reality, nothing objectionable in the making of such an agreement; on the contrary, it showed better statesmanship than the menace and bluster with which the government had hitherto proceeded. But, gaining publicity at the very climax of Lord Beaconsfield's performance as champion of the treaty-rights of Europe, and conceding, in the cession of Bessarabia and Batoum, the very points on which the war-party in England had raised the loudest outcry, it excited a fatal sense of the comic, while the equivocations made in Parliament as to its genuineness damaged the moral prestige of the government. The congress of Berlin, anticipated to a great extent by negotiation between the two rival powers, had for its principal task the settlement of the limits of Bulgaria. In the curtailment of the exaggerated area, given to this country by the treaty of San Stefano, England and Austria possibly achieved a useful result. The division of Bulgaria into two principalities was a measure of doubtful wisdom; and the stipulation insisted upon and carried by Lord Beaconsfield that the Sultan should have the right of maintaining garrisons in the Balkans was matter of ridicule to every one who considered it seriously, for the appearance of Turkish troops in any part of Bulgaria would certainly have opened up the whole Eastern question anew. One more surprise awaited the English public. The nation suddenly learned that by a secret convention the Sultan had ceded Cyprus to Great Britain, which in return had undertaken to defend his whole Asiatic territory against all future attack. The Sultan also promised in the same agreement to carry out a system of reform throughout his Asiatic dominions. When the congress was over Lord Beaconsfield and his colleague returned to England, and received an ovation in London, bringing back, as they said, "peace with honor." But the more the work of the ministry was examined the less it appeared to be in consonance with the instincts of the English people in favor of straightforward action and

of the rights of nations. Greece, when on the point of entering into the Russo-Turkish war, had been held back by an assurance from England that its interests should not thereby suffer; and, when it was a question of curtailing Bulgaria, Lord Salisbury had made effective use of the claims of the Greek race in Macedonia. But no sooner had the Sultan agreed to cede Cyprus to England than the ministry practically abandoned the cause of Greece; and the congress of Berlin contented itself with recommending the Porte to accept a new frontier-line in Thessaly and Epirus, declining to provide means for enforcing its recommendation. This question, therefore, remained open, and a probable source of war in the East. What was done was perhaps worse than what was left undone. The acquisition of Cyprus was from the first viewed with suspicion in England. The guarantee given to the Sultan for the defence of his Asiatic dominions was regarded as either illusory or the acceptance of an enormous and intolerable responsibility; while the promise of reform, which alone could justify England's protection, had been too often made by the Porte to gain the slightest degree of confidence. In spite of the extraordinary fascination which at this time Lord Beaconsfield exercised over his sovereign, over the higher classes of England, the public service, the clergy, and the men of finance, as well as over the metropolitan press, there seems to be good reason to believe that the great mass of popular opinion was steadily, from first to last, against the government from the time when it allowed it to be seen that its sympathies were with the Turk, and not with the subject European races. The expressions of this deep-rooted conviction were no doubt overpowered for a while by the noise and vehemence of the so-called "Jingo" party, and in the metropolis itself physical force was sometimes called into play to suppress the free utterance of opinion. But in the provinces the voice of protest was never silent. It is, indeed, one of the most singular features of this agitated time that the supposed leaders of public opinion in the metropolitan press were utterly ignorant of what was passing in the country at large. Down to the day when the general election of 1880 swept Lord Beaconsfield's government from power they knew no more of the real current of English feeling than if they had been living at Constantinople. Public opinion has since begun to appreciate these organs at their true value. It is now understood that outside London, where political organization is less advanced than in the other large towns, they reflect nothing and influence nobody.

Towards the end of the year 1878 the Eastern Question passed into the background, to the intense relief of those who feared that England might be plunged into war, with Turkey for an ally. Troubles of a minor character, however, soon arose. The Zulu king, Cetewayo, had organized an army, which caused great alarm to the neighboring colonists, and especially to Sir Bartle Frere, the Queen's High Commissioner in South Africa. No evidence has ever been produced that Cetewayo actually intended to invade Natal. Sir Bartle Frere, however, declaring that attack could only be averted by taking up the offensive, ordered British troops to invade the Zulu territory. Lord Chelmsford was the commander, and through the incapacity of this general, or his subordinates, a body of about a thousand British soldiers was annihilated by the warriors of Cetewayo at Isandlana, on January 22, 1879. Severe fighting followed during the spring and summer. In this campaign the young Louis Napoleon, son of the Emperor Napoleon III., lost his life. It was found necessary to send out large reinforcements to overcome the resistance of the brave and energetic Zulus. Cetewayo was ultimately defeated at Ulundi, and, after being hunted down, was taken as a prisoner to Cape Town. The sympathy of the English, however, is easily won by a gallant enemy. Cetewayo excited much interest in his captivity; there were many

who pleaded his cause in England, and maintained that the war had been unnecessarily begun; even the government had at first dissented from the policy of Sir Bartle Frere, and urged him to confine his action to measures of defence. Though Cetewayo remained a prisoner until the downfall of Lord Beaconsfield's administration, he was subsequently brought as a guest to England, received with kindness by the Queen, and restored to sovereignty over a part of his dominions. His return, and the division of Zululand into several petty states, were not followed by the advantages expected. His prestige was lost and he perished ignobly. It is doubtful whether, by the disintegration of that country, which Cetewayo seems to have governed before the war with more than the average ability of a savage chieftain, the welfare of the inhabitants has not been greatly injured. To England itself the affairs of South Africa are the source of nothing but anxiety and annoyance.

The inquiet spirit which animated Lord Beaconsfield's system of imperialism made itself felt in almost every quarter of the globe. Early in his ministry he conferred upon the Queen the title of Empress of India, and this appeal to the oriental imagination formed the prelude to a series of measures intended to advance English influence in the countries that lie between Hindostan and the Turkoman provinces, that had recently been conquered by Russia. The violation by Russia of an agreement that Afghanistan should remain outside the range of its diplomatic relations gave Lord Beaconsfield the occasion for carrying into execution plans that had already been discussed in the cabinet and communicated to Lord Lytton, the Viceroy of India. As Shere Ali, Ameer of Afghanistan, had allowed himself to be withdrawn from the isolation in which he ought to have remained, and had admitted a Russian legation to Cabul, England had the technical right to demand that a British legation should also be admitted to the capital. But before this demand was made the town of Quettah, beyond the frontier of British India, was occupied by the Queen's troops. The seizure of this post excited a strong protest on the part of Lord Lawrence, formerly Governor-General of India, and probably the highest authority of the time on Indian affairs. It seems also to have had an unfavorable effect on Shere Ali; and when Sir N. Chamberlain, accompanied by an escort of a thousand armed men, appeared on the road to Cabul, and demanded, through his subordinate, Cavagnari, to be admitted as the Queen's representative, he was informed that the Ameer declined to receive an embassy. It was telegraphed to England that Cavagnari had been threatened and insulted—a disgraceful fabrication, intended to justify, in the eyes of the English people, an immediate declaration of war. The zeal of Lord Lytton, however, outran that of the government, and he was compelled to wait until an ultimatum had been tendered to Shere Ali. In the meantime troops were massed upon the frontier; and again Lord Lawrence raised his warning voice, declaring that, in forcing a mission upon Afghanistan, the British government were playing Russia's game, and courting, in place of their rivals, the hostility of a savage people which resented all foreign intervention alike. No attention was paid by the ministry to this advice; and when Shere Ali, in vain reliance upon Russian support, had allowed the time for an answer to the ultimatum to expire, war was declared, and British troops marched upon Cabul (Nov. 20, 1878). No effective resistance was made by the Afghan forces. General Roberts gained a victory at the Peiwar Crest; Stewart occupied Candahar; and Shere Ali fled from his capital, leaving his son, Yakub Khan, in possession of the government. Yakub entered into negotiations with the English commanders, and finally signed a treaty at Gandamak, placing his foreign relations under British control, admitting an English resident to Cabul, and ceding a strip of territory on his eastern

frontier (May 26, 1879). The object of the war seemed to have been attained by England. Cavagnari was received at the capital as British resident, and the process of evacuating the country was begun.

Suddenly there came an event which, in a striking and tragical manner, verified the prediction that had been made by Lord Lawrence. On the 23d of September Cavagnari was attacked and murdered with all his suite. The outbreak appears to have originated in a military tumult; it is doubtful whether Yakub Khan was in any way implicated in it, and the story that it was the result of a Russian intrigue was a mere invention of anti-Russian newspapers. There was, however, an end of the illusion that Afghanistan was pacified and won. General Stewart, who had just evacuated Candahar, reoccupied that city. Roberts marched upon Cabul, defeated the enemy, and entered the capital, where there was complete anarchy. Yakub, declaring that the murder of Cavagnari was the work of rebels, abdicated, and was sent as a prisoner into India. The murderers of Cavagnari were brought to justice; and in an order, which was severely criticised in England, General Roberts announced that he would execute, as rebels against Yakub, all persons taken in arms. A chief-priest and a great number of Afghan soldiers so taken were put to death. But whether in consequence of the severity or in spite of it, Roberts found that the whole country was now rising against him. His positions outside of Cabul were attacked, and a series of encounters took place, in one of which the British troops were so severely handled that Roberts found it necessary to evacuate the capital and await reinforcements. The houses of the adherents of the British were now destroyed by the National party. Reinforcements, however, soon arrived, and Roberts again occupied Cabul. Afghanistan, however, was not really conquered, nor could the English find any native chieftain to whom, in pursuance of the boasted intention of making a "strong, united, and friendly Afghanistan," they could with safety commit the government of the country. It was accordingly determined to divide Yakub's dominions into several provinces, and to incorporate Candahar with the system of Indian protected states.

Things were in this unsettled condition when events took place in England which gave an entirely different complexion to the affairs of the East. Lord Beaconsfield dissolved Parliament in the spring of 1880, and a general election immediately followed. The contest was fought with extraordinary passion and energy; and, turning almost wholly on the foreign policy of the government, it gave occasion for the clearest possible expression of the judgment of the nation upon that policy. On the one hand, it was said that Lord Beaconsfield had kept the Czar's armies out of Constantinople, and had forced Russia to modify the treaty of San Stefano without involving England in war; that something of the Ottoman Empire had been saved out of the general wreck; that the Zulu war had been unavoidably begun and successfully ended; and that the invasion of Afghanistan was no more than a measure of self-defence, forced upon Great Britain by the advances and the intrigues of Russia in the East. On the other hand it was charged upon the government that they had deliberately sided with the Turk, and opposed the liberation of the Christian races; that when there was not the least danger of Russia appropriating Constantinople, and when it was perfectly certain that Austria and Prussia would have prevented the execution of any such design, had it existed, Lord Beaconsfield's menaces and armaments had brought this country within an ace of war with Russia; that the claim, to have wrested back by diplomacy some of the fruits of Russia's victories, was mere bluster, for, by the secret agreement with Lord Salisbury, Russia had gained everything that it wanted; that Cyprus had been dishonorably acquired; that the invasion of Zululand was an act of unnecessary and wanton aggres-

sion; that the attack upon Afghanistan was a crime and a blunder, committed in spite of the most authoritative warning, and accompanied with every circumstance of harshness and injustice; and, finally, that throughout his administration Lord Beaconsfield had systematically kept Parliament and the nation in the dark, or misrepresented his intentions until they were carried into effect and it was too late to attempt to undo them. Such was the indictment—the gravest made against any English government since the Napoleonic wars—which in every quarter of Great Britain was raised against Lord Beaconsfield's ministry in the spring of 1880. It found its most eloquent and impressive enunciation in the speeches made by Mr. Gladstone during his candidature in Midlothian; but everywhere the drift of argument was the same; and never were political questions more thoroughly thrashed out, or the points at issue more completely understood by those who were about to vote upon them. The answer made by the nation to Lord Beaconsfield's appeal was summary and overwhelming. His followers were utterly routed, and his rival was called to power by one of the greatest majorities that has displaced or set up a government in recent times. Lord Beaconsfield, in conversation with a friend of the writer, who was then staying under the same roof with him, attributed the decisive character of his defeat to three causes: First, to the accidental winning of so many seats by the Liberals on the first day of the election, that their opponents became demoralized; secondly, to the irresistible energy and eloquence of his rival; and, thirdly, to the commercial and agricultural depression which had prevailed during the four preceding years. The first of these reasons only illustrates Lord Beaconsfield's own habit of making the most of the accidental; the second is assuredly no undeserved tribute to a statesman whom Lord Beaconsfield, in the intoxication of success, described in very different language; the third seems to be in great part disproved by the fact that the agricultural counties of Wales, where the government sustained its most crushing and most unexpected defeats, were precisely those where, in all Great Britain, the "bad times" had been the least felt. The plain reason for the overthrow of Lord Beaconsfield's government was that, from the moment when it began to have a distinct policy of its own, the mass of the nation disagreed with it.

The first task of the new ministry was to decide what they should do in Afghanistan. They had, while in opposition, condemned the principle of intervention in the affairs of that country; and, consistently with their earlier language, they now determined to withdraw from it as soon as the actual condition of affairs permitted them to do so. Lord Lytton resigned the vice-royalty as soon as he heard of the result of the elections, and was succeeded by Lord Ripon. From among the rival claimants to the Afghan throne Abdurrahman was recognized as Ameer, and preparations were made for quitting Cabul. But it is easier to begin an unjust enterprise than to relinquish it. A son of Shere Ali, Ayub Khan, had gathered an army round him at Herat, and now moved against Candahar. General Burrows, who set out with about 2500 men to oppose him, was totally defeated at Maiwand, June, 1880, and Candahar, with its British garrison, was besieged by Ayub's forces. Roberts was ordered to march from Cabul to its relief. This march of 318 miles, through a wild country and under an Indian sun, was executed with admirable energy and skill by the general and his troops within twenty-three days. The troops had to carry their supplies with them, for all communication with Cabul was abandoned, and the army struck into the mountains trusting to itself alone. Roberts reached Candahar on the 31st of August, combined his operations with those of the garrison, and, by one vigorous blow, dispersed the besieging army. This ended the Afghan war. In pursuance of the fixed policy of the government Ca-

bul had already been evacuated, and Candahar was not long held. The victory over Ayub made the conqueror's withdrawal possible, and in the spring of 1881 the last British troops quitted Afghanistan. It was, of course, represented by Lord Beaconsfield's followers that this withdrawal from the country was an act of cowardice as well as an abandonment of the interests and of the allies of Great Britain. But the nation had formed its judgment upon the policy of the late minister, and the attempt to draw a "scientific frontier" for the Indian empire in the hornet's nest of Afghanistan is not likely to be soon repeated.

It would have been well for the credit of England if the new government had as frankly broken loose from the policy of their predecessors in Africa as they did in Asia. In the year 1877 the Transvaal republic, inhabited by Dutch Boers and by natives, had been annexed to the British empire by the colonial executive, in consequence of the supposed inability of the Boers to defend themselves against the warlike Zulus, and of acts of oppression alleged to have been practised by the Boers upon the natives. Very little attention was paid in England at the time to this annexation, and, although the Boers protested against it and declared that they would maintain their independence, they remained quiet during the Zulu war or even assisted England, not desiring a native alliance against a European power. But when the Zulu war was over they renewed their protests, and held a great meeting at Wonderfontein in December, 1879, at which they fixed upon the maximum of concession which they would make to England. In the meantime public opinion in Great Britain was becoming more busy with the Transvaal question. It was discussed in Parliament, and the annexation was generally condemned by the liberal party. After the overthrow of Lord Beaconsfield in the elections of 1880 it was anticipated by many in England and by the Boers themselves that the annexation would be peaceably undone by Mr. Gladstone's ministry. This hope, however, was disappointed. In the Queen's speech at the opening of the new Parliament the Transvaal question was thus handled: "In maintaining my supremacy over the Transvaal, with its diversified population, I desire both to make provision for the security of the indigenous races and to extend to the European settlers institutions based on large and liberal principles of self-government." The Boers sent a telegram to England as soon as the declaration of the ministry became known, expressing their dissatisfaction, and forcible resistance was now offered to the collection of taxes. On Dec. 16, 1880, the flag of independence was hoisted. A triumvirate was appointed to carry on the government of the republic provisionally, and hostilities with the British troops in the Transvaal began. A body of the Ninety-fourth regiment was attacked and suffered severely from the accurate firing of the Boers. Sir Owen Lanyon, the governor, was blockaded in Pretoria, and other garrisons were besieged. Gen. Colley, governor of Natal, made preparations for the relief of his countrymen. Though he had but 1500 men he took up the offensive, crossed the river Ingogo, and moved against the Boers, who were stationed at Laings Nek. Here on Jan. 28, 1881, he was repulsed with loss. His communications were threatened, and he fell back to protect them. In the meantime negotiations were being conducted with the English government through Mr. Brand, president of the Orange Free State. The ministry, who were anxious not to come to extremities with the Boers, telegraphed that if opposition ceased forthwith they believed an accommodation would be possible. Gen. Colley, however, who had received reinforcements, attacked the Boers at Majuba Hill without waiting for further negotiations. He was defeated and killed. An armistice followed, during which Sir Evelyn Wood conducted negotiations with the Boer leaders, which ended successfully. The suzerainty of the Queen was acknowl-

edged; complete self-government was given to the Boers, the control of their foreign relations being reserved. It was agreed that a British resident should be placed at their capital, and that a royal commission should consider the provisions necessary to be made for the protection of native interests, and decide whether any portion of territory eastward should be severed from the Transvaal with the view of preventing disputes between the Boers and their neighbors. The commission sat from June 14 to August 3, when a convention was signed. This was ratified by the Volksraad of the Boers on Oct. 25. A certain number of disputed questions, however, still remained open, and the last difficulties between England and the Transvaal are yet scarcely settled.

While embroiled with Zulus, Afghans, Egyptians, and Boers, Great Britain has had to face a yet more painful and difficult problem in its dealings with Ireland. The discontent of a conquered nation, whose soil is owned by a handful of landlords, alien in religion and race, is not to be appeased by a generation, nor by a century, of palliative measures. The disestablishment of the Protestant Church in Ireland and the land act of 1870 failed to make many friends for England. The tenant was still in the power of his landlord, who could raise his rent and evict him when he declined to pay the increase. It needed only the failure of the harvest in 1879 to throw the whole country into the hands of agitators. The Land League, since become famous all over the world, was established in the autumn of that year; and, in order that nothing might be wanting to popular exasperation, the landlords continued to evict their tenants throughout the winter, when famine had actually begun. The coercion act, which expired in June, 1880, was, however, not renewed by Mr. Gladstone's ministry, which showed its good-will to the Irish peasantry by bringing in a measure temporarily preventing evictions. This bill, after passing the Commons, was thrown out by the Lords. Affairs now became much more serious. Agrarian outrages increased, and the payment of rent was very generally refused. The Land League became the dominant authority in Ireland, and the operation of boycotting, named after its first victim, the land-agent Boycott, proved itself wonderfully effective. More murderous crimes, however, which at a later period covered the managers of the Land League with infamy, were as yet rare. It was still hoped in England that a moderate tightening of the reins, combined with a liberal reform of the land laws, might restore order. In the spring of 1881 Mr. Gladstone submitted a coercion bill to Parliament, intending to follow it immediately with a land bill. The progress of the coercion bill brought to a climax that system of obstruction with which the Irish members had for some time past been endeavoring to extort home rule from England by rendering all legislation in the imperial Parliament impossible. After a series of sittings, extended over whole nights and days together, twenty-eight Irish members, brawling and vociferating, were thrust out of the house by main force. The coercion bill, empowering the executive to imprison without trial, was carried, and the way made clear for the introduction of the land act. This measure, which passed both Commons and Lords in the summer of 1881, was one of those few in modern English history in which Parliament, rising above the principle of *Laissez Faire* and the maxims of current political economy, has boldly faced a great social problem, and endeavored by resolute legislation to recast the social order of a people. The so-called freedom of contract, under which it was possible for the Irish landlord to extort whatever he pleased from his tenant, under the threat of expelling him from his home, was ruthlessly swept away. Law courts were established for the purpose of settling, on the tenant's appeal, what rent was a fair one for him to pay. The rent so named by the court was fixed for fifteen years, and at the end of that time the land-

lord could only raise it if the court should decide that agencies other than the tenant's own industry had added to the value of the land. The Government was empowered to advance three-fourths of the purchase-money to tenants who should arrange, under certain conditions, to purchase the land outright from their landlords and become peasant proprietors. These were the two leading provisions of the act, and although the second has as yet failed in its operation, the first has within two or three years reduced the rents paid by tenants by something representing a capital sum of over £5,000,000, and has made hundreds of thousands of families, who were hitherto at the mercy of their landlords, secure in the possession of their farms. Fair rents, free sale, fixity of tenure—the so-called three F's, long demanded as the minimum of reform by the more practical leaders of the Irish people—were virtually conceded in the land act of 1881, to the deep satisfaction of that numerous and increasing class in England which desire to see the Irish people secure, prosperous, and happy in their homes. If the Irish parliamentary leaders had been less inclined to methods of violence, or the mass of the people had understood how great a victory had been gained by their friends in England over the lately dominant class, they would probably have settled down under the new act and have trusted to time and conciliation for the winning of further concessions. This, however, was unfortunately not the case. Mr. C. S. Parnell and his colleagues set themselves against pacification. Ancient hatreds were rekindled, the peasantry were taught to distrust the land act, and, instead of the expected harvest of quiet, storms of agitation swept over the country. The British ministry now lost patience, and, under the powers given them by the new coercion act, arrested Mr. Parnell, with his colleagues Dillon and O'Kelly. They were confined in Kilmainham Gaol, and so unsparingly were the provisions of the coercion act put in force that during the winter of 1881-82 above 700 persons were imprisoned without trial. The Land League now published a manifesto calling upon the Irish farmers to pay no rent at all until their leaders were released. This was followed by a proclamation of the English government declaring the Land League an illicit society, and making membership in it a punishable offence. The meetings of the League were suppressed, and its organization appeared to dissolve under the armed hand of authority. But worse growths came in its place. Secret conspiracy was substituted for open combination, and homicide became the agency of those who, whether in hiding or from beyond the seas, kept up the agrarian conflict with the landlord and the political conflict with England.

The opening of the year 1882 was marked by a series of frightful murders. The state of affairs grew worse and worse, and at length Mr. Gladstone's cabinet resolved to come to terms with the prisoners of Kilmainham, and, on the understanding that their influence would be used in a pacific direction, to release them from confinement and to bring in a bill extinguishing by state help the arrears of rent still due from many tenants to their landlords. There was a division of opinion within the cabinet as to the wisdom of this policy. Mr. W. E. Forster, chief-secretary for Ireland, protested against releasing the prisoners until they had given some real guarantee that they would not repeat the conduct for which they had been imprisoned. His advice, however, was overruled; Mr. Parnell and his colleagues were set free from Kilmainham and returned to Parliament. Both the chief-secretary and the viceroy of Ireland now resigned their offices. In Mr. Forster's place Lord Frederick Cavendish, a nephew of the premier by marriage, and brother of his colleague Lord Hartington, was appointed. Lord Frederick landed in Ireland on the morning of Saturday, May 6. On the evening of that day the frightful and astounding news reached London that he had

been attacked and murdered in front of the viceroy's lodge at Dublin, together with the under-secretary, Mr. Burke. The impression of pain and dismay made by this intelligence will never be forgotten by those who were in London on its arrival. Nevertheless after a momentary panic the public mind regained calmness, and the few who were disposed to call for vengeance on Ireland were hushed by a noble letter of Lord Frederick's widow deprecating every thought of revenge. But the blow which took the young chief-secretary's life struck to the heart every friend of the Irish cause. There was an end of all hopes of conciliation; the government had no alternative but to establish the most stringent precautionary rule, and to cover Ireland with police and troops. To the misfortune of Ireland itself the murderers were not discovered till the following year; it was then proved beyond all doubt that the life of Mr. Burke alone had been sought, and that Lord Frederick Cavendish, assisting his friend against the assassins, was murdered by ruffians who did not know who he was. It is to the credit of the English Parliament that in spite of the most extreme provocation the bill of the government for the relief of tenants in arrears was carried through both houses, and that the inevitable rigor now introduced into the police-administration of Ireland did not interfere with the great legislative project by which it has sought to bring ultimate contentment to that country. The long-baffled efforts of the executive to bring the Phoenix Park murderers to justice were at length successful. The worst of them, the execrable James Carey, turned informant. The actual assassins were put to death; the less guilty of their accomplices had their lives spared. Carey, in vain endeavoring to escape from the avenger, was murdered at the Cape of Good Hope by one O'Donnell, who in his turn paid the penalty of death.

The latest chapter of English history is occupied with Egypt and the Soudan. Lord Beaconsfield, always looking towards the East, had purchased the Khedive's shares in the Suez Canal with the object of making England the chief proprietor of this highway to India. Whether the financial ownership of share-certificates was likely to give Great Britain increased military and naval control of the canal, in case such control should require to be asserted by force, was much doubted at the time, and many were of opinion that England would only embarrass itself by helping out its powers as mistress of the seas by those of the stock-proprietor. Lord Beaconsfield, however, held fast to his policy, and when the financial system of Egypt collapsed he united with France in establishing the so-called dual-control, in virtue of which the administration of the Egyptian exchequer was intrusted to commissioners named by England and France. The primary object of this measure was to secure for English and French bondholders the interest of the money which they had lent, generally at usurious prices, to the Khedive Ismail; a secondary result was that the finances of Egypt were much better administered under European control, and the taxes much less oppressively levied, than under the native government. A great number of civil and military officials were, however, displaced without compensation, and large salaries given to the multitude of Europeans who were set in their places. Foreigners continued, as before, exempt from taxes which ground down the Egyptians. Thus great discontent arose, and the grievances of the pashas and military men, who could no longer batten upon the peasantry, formed the ground of an agitation which appears ultimately to have become a really national movement against the foreigner. Arabi Pasha, a colonel in the army, set himself at the head of the revolt against the new Khedive Tewfik, who had been placed upon the throne in order to carry out the European programme. The dual-control was overthrown, and the French Chamber of Deputies, more truly sagacious than M. Gambetta, who pressed for

action, left England to settle the Egyptian question by itself. An attack was made upon foreigners in Alexandria in the summer of 1882. The British fleet was now ordered to sail into the port, and as Arabi Pasha placed guns upon the defences and showed that he intended to defend himself, the fleet was ordered by Mr. Gladstone's cabinet to bombard the forts of Alexandria. The most probable explanation of this violent action on the part of a ministry pledged to a peaceful policy is that Mr. Gladstone knew Arabi to be an instrument of the intrigues of the Turkish Sultan; that he expected to see the loathed rule of Turkish pashas substituted for the improving agencies introduced by the dual-control; and that he was misled by Sir L. Mallet's reports of the absence of any real national interest in Arabi's cause. The bombardment of Alexandria proved what enormous brute force and how little foresight was at the disposal of the English government. The Egyptian army acted as the Russians did at Moscow, setting fire to the city, and attempts were made to massacre all the Europeans within their reach, while the English admiral lay powerless at sea, without even that small contingent of troops which might have saved the burning city and protected its Christian inhabitants. It now became clear that Arabi had the whole army at his back, and that England had launched itself into a serious war. The blunders with which the struggle commenced were to some extent redeemed by the skilful conduct of the campaign under Sir Garnet Wolseley, who overthrew the Egyptian army by a night attack at Tel-el-Kebir on September 13, and saved Cairo from the fate of Alexandria by a forced march of cavalry which excited universal admiration. By this one blow the campaign was ended. Arabi was brought to trial and banished to Ceylon; Tewfik was restored to his dummy-sovereignty; and, in place of the fallen dual-control, English officials were set by the side of the Khedive to inspire but not to dictate his actions. So far all seemed to have ended well for England, and Mr. Gladstone repeatedly informed the world that the troops of Great Britain would be withdrawn from Egypt, whose sovereign was again secure upon his throne. Unfortunately the well-meaning English cabinet overlooked the fact that Tewfik was engaged in a most bloody and dangerous struggle with the Arabs of the Soudan, whose towns were occupied by his troops, though their country had never been really conquered. The revolt of the Soudanese, led by El-Mahdi (The Prophet), became more and more formidable. Tewfik placed an English soldier, Hicks, at the head of a contingent and sent him against the rebels. The English government, foreseeing that Egypt could not permanently hold the Soudan, discountenanced the expedition under Hicks, but did not prevent the Khedive from carrying his plan into execution, preferring to treat the Egyptian government as responsible for its own actions. At the close of the year 1883 news reached England that Hicks' army had been utterly annihilated. The return of the English troops from Egypt was now postponed, but they were not sent to reinforce the points threatened by the victorious Arabs, though two of these, Sinkat and Tokha, were within easy reach of the Red Sea. The Khedive was again left to act on his own responsibility, and he sent a miserable corps of Egyptians and negroes, commanded by Baker Pasha, an Englishman in his service, to relieve Sinkat. Baker's troops in their turn were cut to pieces. The garrison of Sinkat was put to the sword along with the women and children; and though the English now despatched a force to relieve Tokha, that place surrendered before operations could be undertaken. The reputation of Mr. Gladstone's ministry was grievously impaired by these events; and it remains to be seen whether, in consequence of the military impotence of Egypt, it will not become necessary to abandon the policy hitherto followed, and to place it permanently under British protection.

The social and domestic history of Great Britain during the period embraced in this sketch has been a chequered one. The years from 1874 to 1882 were marked by an unparalleled failure of agriculture owing to the succession of cold wet seasons; and this, combined with the ever increasing pressure of foreign competition, brought down the profits of trade to a low ebb, and threw masses of the population out of work. A revival, however, has now set in, and the country again wears an aspect of prosperity. Invention and ideas have progressed; public taste has made a marked change for the better; art has become more popular and diffused; and social justice has won one of its most necessary, though not most noticed, triumphs in the enactment of the law which places the married woman precisely upon the same footing as her husband in everything relating to the ownership and disposal of property. (C. A. F.)

ENGLAND, JOHN, an American Bishop of the Roman Catholic Church, was born in the city of Cork, Ireland, Sept. 23, 1786. Until his fifteenth year he went to the best schools in his native city, and made considerable progress in his studies. He then studied at home for two years, and having determined to embrace the ecclesiastical state he was sent to the College of Carlow, where he remained five years, devoting himself to the study of the higher philosophy and moral and dogmatic theology. His shining virtues and brilliant talents won the admiration of both professors and students. While still a seminarian he gave instructions on the catechism to the children of the town, but so interesting were his discourses that they were attended by persons of all ages. He was instrumental in procuring the establishment at Carlow of a female prison, an asylum for unprotected females, and poor schools for both sexes. In 1808 he returned to Cork for ordination, a special dispensation having been obtained from Rome for that purpose, as he was only twenty-two years old. Soon after his ordination he was appointed to lecture on the Old and New Testament at the Cork Cathedral. His eloquent discourses attracted crowds of people of all religions. He established a Magdalen asylum, and gave his services as chaplain gratuitously to the city jail. In 1812 he was appointed president of the Theological Seminary of St. Mary's. His matchless eloquence, powerful pen, and patriotic devotion to Ireland caused his name to be mentioned as a fit candidate for a mitre. He did not shrink from the duties and responsibilities of the position, but declared he would never wear a mitre in any country subject to the British Government. The United States had already become a great and powerful republic, and as the Catholic Church grew with the growth of the country, new Sees were rapidly created. In 1820 Dr. England was appointed the first Bishop of Charleston, S. C. He was consecrated at Cork, Sept. 21, 1820, and, shortly afterwards sailing for America, arrived at Charleston, Dec. 31.

The new diocese of Charleston embraced Georgia, North and South Carolina, but had only two priests and two churches. The Catholic population was very limited in number, and consisted chiefly of poor Irish emigrants, ruined refugees from San Domingo, and their slaves. All the wealth, influence, culture, and respectability belonged to the Protestants. Bishop England devoted himself first to his own flock, which had been long neglected, and was scattered over a large extent of country. He succeeded in infusing into them some of his own zeal and enthusiasm. Churches were built, and the number of priests soon increased. The people of Charleston discovered that Bishop England possessed intellectual gifts worthy of their highest admiration. His learning and eloquence drew around his pulpit some of the most distinguished people of the South, who were delighted by his oratory, if they were not convinced by his logic. Bishop England opened a classical school at Charleston, which was attended by the sons of the first gentlemen of the city, and by this

means a sufficient income was raised to support the theological students, and thus gradually able and zealous clergymen were secured for the diocese of Charleston. The scarcity of priests rendered the labors of the Bishop very arduous. Sometimes he went one hundred miles to administer the sacraments to a single individual. Bishop England identified himself with every good and useful movement of the community in which he lived. An elegant scholar, he revived a love of classical literature in South Carolina. He was an active member of the Philosophical and Literary Association of Charleston, and infused a new vigor into it by his eloquent addresses and scientific investigations. In order to check the barbarous practice of duelling, he formed, in conjunction with several influential gentlemen, an Anti-duelling Association, of which Gen. Thomas Pinckney, of Revolutionary fame, was president. Before this Society the Bishop delivered one of the most powerful and irresistible arguments against duelling ever written on that subject. He was also instrumental in preventing hostile meetings in a number of conspicuous instances. So great was his fame as an orator that, for the first time in the history of our country, a Catholic bishop was invited to preach in the House of Representatives at Washington, and he delivered a brilliant and forcible address, which a committee of the members, in a flattering letter, requested permission to print. Before the Washington Light Artillery of Charleston he delivered an oration, which was one of the noblest tributes to the character of Washington.

Bishop England was thoroughly imbued with the spirit of American institutions, and all his public addresses breathed the most exalted patriotism. Through his influence the provincial councils, composed of the American Catholic bishops, assembled at stated periods, for the promotion of friendly intercourse, for counsel, and for the transaction of important ecclesiastical business. His learning, tact, and energy were of great service upon these occasions, and were so generally recognized that he was called the "Father of the Provincial Councils." Bishop England visited Europe three times during his episcopacy, and secured great assistance in priests, money, and female religious. So highly was he appreciated in Ireland that he was offered the bishopric of Ossory in that country, but he declined that high ecclesiastical dignity, which would have secured for him ease and luxury in his native country, saying he preferred to remain with the beloved church in America,—that he had become an American citizen and an American prelate, and intended to be both as long as he lived. When in Rome he was consulted on the ecclesiastical affairs of this country by the pope and cardinals, who were astonished at the great labors and extensive travels of the Bishop of Charleston. From the chambers of the Propaganda he would announce the very day he intended to administer confirmation in the interior of South Carolina, and the cardinals, impressed by the rapidity of his movements, called him "*il Vescovo a vapore*," or the "Steam Bishop."

In the diocese of Charleston he increased the number of churches from two to sixteen, organized a well-appointed and zealous clergy, and established many ecclesiastical, religious, and charitable institutions. He introduced the Ursuline Sisters into his diocese, where their school acquired a high reputation, and also the Sisters of Mercy to take charge of orphan children, visit the prisons, and nurse the sick.

On Bishop England's return, from his last visit to Europe in 1841, the voyage was long and stormy. With health broken down, he had to act as the physician and nurse of many persons who were really less ill than himself. Malignant dysentery broke out among the steerage passengers, and he attended them day and night, until he was taken down with the disease himself. When he landed at Philadelphia, instead of retiring to a sick-bed, he delivered a course

of lectures, speaking for seventeen nights in succession; assisted at consecrations, and was kept busy sending to Charleston the numerous co-laborers whom he brought from Europe for the various institutions of his diocese. In failing health he went to Baltimore, where, although he remained only four days, he preached five times, and never in his palmiest days did he display more power, eloquence, and brilliancy. At length he arrived in Charleston, exhausted from travelling and constant work. His physicians pronounced his case hopeless, and, with calmness and resignation, he prepared for his death, which took place on April 11, 1842. As an evidence of the respect felt for the illustrious deceased, the bells of the Protestant churches tolled, the flags on the shipping were lowered, and persons of every denomination, class, and condition united in paying every mark of respect and affection to his memory. (E. L. D.)

ENGLEWOOD, a village of Cook co., Illinois, is a suburb of Chicago, from which it is distant 7 miles, on the Chicago, Rock Island, and Pacific Railroad; the Lake Shore and Michigan Southern Railroad; the Pittsburg, Fort Wayne, and Chicago; the Wabash, St. Louis, and Pacific Railroad; the Chicago and Eastern Illinois Railroad, and the Louisville, New Albany, and Chicago Railroad. Here many business men of Chicago reside, and there are more than forty trains each way daily. It has 9 churches, the Cook County Normal School, a high-school, and 3 other public schools. Population, 2850.

ENGLISH, THOMAS DUNN, an American poet and journalist, was born in Philadelphia, June 29, 1819. He studied medicine at the University of Pennsylvania, receiving the degree of M. D. in 1839, but afterwards turned his attention to law, and was admitted to the bar in 1842. In that year he published in a New York paper a song called "Ben Bolt," which became widely popular. He has since published several novels, only three of which he has acknowledged. He has also composed several dramas, of which *The Mormons* has been printed. He has contributed numerous poems and prose sketches to journals and magazines in New York and elsewhere. He lived for some time in Virginia, but since 1856 has resided in New Jersey, near New York city, practising as a physician, and giving his leisure to writing for the magazines. He has represented his district in the State legislature. His most noteworthy productions of recent years have been a series of ballads on events in American history, which have been published in *Harpers' Magazine*.

ENGLISH LITERATURE. The death of Sir Walter Scott, in 1832, marks the close of an interesting era, for with him expired what we may call the original romantic movement in English literature. At its beginning, romanticism was the literary expression of a widespread reaction against the classicism which accompanied and followed the renaissance. The long-continued imitation of the ancient, and especially of the Roman, writers, had combined with the strong tendency of society to seek polish, and was at length outgrown after much of literature had become scarcely more than a sort of scholastic exercise. Early in the eighteenth century English and French writers had discovered how great a part of human nature was left without representation in the exact but arid methods of writing then current; yet it was not till shortly before the French Revolution that we see unmistakable signs of the existence of new models and wider interests.

The Romanticists, of whom Scott is one of the most famous English representatives, gave the world brilliant pictures of the past as well as of the remote regions which had been somewhat contemptuously overlooked by those writers who cared most for polish. Yet, while Scott's influence long survived upon the Continent, in England he left no important successor, and almost the sole survivor of the army of knights

and warriors who crowded his pages was G. P. R. James's long since forgotten "solitary horseman." The picturesqueness of romanticism was but one side of the movement. Already, before Scott's death, some of his contemporaries had indicated the lines on which his successors were about to do their work. He had shown the splendor of the past; other writers began to see that it was not necessary to go back four or five hundred years, or even fifty, to find impressive subjects. Miss Edgeworth's stories—and, for that matter, such of the Waverly novels as dealt with contemporary life in Scotland—showed that there was an abundance of material near home capable of interesting treatment. Moreover, there was a strong impulse toward utilitarianism, which was directly opposed to one side of romanticism, although later, as we shall see, the two influences amalgamated.

The Reform Bill of 1832 was an important step in the advance of England towards popular government, and the victory of the Liberals placed political power in the hands of a large number of inexperienced men. The successful reformers immediately interested themselves in popular instruction, and simultaneously a number of writers began to publish manuals full of lucid information on almost every conceivable subject. These manuals were what may be called secular tracts: they undertook to impart knowledge instead of religion. As early as 1825 Archibald Constable had led the way with his *Miscellany*; in the same year Lord Brougham wrote his *Education of the People*, and in 1826 the same indefatigable writer began to organize the Society for the Diffusion of Useful Knowledge. Charles Knight was appointed to superintend the publications of this society, and shortly after he started his own, *Library of Entertaining Knowledge*. Charles Knight continued this useful task by establishing the *Penny Magazine* in 1832, the year in which William and Robert Chambers began to publish *Chambers' Edinburgh Journal*. Charles Knight in 1838 brought out his *Pictorial History of England*, and in 1844-45 Prof. Craik's *Sketches of Literature and Learning in England*. Meanwhile *Chambers' Information for the People* began to appear in 1833, and was followed by various other works of a similar aim. This list, which might easily be made longer, will show how widespread was the general movement in the direction of popular instruction. In the previous century literature had been undeniably didactic. Phillip's *Cyder* and Dyer's *Fleece*, for example, had in their way echoed the *Georgics*, and the never-ending instruction in morality had done much toward civilizing a rude society. Now an effort was made to simplify for the populace the great discoveries in modern sciences. The effort extended into what we may call pure literature; traces of practical instruction indeed are to be found in Richardson, and it held a prominent place in Rousseau's novels. Miss Edgeworth, too, had followed Day's *Sandford and Merton* with *Frank*, the hero of which was dosed with early instruction. These books, however, were but the blind gropings of beginners. Miss Martineau, in her tales illustrative of political economy, developed the method which Miss Edgeworth had adopted in her *Evenings at Home* and her *Moral Tales*.

This outbreak of utilitarianism in literature seems very remote from the spirit of romanticism, which atoned for the long reign of good sense by concerning itself mainly with the picturesqueness of things. Indeed, in France, where all thought is carried to its logical extreme, Théophile Gautier had said with a youthful exaggeration, which, however, well expressed one of the animating principles of romanticism, that everything that was useful was hateful. "I had rather forswear potatoes than roses," he said; "and I do not think there is more than one utilitarian in the world capable of uprooting a bed of tulips in order to plant cabbages there." It is at first somewhat puzzling to find the landscape gardeners engaged in setting out

cabbages picturesquely. Yet that is what happened, and we may understand it when we recall the double origin of romanticism in a feeling of the picturesqueness of man as well as of nature. That men were brothers was part of the new creed, and it at once became necessary to know what was to be done with these newly-discovered relatives. Sheer picturesqueness could scarcely ameliorate the pangs of suffering humanity; these appealed with a new zeal to writers, who at once set about rectifying what was wrong. Thus, in France, George Sand made use of romantic methods to do away with what she thought abuses. In the same way in England, the real home of compromise, we find Dickens beginning, in 1838, the war against social wrong with his *Oliver Twist*. William Henry Ainsworth was meanwhile busying himself with the already obsolescent historical novel, and Bulwer was busy with the romantic exposition of the moral superiority of criminals. Home-born evil-doers took the place which in Scott's time had been occupied by the heroes of the past; the crusaders gave way to more informal murderers. The study of lofty heroes was carried on, as we shall see, by philosophers and historians, while fiction, which for nearly a century and a half has been the most sensitive means of expressing the prevailing thought of the time in all its fluctuations, led the way in the more careful study of the populace. Here, however, it was the most striking and picturesque objects that were first studied. Dickens desired to bring out what he called "the romantic aspect of familiar things," and he began with the study of vicious poverty. Bulwer had tried to show how excellent were highwaymen like Paul Clifford and murderers like Eugene Aram. Dickens was dissatisfied with these novels, and he undertook to show how pardonable was law-breaking in the condition of society at that time. Before *Oliver Twist* (1837) appeared the *Posthumous Papers of the Pickwick Club* (1836), and the *Sketches by Boz*, in the same year. *Nicholas Nickleby* was begun in 1838 and finished in the next year. In this, as is well known, he turned his attention to the long infamous barbarities of Yorkshire schools. Most of Dickens' subsequent novels were inspired by a firm purpose to accomplish some reform. The intention of a novel, however, is something very different from the execution; and in Dickens we find his desire to represent "the romantic side of familiar things," leading him to exaggerate, to be sure with delightful humor, one side of almost all the many characters which he introduces into his novels. It would be quite possible that each thing uttered by his characters might really have been said, but a marked exaggeration of the salient points of the people he writes about is what most frequently strikes his readers. We notice this in *Our Mutual Friend* quite as much as in his earliest work. If his writing seems to a later generation to smack of excess, it is because other writers have shown that equal vividness may be attained by greater economy. The change of taste was obvious in Dickens' lifetime. We have seen how Dickens answered Bulwer's early work, and in Thackeray's *Catherine*, which is reprinted in a less violent form than that in which it was first published in *Fraser's Magazine*, we notice how the melo-dramatic tone of *Oliver Twist* struck him. In Thackeray's longer novels, too, we find him continually holding his hand, and taking just those pains to be deliberate and exact which Dickens was forever neglecting. The contrast between the two writers was not merely a personal one between two rival claimants for the popular favor; it was one between the fashion of the time and the fashion that was to succeed it—between romanticism and the realism that naturally and necessarily followed it. Just as, doubtless, Fielding was induced by Richardson's delicacy to add to the roystering tone of his own novels, so we may presume did Dickens' exaggeration tend to make Thackeray's work more polished. Already in *Bleak House* we see Dickens abandoning the

study of a single hero and taking up the study of a careful plot. This was a change that the age was making. We see it in Thackeray, whose early picturesque sketches were followed by descriptions of masses of society, and in other writers.

Carlyle was the mouth-piece of the strongly-felt need of individual heroism, such as, with some modifications, had inspired this early literature. Kingsley in his first stories gave it full expression, but, after the revolutions of 1848, heroes, so to speak, went out and society came in. We see the change in Germany, perhaps, even more clearly than in England. Kingsley's fervid rhetoric has now a remote sound, and in the work of succeeding novelists we find less stress laid on the hero and more on the manifold influences and complications of society. In Trollope's novels we have the conventional, in George Eliot's the philosophical exposition, of modern life. What recent novelists have shown is the interdependence of human beings, the relation that every man bears to his surroundings. Fiction has thus kept in close connection with society, reflecting not only its mood, but also its important changes, showing thereby that it has real life and does not exist as a mere literary form at the present time, like the modern drama or a great deal of modern English poetry. Even such novels as Mr. William Black's—which are certainly not the best, clear as they are—have much more genuineness in their composition than many of the more famous verses of his contemporaries. In the novels, too, we see the steady inclination of modern literature towards realism.

The novels of Charlotte Brontë, published between 1847 and 1853, opened fresh stores of delight to the reader. The books are full of romantic interest, which is only intensified by its realistic setting, and few writers have shown such power of delineating passion. Mrs. Gaskell's novels lack that fierce intensity, but they are admirable books, and full of humor as well as pathos. Mrs. Oliphant, a most industrious writer, carries on the same tradition. Her excellent stories have left romanticism far behind them, and they show no trace of the struggle with social wrongs which inspired Mrs. Gaskell, as well as the other writers of her time; but the three writers are alike in the precision with which they represent the life of women. There is a touch of artificial grandeur about Charlotte Brontë's men, but the other two novelists draw admirably the domestic lives of their heroes.

The English poetry of the last fifty years has received much admiration. That is something, however, that has never been lacking, even in times of extreme poetical drought. Young readers are always ready to praise those of their contemporaries who repeat to them their own sensations in a novel form. Whether the fame of the poetry of this period will last is a question that time will answer, but it may be fair to doubt the importance of much modern verse. That a great deal of pains has been expended on expression cannot be denied, but whether the poetry that has been most admired has been burdened with an important message is still an open question. Tennyson began to write under the influence of Keats, and he gave the world a number of short pieces in which precision of phrase, careful workmanship, and some of the more immediately striking qualities of artistic taste are plainly visible. His method in these minor pieces shows the same traits of artificial grace and modern sentimental pathos that we see in the pictures of the once-famous pre-Raphaelite school of a few years ago. His *Maud* is an attempt to put into verse the tragedy of modern life, but it is scarcely a success. The *Enoch Arden* and the few short idylls of contemporary life in England abound with a cold, ornate simplicity which stands in the same relation to the work of the great poets of the latter half of the century that the poetry of the later followers of Pope does to that of their great master.

The remoteness of modern poetry from contemporary life is shown by nothing more vividly than by its artificial prolongation of romanticism, which was at one period a healthy, natural impulse, but is now a mere temporary diversion, like a back-eddy that one sees near the bank of a swift stream. The whole movement of the Neo-romantic school in England is a frank confession of inability to deal with modern life, an undisguised effort to imitate, as if through thin tracing-paper, once successful work. The tone of the age is towards critical examination of the legends of the past and precision in the treatment of antiquity; yet one of the leading poets of the day invokes the shadowy King Arthur and endows him with modern feelings. William Morris, again, with false modesty, considering his numerous volumes, calls himself "an idle singer," and denounces the present time as "an empty day," but the emptiness is not in the day. He chooses the most simple, unconscious poet that has ever sung in English verse for his model, and gives us deliberate studies in wilful simplicity. Rossetti, on the other hand, selected the masters of literary artificiality for imitation, and outdid them in decorative work. Painting in England, we may remark, has followed a similar direction.

Fortunately, however, the present time has produced some writers who have dared to be themselves instead of throwing all their energy into being some one else. Browning, for instance, has never followed the tempting path into which many of his contemporaries strayed. He has suffered somewhat from the fact that he possesses a rare dramatic imagination in a period when the drama is dead and buried. Then, too, in a natural reaction from the current alliterations and the euphuistic abuse of adjectives, he has kept much of his verse needlessly rugged, for excess in one direction always does additional harm by inspiring excess in the other. He has, nevertheless, not wanted admirers, and, indeed, he has, within a few years, had an opportunity to enjoy honors which are generally delayed until after a great man is dead, and he has been able to see, doubtless to his surprise, how many interpretations pious disciples have been able to put on his writings.

Where Browning shows his modern spirit, his content with the air of his own time, is, of course, in his way of handling his subjects. For many of the things he writes about he is indebted to the romantic revival which unlocked vast amounts of unknown treasures, enriching literature in a way that it is hard for us to appreciate. Yet Browning is not a romanticist of the early kind, who were forever in peril of becoming melodramatic, nor yet one of the new kind, whose verses seem but one form of household decoration; but rather a poet of to-day, with the endless curiosity, combined with wide sympathy, such as are distinct traits of modern men. He neither tries to show that the most vicious person is thereby the most virtuous, nor does he shut himself up in a room with a dado to sing about pallid, wan-faced nymphs. Far from it: Browning writes about living people of flesh and blood, and he describes them with a realism which is far removed from mere petty precision of detail.

Clough's fame is not widespread in these days when much stress is laid on mechanical execution, yet there are few of his contemporaries whose verse so exactly expresses the thought that animated the controversies of his time. He and his friend, Mr. Matthew Arnold, will never be popular poets, but they will always have the admiration, and, what is better, the affection, of a certain number of readers who perceive the pathos of life. Much less known will always remain Ebenezer Jones, whose stammering measures gave but awkward expression to the utterances of an intense imagination. James Thomson, too, who died in 1882, had just published two volumes of verse which gave clear proof of the possession of technical skill and true feeling. It is to be hoped, and indeed

expected, that in the future this sincerity of feeling will be more respected than it is when the public taste is temporarily perverted by undue praise of exaggerated but picturesque emotions.

It may not be unfair to say that Swinburne has done as much as any one to make these cloying measures fashionable. He possesses magnificent lyrical gifts which cannot fail to do good to the mechanical part of poetry, and, now that he has abandoned the lush wantonness of much of his earlier verse, he shows great power in interpreting some of the elemental feelings that animate the social system of the day. This is but a cool manner of describing Swinburne's passionate, dithyrambic verse, which is full of comprehension of the past and hope for the future. Yet the future which he sings is a very misty future, and very indistinct is the liberty which he chants so melodiously.

Chronologically, Landor of course belongs before Swinburne, but his absolute lack of connection with any time nearer than the Hellenic civilization permits mention of him here. He was truly a survival of ancient Greece, resembling one of those statues that are exhumed at times from beneath a street which has been a public way for centuries, and has lost all memory of the past amid the sordid needs of the present. His appearance in the full glory of the early romantic period was no stranger than it would have been in the time of the French classicism of a century earlier, for a Greek revival accompanied the birth of romanticism. He would always have been alone. His audience is small, but for those who admire the artful simplicity of his well-molded phrase, of his clear-cut epigrams, he is, and will always remain, a consummate master. His work is sculpture in verse, and his sonorous prose is an unattainable model. He seems to have been born to show an age of materialism what are purity of style and grandeur of phrase. He has had no equal followers, and it may be many centuries yet before another poet appears to show us in our own tongue what it was that people mean when they express admiration of the best work of the Greek classic writers, on which education has been based for four hundred years, with Landor for the only pupil who has learned his lesson.

In this brief sketch it has been necessary to overlook many things; such as, for instance, the transitory notoriety of the "spasmodic school," which barely lived long enough to receive the name that is now its epitaph. Alexander Smith wrote some pretty lines, but he had no significance as a poet, and P. J. Bailey, the author of *Festus*, suffers from the resemblance of the title of that poem to *Faust*. It might be interesting to examine with some clearness the vagaries of Arthur O'Shaughnessy, Mr. J. Payn, and Mr. Marzials, all of whom are very modern poets; and more serious attention is demanded by Mrs. Browning and Miss Rossetti. Mrs. Browning had considerable poetical feeling and an abundant vein of sentiment which was always ready to grow into sentimentality; her facility of expression too frequently became profusion. Yet she well repays study as one of the more important of the women who within a century have taken up literature. In the interchange of thought which makes up literature it is interesting to observe the direct influence of the women who write; and what we notice in her and in her more illustrious contemporaries, George Eliot and George Sand, is a swift application of the current thought to the practical questions of daily life. Abstract questions interest them mainly as possible solutions of the problems of, one might say, daily life. Thus, in the Italian war of independence, Mrs. Browning sees not the exultant joy in the market-place for a nation victorious over a detested enemy, but the mother who mourns her slain sons, and is yet proud of her sacrifice. George Sand, while busy with the discussion of the complete upheaval of society, applies every theory to some concrete instance of more or less

domestic life. In George Eliot, too, we see morality taken out of the seclusion of books on ethics and put to the test of daily wear and tear. As the number of women who write increases, we shall doubtless see the growth of this tendency. Miss Rossetti has written some charming verses that are marked by much feeling, especially of a religious sort, and great technical skill. Certainly, English poetry with this abundant and, in many respects, rich showing is justified in not turning to the colder paths of criticism, as it has been recommended to do.

There is seldom a lack of critics and teachers in the world, and certainly if the present generation goes astray it will not be for want of advice. The man who has had the most influence on his contemporaries during the last forty years is probably Carlyle. His importance lies in this that he was by far the greatest of the Englishmen of his time who taught the value of sincerity, who inculcated admiration for heroic endeavor as distinguished from the barren emotion of the poets on the apathy of common life. His fervor, his eloquence, are familiar to us all, and after the reign of reason in the eighteenth century, and the vast tempestuous whirl of Byronism, Carlyle's stern voice crying out the command to be one's self, to do one's duty, was a new sound. Yet just where one's duty lay was not perfectly clear. To do right is excellent but sometimes vague advice, and Carlyle seldom defined his meaning. To all the fervor of the romanticists in teaching the importance of the individual as something in itself grand and admirable he added the romantic detestation of utility. He shared the abhorrence which the whole school felt for practical instruction, for science, for positive tangible improvement. Yet his eloquence fertilized and prepared the ground for the seed that was to fall on it. He refused to say that the seed was good, but he was forever fitting the soil for its reception. He aroused the love of duty, and there he stopped; it was left to others to point out what the duty was. He reminded the world of the need to admire heroism; and the value of a man who fills his generation with ardent enthusiasm for duty and warm love of greatness cannot be easily estimated. Yet the thrilling response to the prophet's eloquence is a transitory emotion, and the moment one begins to analyze or explain one's admiration half of their fervor is lost. We see in Carlyle's own fate the insufficiency of his way of looking at things. He finally became so enthusiastic for force that the quality itself, without regard to its object, seemed holy in his eyes. In his admiration of individual force, which, it will not be forgotten, was contemporaneous with Balzac's study of *l'homme fort*, he overlooked the way in which national forces work together for some great end, and also how even wider forces work together on all civilized men for the accomplishment of progress. We shall see later how the recognition of these facts affected modern thought.

Before we come to that, however, it will be necessary for us to consider another writer who has had an enormous influence on some of his contemporaries, and an influence that shares many of the peculiarities which we notice in that of Carlyle. This writer is John Ruskin, and the remoteness from the English people of any wise comprehension of art sufficiently explains the apparent anachronism of his appearance at this late day. For in Ruskin we find romanticism applied to the fine arts. We have seen it in poetry and in fiction; Carlyle illustrates it applied to ethical thought; it affected every interest, for is not imperialism in politics one of its manifestations? However this may be, as it appears in Ruskin's writing it is as a vigorous denunciation of the pseudo-classical painters, extreme condemnation of the modern French school, and most enthusiastic praise of the glowing splendor of Turner.

Ruskin's advocacy of Turner's work has been unwearied. His unrivalled eloquence has been directed to proving him the greatest of modern painters. This

is very natural, for if Ruskin represents romanticism in critical writing about art, Turner represents in painting the melodramatic spirit which is so abundant in romantic literature. Ruskin takes Turner's work to pieces, and shows that this bit is true and that the other is also true, just as literary critics have shown that this and that sentence in Victor Hugo or Dickens might be uttered in certain circumstances; but after all is done the impression still remains on the student of Turner that the whole sum of his work represents something beyond Nature—that he is a melodramatic painter.

Another instance of Ruskin's romanticism is his ardent admiration for the wilful attempts of the pre-Raphaelites to be mediæval, a movement which exactly corresponds with some of the forms of romanticism in literature. That past was discovered anew, and it seemed the most valuable model; and in Ruskin's praise of the great Italian artists, Michael Angelo and Raphael, as well as the Venetian school, we see the equivalent of the renewed interest in Shakespeare and the whole Elizabethan drama. For this service romanticism deserves and receives all praise, but when we find it turning its back on the present in order to be a bad copy of the past, we see that it has outlived its best work. The most intelligent eclecticism, if not sterile, produces hybrids. The followers of Ruskin, who do not distinguish the wheat from the chaff in the copious writings of their master, look with considerable scorn on the sole natural, as distinguished from literary, art of the present day—that, for instance, of J. F. Millet—with very much the same impatience that a thorough-going romantic writer must feel when he tries to read the work of a realist—as if, in a word, the glory of life were wholly overlooked.

Yet the very grotesqueness of the romantic exaggerations is but proof of the original fervor. When we read Ruskin's curious medley of talk about pictures, political economy, the beauty of mountains, and of sincerity, one is impressed with the feeling that there are some things which the warmest *a-priori* inspiration cannot accomplish—that enthusiasm has its place, but that it is not omnipotent. It has done its work, and even if it has tried to do a great deal more, it should not be judged too harshly. When Mr. Ruskin denounces railroads and factories and science, he is talking pure romanticism, such as inspired Théophile Gautier when he wrote his preface to *Mademoiselle de Maupin*—such as in later years inspired Carlyle; it was, in one way perhaps, intolerance of practical detail. Romanticism, we must not forget, stands wholly outside of the idea of growth. This is not a peculiarity of romanticism alone, but a distinguishing trait of all periods of great emotional excitement. The renaissance at first inspired pure intellectual ardor; then, when its first fury was extinct, it became a cold-blooded imitation of classicism as interpreted by pedants. It is not in periods of great religious fervor that one finds the narrow bonds and details of sects insisted on; they become prominent later, when faith is cool and trifles take the place of principles. In just the same manner the romantic writers swept away the rigid routine of the past and brought all manner of forgotten truths before the world, dissolving arid superstitions; it is only later, when questions begin to be asked, when the original impulse is growing cool, that we find the law applied to the new material. We now-a-days are but pruning, revising, correcting our predecessors, and we are but once more bringing into notice the law of growth which was stated by Herder a century ago, and overlooked everywhere, except in Germany, as a bit of cold and profitless eighteenth-century reasoning. The true romanticist would have nothing to do with it; he would wear no fetters, and consequently he has become a mere declaimer to deaf ears, who is left behind by men who acknowledge that romanticism must have a sequel.

This is all in accordance with the German proverb,

that it is carefully provided that trees shall not grow into the sky. Each generation has its own message to deliver, and the fervor which enables it to struggle on against prejudice, opposition, and that deadliest foe to progress, indifference, hardens it against those who bring forward some modification or novel application of their own principles. They can answer all the arguments of the past, but they cannot cast their minds into the future; just as social reformers wish every one above them to be overthrown, and desire their own condition to be the norm, so do they believe that beyond them truth may not go.

We may see an illustration of this in the way the romantic leaders regarded John Stuart Mill, who represented the reaction against the emotional enthusiasm by which they were inspired. He had the same object in view as they had—namely, the amelioration of the race—but his method of attaining it was entirely different. He applied his reason to the discussion of similar problems. In the eighteenth century the object of interest had been a philosophical, abstract man; romanticism created the notion of what we take to be the real man, with failings as well as with aspirations. Carlyle appealed to the aspirations. Mill argued with the prejudices and convictions of a later generation; his influence was, and still is, very great.

Yet while in Mill we see beneath a cool exterior a warm nature that was not wholly suppressed by education and training, Macaulay represents in all its mechanical neatness the practical spirit and complacent content which Carlyle was forever denouncing in vain. Macaulay drew his vivid pictures in plain black and white, with no more consciousness of the mystery of things, of the baffling questions that gather about the study of life, whether in the present or the past, than have the color-blind of the majesty of sunset or the varying tints of the landscape. He treated bygone days with the easy assurance that a prophet displays when in full flood of eloquence about the future. He was proof against contradiction and argument. Yet his lucid style and his masterly arrangement of abundant facts must have fostered a love of reading among multitudes who, but for him, would never have approached the higher walks of literature. This is something for which Macaulay deserves respect; he carried out the principles that were warmly supported by poets like Wordsworth and Southey, and by what in distinction are called practical men, in doing his part in the education of the people.

In the hands of later writers literary criticism has become much more complex. Macaulay's dogmatism has been succeeded by the perception of the half-tints and shades that make the final appreciation of works of art a delicate and difficult matter. No English writer has more earnestly insisted on the need of carefully weighing all the various qualities that go to form a piece of literary work than has Mr. Matthew Arnold. This writer is not only a philosopher—not, to be sure, of the schools—but one who in his books on theology has examined the most serious problems of human life, and a poet who has remained firm in his allegiance to the higher subjects of poetry in a time when dexterity of execution has seemed the most important thing. He has brought to the discussion of literary matters the wide cultivation of a delicate taste. No one has done more than he, it may be safe to say, to open the ears of Englishmen to what is uttered in foreign lands. He has brought to his fellow-countrymen the results of the best French thought of modern times, and at times he has acted as an interpreter between Germany and England. In doing this service he has met with some opposition: a certain provincialism has inspired the objection that this course renders a man unfit to judge of what is done at home—that this enlargement of his vision cannot fail to obscure his mind. Mr. Arnold's essays are a sufficient answer to such statements, which might possibly have some weight in the unsupposable case that thought

observed geographical limits, and never strayed from one country to another. It is sufficiently obvious to any one who has studied literature even superficially that such is very far from being the case. For a single instance, take the influence of the French Revolution on English literature in the first quarter of this century, and it at once becomes clear that the student is aided rather than confused by investigating what was done across the Channel. Moreover, even if this were not true, the study of the vicissitudes of any remote literature would be profitable, just as the study of any history is full of lessons to the thoughtful reader.

Possibly Mr. Arnold's ardor led him to more enthusiastic admiration of certain French methods than can command universal assent. There seems a lack of historical tact in commending the French Academy, as he has done, to English-speaking people, with their history behind them; but enthusiasm is a pardonable error in a reformer. It certainly has not led him to disloyalty to the magnificent abundance of English literature, or to raise up an altar to foreign provincialism in the place of that which is native to the soil. He is simply one of the leaders of thought who anticipate the practical men of the future in seeing that civilization is a unit, and not an accumulation of diverse and separate institutions.

The late Mr. Walter Bagehot was a valuable critic of moderate scope. Mr. Swinburne has given the world some prose essays which are interesting and often valuable, although at times marred by extravagance. His most important work has been the praise of English poets, of the past as well as of the present. For one thing, he is singularly and admirably free from petty jealousies. Mr. Leslie Stephen has written, and, fortunately, continues to write, papers of literary criticism which are always full of meaning, although at times they are marred by a note of crude, boyish indifference to delicate distinctions. Of course the boundary-line between delicacy and effeminacy is one not easily drawn, but in his reaction against the affectations of the lily-lovers, Mr. Stephen in his essays sometimes betrays what may be called an eighteenth-century violence. In his most important book, however, he is free from this fault. His *History of English Thought in the Eighteenth Century* is one of the more important works of recent date. It is a model of what is still rare in English literature of historical criticism which is not the expression of likes and dislikes or the defence of the decisions of taste, but the interpretation of the matter under discussion by the investigation of the causes and attendant phenomena. This method, which has long been familiar to Germany, is the result of the welding of science and literature, which is one of the more interesting modifications of modern thought.

Mr. John Morley's writings do an important service in widening the literary horizon of England. His lives of Voltaire, Rousseau, and Diderot are most valuable contributions to modern history, and have been of especial merit in correcting the narrowness with which the English were disposed to judge these three remarkable men, against whom there had existed a bitter prejudice, handed down from what we may call the stalwart conservatives of the last century. Mr. Morley's *Essays* are full of interest, not merely from the intelligent literary criticism which they contain, but also because the writer has a wide comprehension of the fact that literature is not merely an art by itself, but rather the vehicle in which are expressed the hopes, interests, and aspirations of the time. It is the perception of this connection between literature and humanity which makes Mr. Morley one of the most prominent writers of the present day. It is curious to notice, however, that he has not inspired most of the contributors to the "English Men-of-Letters Series," which he edits, with his own comprehension of the dependence of different authors on one another and on their own and earlier time. In most of the volumes

we find the writer under discussion treated as if he were an absolutely singular phenomenon, unrelated to anything in the universe. Mr. Morley's volumes on Burke and Cobden abound with political wisdom, and it is one of the most marked traits of this author that his great intelligence and wide and careful training are mainly devoted to furthering the good of mankind. Many writers treat literature as if it were a remote thing, like painting on china; with him it is a means of civilization.

Mr. J. A. Symonds has discussed many chapters of literary history, and his *History of the Renaissance in Italy* carries him into deep waters. His discussion of this important period is marked by most intelligent sympathy and discreet criticism, and is an admirable proof of the wideness of the interests of the present day. The book is a masterpiece.

The consideration of the minor writers of promise would carry us too far. It is interesting to see in literature the widening of interest among the cultivated classes, and the way in which the modern spirit is gradually making its way into England. Much yet remains before its work is done with anything like thoroughness. There is now a wide chasm between the leaders and the huge untrained band of ordinary writers. England, the country that has made the most important contributions that the present century has seen to the arrangement of the accumulated knowledge of ages in Darwin's theory of evolution, has, though with some exceptions, remained singularly indifferent to the importance of this great step, which is meanwhile inspiring good work in Germany, where for a century the historical method had been followed in almost every department of work, and in France, where it is now taken up by the younger men.

Darwin's theory, which has made over again the classification of knowledge, need not be described here. It is curious to observe that the need of some systematic arrangement was felt by other investigators. Not only did Mr. Wallace contemporaneously light on one part of the truth, and Mr. Spencer advance towards it from another direction, but there had been other men shooting at the same mark. Comte's classification of human knowledge was an empirical attempt to accomplish the same end, but in its singular incoherence it bears the mark of being an ingenious guess rather than the result of generally convincing arguments. Buckle a few years later made another attempt, in which we see the confusion wrought by an exaggerated notion of the power of the metaphysical conception of law.

That literature has been influenced by the new vigor given to science is sufficiently clear to every one who has observed its course of late years. Every department of intellectual work has responded to the impulse which Darwin's theory gave to the thinking world. History has been made over, one may fairly say; criticism, which, rightly understood, is a subdivision of history, at last rests on a firm foundation, instead of being the expression of casual likes and dislikes; and men of science, like Huxley, Tyndall, and the late Professor Clifford, have all enriched literature by the application of scientific methods to topics of general interest. This, however, is but the smallest part of what the renewed interest in science is accomplishing. Its indirect influence on literature cannot fail to be productive of great results, for the men who are taught to regard Nature and humanity in a new way cannot fail to express their feelings in new forms, or at least in important modifications of the old forms. Every great change in human thought is an inspiration to literature, because literature is nothing more or less than one form of expression of the thoughts of a time. (T. S. P.)

ENSILAGE. This word, together with the term *silo*, has been adopted from the French, in connection with a system of providing cattle with green forage throughout the year. The word *silo* denotes the pit,

ensilo the process of pitting, and *ensilage* the product, or pitted material. As different plants are preserved by this method, the single word ensilage is incomplete, and "ensilage of corn," "ensilage of clover," or the like, is necessary to a clear understanding of the article referred to; yet usage already makes "ensilage" alone mean pitted corn-plants. Prof. McBryde quotes passages from the writings of Cato, Varro, Columella, and Pliny, showing that the word *sirus* denoted an underground pit used for the storage of grain and green crops, at a very early period, by the people of Cappadocia, Thrace, Spain, different parts of Africa, and the East. The requirements for the ancient *sirus* were the same as those deemed essential for the modern *silo*, protection of the contents from contact with sides of pit, if of earth, by a straw lining, dryness, and perfect exclusion of the air.

It is not easy to trace this method of preserving green forage down to the present time. It is known to have been in practice in Hungary at the opening of the nineteenth century, and in Germany not many years later. The process in East Prussia was well described by Grieswald in 1842, and similar accounts exist of its application in Spain, France, and Mexico, to the preservation of different vegetable products, including the leaves of trees and vines. In Germany it was especially useful in keeping beet leaves and beet pulp in connection with the sugar industry. The French adopted it from the Germans and used it in the same way until a beet-sugar manufacturer, Adolph Reihlen, near Stuttgart, accidentally applied it to maize about the year 1855. Auguste Goffart began a series of experiments with the ensilage of maize, at his farm near Burtin, Loir-et-Cher, France, about the same time. These two, with their countrymen Crevat, Piret, Grandeau, and Leconteaux, have the credit of bringing the system, after years of trial, to a state of greater perfection and economy than exists elsewhere in Europe. It was mainly through the efforts of M. Goffart and the attention his work attracted, that the silo was introduced into the United States.

In the year 1873, and again in August, 1874, a description of the Hungarian method of making "sour fodder" in the crude trench form, appeared in *The American Agriculturist*. The same journal published in June, 1875, an illustrated account of the European experiments with ensilage, based upon reports in the *Journal d'Agriculture Pratique* of Paris. The report of the United States Department of Agriculture for 1875 contained (pp. 397-408) a full description of "The French Mode of Curing Forage," its origin, the silos, the usual methods of cultivating crops for and making the ensilage, effects of fermentation in the silo, and value of the ensilage in stock-feeding. The general principles of ensilage were applied to the preservation of different products in numerous places in America, between 1870 and 1880. Prof. Manly Miles, at the Illinois Industrial University, kept broom-corn seed and the green corn plant, whole, in this way for months. In dairying districts brewers' grains were similarly preserved in pits. In September, 1877, *The American Agriculturist*, under the title "An American Silo," described and illustrated a dairy barn in Westchester co., N. Y., which contained a cellar or pit, especially constructed for storing brewers' grains and preventing their fermentation and decay by pressure and the exclusion of air. M. Goffart's book on *The Ensilage of Maize* (1877) was noticed in a paper read by ex-Gov. R. M. Price, of New Jersey, Dec. 6, 1878, at the International Dairy Fair, New York city, and subsequently printed in its *Proceedings*; the subject attracted much attention and was discussed by the farmers and dairymen present. This was undoubtedly the first presentation of ensilage in a public meeting in America. In 1879 a translation of Goffart's book was published in New York by J. B. Brown. Other American publications are: *The Book of Ensilage*, by Dr. John M. Bailey (Boston,

1880); *Ensilage of Green Forage Crops in Silos*, by H. R. Stevens (Boston, 1881); *Silos and Ensilage*, by Dr. Geo. Thurber (New York, 1881); and *Soiling, Summer and Winter*, by F. S. Peer (Rochester, 1882). Since 1880 the agricultural press of America has maintained an active discussion of the merits of ensilage, with many statements of practical trials. At least nine-tenths of all persons who have practised the system for a year or two give unqualified testimony in its favor, as being economical and advantageous.

The first person who built silos and made ensilage of corn in quantity for cattle food, in the United States, was Francis Morris, of Oakland Manor, Howard co., Md. Having read an account of the process in a French newspaper, early in 1876, he opened a correspondence with M. Goffart, and in the same year he raised five acres of corn in drills and preserved it in silos, repeating the trial the following year. It was his experience that was given at the Dairy Fair, as already noted. From this beginning, the system has rapidly spread in America; and in 1882 there were hundreds of silos, of varied forms and sizes, in use in different parts of the country. They are chiefly in the Eastern and Middle States, but also as far south as Georgia and as far west as Nebraska.

Silos may be built wholly above the surface of the ground, partly excavated, or entirely underground, and may be made of stone, brick, concrete, wood, or earth. The location, form, and material for any silo should be largely governed by the surrounding circumstances. Therefore only general directions can be given. The requirements in building a good ice-house apply well to a silo. It must be strong enough to hold its solid contents at 50 pounds per cubic foot and the weight or pressure placed upon the upper surface. It should be air-tight and water-tight. Whether it must be so placed as to protect the contents from the action of frost is still an open question, but ensilage is probably not liable to injury by freezing, while under pressure. When equally convenient, it is desirable to place a silo so as to maintain an even temperature of its contents at all seasons. The location should be such as to facilitate filling and also removing the ensilage. It is well to have the bottom on a level with, or not much below, the feeding floor, with a door into the silo from this floor, through which the ensilage is taken out. The opening must be made air-tight. The inner walls of the silo must be vertical and their surface smooth, to permit the ensilage to settle evenly in the pit and for the cover to follow. To avoid angles, silos have been built in Europe, and a few in America, of oval form, horizontally, but the usual form is rectangular. A large upper surface is not desirable, and the depth should be as much as either length or width, preferably more. Several small silos, independent or connecting, are better than one large one. A good size is that which, with accompanying facilities, enables the filling, covering, and weighting of a compartment to be done in one day, or in two days at the most. Yet such rapid work is not essential, and it will answer if, from the commencement of the filling, at least two feet in depth of ensilage over the whole surface can be put in daily until the work is done. In calculating the size for a silo, a rule approximately accurate is to allow one and one-half cubic feet of space, in the portion to be filled by the ensilage after its compression, for every day that it is desired to feed the material, as the only coarse fodder, to 1000 pounds live weight. Thus, a silo 12 feet long, 10 feet wide, and 16 feet deep, contents to be compressed to about 12 feet depth, will contain from 30 to 35 tons, or enough, allowing for waste, to feed three cows for a year. Forty-five cubic feet will generally hold a ton, and this is a maximum allowance for an animal for one month. A substantial masonry silo, by greater durability and better action, will generally be found true economy, yet cheaper structures, with walls of wood or earth, do very well. Silos are in use, and satisfactory, built

wholly above ground, the walls of two thicknesses of inch boards, with and without tarred paper between. Under-ground silos, if not cement-lined, must have thorough drainage. Successful silos have been made by excavations in a heavy clay soil and in the side of a compact, well-drained gravel bank; in these cases the walls are coated with cement mortar, like a cistern, or the earth-walls left bare and simply a layer of straw, as a lining, placed between the earth and the ensilage. The crude form of the silo still in use, in parts of Europe, is a long, narrow trench, with sloping sides; this is filled with fodder, cut or uncut, and as much more piled above; the whole is then banked up and covered closely with earth, which serves both for pressure and sealing. This is, substantially, the kind of silo used by Mr. Morris, of Maryland.

Indian corn, rye, oats, the different millets and clovers, vetches, the cow-pea, beet tops and various grasses, can be successfully preserved green, as ensilage. But corn is so easily grown and is so much more productive on a given area than all other plants yet tried, that it is the ensilage crop *par excellence* in America. The large varieties with luxuriant foliage, regardless of grain, are those best adapted to the purpose. The corn is best grown in drills, three or four feet apart, on highly manured land, and thoroughly cultivated during growth. Crops of 20 to 30 tons of green fodder are commonly obtained; much larger crops have been claimed, but the average is rather below 20 tons than above it. The best time for cutting is when the plant is approaching maturity, after the ears have formed but before any part begins to dry.

In filling the silo, the fodder, whatever it be, should be cut and taken from the field without delay, to a chaffing machine placed near the silo, and then quickly cut into lengths of not less than $\frac{1}{4}$ inch nor more than one inch. Experienced persons differ in judgment as to the length of cut; the greater number prefer to make it nearly one inch, if not quite. The chopped fodder should pass at once to the silo; carriers attached to the cutters are economical. In the silo the material must be spread of even thickness and moderately tramped down, as the filling proceeds; these are points of importance and require careful attention. The fresher the fodder when it goes into the silo and the sooner the compartment is filled, the better. No harm results from the material being quite wet with dew or rain at the time of pitting. In order to have the silo full, after settling, there should be an upward extension of the walls, one-fourth to one-third the depth of the silo, and the filling should be to the top of it. This curb or apron may be a temporary arrangement of boards, to be removed after the ensilage has fully settled. Immediately after the silo has been filled, a cover of stiff planks should be put on, closely fitting, yet just loose enough to prevent catching on the side walls during the settling. A second course of planks placed so as to cover the joints of the first is desirable. Upon the cover apply pressure in any convenient but effective form. The simplest method is by weights, using 150 to 250 pounds to the square foot of surface; these limits are safe without regard to the depth of the silo. The object is to force out air and prevent fermentation, and the weight is only needed for the uppermost six feet of ensilage, all below that depth being sufficiently compressed by the weight of the mass above. There are several devices in use for applying the pressure by screws and levers. A continuous following pressure is the best; the details are immaterial. When the cover rests directly upon the ensilage, it is usually found upon opening that two or three inches in depth has moulded and become unfit for food; this can be avoided by putting a layer of two inches thickness of cut straw upon the ensilage before covering the pit.

Harvesting the crop and filling the silo are the main items of labor in connection with ensilage, and it is in this work that the greatest opportunity occurs for sys-

tem and economy. The location of the growing crop, with reference to the silo, and the arrangement for hauling, cutting, storing, and pressing, require good judgment. Ensilage in the silo costs from one to four dollars a ton, according to management; this includes seed, manure, use of land, and all labor. The average cost in the United States, during the season of 1881, was about \$2.25 per ton. Ensilage being four-fifths water, the solid substance costs just about the same as its equivalent in dried fodder at usual market rates.

The silo should remain undisturbed long enough for the fermentation to reach its maximum, and the whole mass then becomes cooled. In several practical tests the greatest heat has been found between the fourth and eighth days after closing the pit, and it has required several weeks to thoroughly cool. It is usually from ten to twelve weeks before the ensilage is in good condition for keeping and feeding, and it may be left as many months without injury. Upon opening a small part of the cover should be removed at a time, and the section thus exposed cut down from top to bottom like hay in a mow. If by cutting the exposed surface is changed daily in warm weather, and twice a week when cold, no decay occurs on the cut face of the ensilage. Corn ensilage comes from the silo in a moist condition, of a dark greenish-brown color, and with a pungent odor and more or less acid taste. The extent of the fermentation in the silo and the degree of acidity developed are very variable; these are important points not yet under control, and not likely to be until careful investigations throw more light upon the chemical processes of the silo.

As a rule, all horses, mules, cattle, sheep, swine, and poultry are fond of ensilage. Occasionally an animal will be found to refuse it when first offered, but these soon learn to like it and, with the rest, eat it with avidity. Most farm animals prefer ensilage to the best of dry forage, and many will eat it rather than good roots when both are placed before them. The acidity seems unobjectionable when the ensilage is fed fresh from the silo; but if kept loosened up for half a day or a day the material becomes less acid, its greenish hue brightens, and it is then eaten with more relish. That it is very palatable is shown by cattle eating a much greater weight of ensilage per day than the same animals do habitually of green grass or growing corn fodder. A cow or steer of 1000 pounds weight will often eat 120 pounds and sometimes 140 pounds ensilage in a day. From the many practical results on record it is plain that corn ensilage cannot be fed alone with profit, unless it be merely as a maintenance ration, and for a limited time. Store-hogs have been wintered upon ensilage alone without loss, but the corn plant is an incomplete food, both in its growing state and as ensilage. The best results have been those where ensilage has been fed in limited quantities, 40, 50, and not exceeding 60 pounds per day to 1000 pounds live weight, and in connection with liberal grain feeding to secure the proper nutritive ratio. Many careful feeders prefer that the ensilage should not constitute the only coarse forage, and so use only 40 or 30 pounds with 5 to 10 pounds of hay added, besides grain. Some well-conducted trials show most satisfactory results from using ensilage mainly as a condiment or addition to the usual dry winter diet and as a substitute for roots. In nearly all cases where ensilage is used as a considerable portion of the daily ration for horses and cattle, but not exclusively, its excellent hygienic effect is apparent in the thrifty appearance and action of the animals, their smooth coats, and the healthy condition of the bowels. Ensilage tends to maintain the flow of animals in milk, like any other succulent food. In the case of breeding ewes it has been substituted for turnips with satisfactory results, and their lambs have learned to eat it sooner than any other food. Milch cows on an ordinary winter diet show a marked gain in quantity of milk and some in quality, if a portion of ensilage be added to their daily ration. No such gains

result from entirely substituting ensilage for other coarse fodder. Errors have arisen from comparing corn ensilage with hay, straw, and other kinds of food. No such comparison can be justly made until ensilage as a food has a more even quality, so that a standard may be fixed. The primary question is as to the effect of this process of preserving any forage plant. What is the feeding value of clover or rye as ensilage compared with the same plant in its growing state, or preserved by drying? Likewise corn ensilage must be compared with the green maize, cured corn fodder, or stover and grain. Chemical and practical comparisons made on this basis show that the nutritive value, digestibility, waste in feeding and result at the pail, are substantially alike in equal quantities of corn, whether cured as fodder or ensiled. When such results are verified the whole problem is reduced to one of convenience and economy in the method of curing, storing, and feeding out the forage crops. With the exception of feeding, the advantages are on the side of ensilage when managed under the most favorable conditions. With well-cured corn-stalks $1\frac{1}{2}$ tons must be handled to give animals a ton of solid food; with ensilage of corn fully five tons are needed to make one of solid food. The large proportion of water in ensilage is not a direct loss, however, for animals fed largely upon it drink very little, and the effect is better when the water is thus combined with the food than when taken separately.

The chemistry of the silo is much in the dark. It is not known why ensilage from different silos varies so much, nor just what the course of chemical change is which occurs in the process, nor the effects upon the food value of the material. Opinions among good authorities range from the claim that the ensilage of any given plant is a better food than the same dried, or even in the growing state, because of greater digestibility, to the assertion of considerable losses in nutritive value by the destruction of carb-hydrates through fermentation. There is need of further investigation, carefully conducted, although the heat generated, and the smells, now of alcohol and now of vinegar, are sufficient evidence of the loss of sugar in the process. The degree and nature of the acidity developed is a matter of interest and importance. That free acid exists in ensilage, usually in considerable quantity, is agreed. But is it acetic acid or lactic? It makes a vast difference whether a milk-producing animal is fed sauerkraut or pickles. The closest determination recorded gives an average of 3.69 per cent. of free acid in samples of corn ensilage analyzed, and classes it as acetic. If this be true, an animal eating 110 pounds of such ensilage a day consumes 3 quarts of strong vinegar, and a milch cow fed 50 or 60 pounds is given 3 pints of vinegar. This is hardly a proper diet to make "food for babes."

With such knowledge of the subject as is available up to present time, the conclusions in America are these: 1. That one or more silos, well built, and not too large, may be relied upon as convenient and economical on most farms, to preserve green any forage crop which circumstances prevent curing, or crops specially grown to supply succulent food for the winter season. 2. That this system of storing forage may be pursued almost regardless of the weather, and timed so that the labor will come at a season when other farm-work is not pressing. 3. That with due care the process of ensiling will preserve green forage in an edible condition, but subject to an uncertain loss in its nutritive value. 4. That as cattle food it forms a good and cheap substitute for roots, but the crops generally thus used fail to fill the place of the root in a judicious farm rotation. 5. That in feeding ensilage to farm animals the best results follow a moderate ration, rather than its entire substitution for dry coarse fodder. 6. That the extensive use of ensilage upon any farm is mainly a question of convenience and economy to be decided by the local conditions. (H. E. A.)

ENTRY is, in law, the act of entering upon real estate in order to take possession thereof. It was at the common law an indispensable prerequisite to complete ownership. An heir could not have the absolute ownership of real estate until he had made an entry thereon; and, in case of his death before entering, the estate did not descend to his heirs, but to the heirs of the prior possessor. This doctrine was an outgrowth of the feudal system and its policy; in the earliest days, upon the conveyance of land, the parties always went upon the land together, and livery of seisin was given by the grantor to the grantee, whereby a clod of earth or a twig was handed by the former to the latter as a symbol of the delivery of the ownership of the whole tract of land, in the presence of witnesses of the neighborhood. This ceremony was formerly requisite to a conveyance, and, after deeds came into use, still continued to be a part of the formality attending such a conveyance. Its object was to give notoriety, so that those interested might know to whom lands belonged, and so that the owner might be able to prove his ownership. The necessity of an entry applied in England to the case of leases as well as to conveyances of the freehold. In America this doctrine has not been generally received very favorably. It was in early days recognized, and was the law of many or probably all of the States, but has been generally altered by statute; and it is now generally the law in this country that any interest of any kind to which an ancestor was entitled shall descend upon the heir; therefore, if an ancestor die without having the actual seisin of land, but having a claim thereto, the heir has the same claim the ancestor had, and can, in a proper case, gain complete possession by his own entry. An entry by a party turned out of possession was also a remedy for many cases where a person had a claim to real estate. The ancient law was very technical upon this subject, and drew many fine distinctions between actual possession, the apparent and actual right of possession, and the right of property. An entry by the party himself who had been turned out was generally a proper means of regaining possession for one who had the apparent right of possession, but not in any of the other cases; it was, in other words, generally a remedy against a mere wrong-doer; but, if the wrong-doer had died, the estate then, by virtue of his having had the seisin, descended upon his heir, and the heir thus gained an apparent right of possession, and could not be turned out merely by the act of the party who had been turned out by the ancestor of the heir. A *writ of entry* was one of the means to obtain possession in such a case as this, and was a regular suit, the object of which was to prove the plaintiff's right and how the defendant wrongfully obtained the possession. Moreover, when an entry was a remedy, it had to be pursued quietly and in a peaceable manner: the party could not go on the land and by force turn out the possessor, for he would thereby render himself liable both to a civil and a criminal action (forcible entry and detainer), but he could go upon the land quietly and break open an outer door of the house if necessary. These elaborate distinctions are for the most part done away with in this country, and now in England, and the actual possession and the right of property alone recognized; the right of property includes the ancient right of possession and right of property. The result of legislation, both in England and in this country, has been to extend the remedy by mere entry of the party dispossessed; thus in England a statute of Henry VIII. enacted that unless the ancestor had held the estate for five years its descent on the heir should not deprive the owner of his right to enter; and it is generally the law of this country that such a descent does not in any case bar the entry of the real owner, but in Pennsylvania the law is as established by the statute of Henry VIII. This old doctrine is known to lawyers as the tolling of an entry by a descent cast.

For the meaning of entry in criminal law see article BURGLARY, vol. I., p. 678. For a stranger to enter upon lands is generally a trespass for which he will be liable to suit. But it is sometimes the case that a party has the right to enter upon lands for certain purposes, even when they are rightfully in the possession of another. Thus, a landlord may enter upon lands leased by him, in order to levy a distress, to see whether waste has been committed, etc.; one may enter upon land to pick up his goods which have gotten there without his default; every one has a right to enter a public inn; and every one may enter upon another's land in order to abate a public nuisance maintained thereon. So, too, the law often gives a right of entry for the purpose of protecting the community from crime or of bringing criminals to trial, as, *e. g.*, in cases of arrest.

The word entry is also frequently used in common language and in law proceedings to indicate the writing down by a merchant or person transacting any business of the details of his business, as of goods delivered, etc., etc. If there be original entries made at the time the business was transacted, they form competent evidence to establish the claim; they must, however, have been actually made at or about the time, and not be mere charges transferred from one book to another, as, *e. g.*, the ledger.

Another use of the word entry is to express the entering of goods imported at a custom-house, when they, together with the invoice and a statement, are submitted to the proper officer to estimate the amount of duties to be paid on them. (W. M. M.)

EPHOD, a Hebrew term denoting a sacred vestment originally worn only by the high-priest, but afterwards by other priests, and deemed characteristic of the office. It is fully described in Exodus, chapters xxviii. and xxxix. It was made of thin plates of gold, with blue, purple, scarlet, and fine linen. Its two parts—one covering the back, the other the breast—were clasped together on the shoulders by two large onyx-stones, each having engraved on it the names of six of the tribes of Israel. The parts were also fastened at the waist by a "curious girdle" of the same materials as the ephod. The wearer was said to be "girded with a linen ephod." Attached to the ephod of the high-priest was the breast-plate of judgment, with the Urim and Thummim, and to this the term sometimes specially refers. The nature of this part of the ephod, and the manner of its use, have never been satisfactorily explained. By means of the Urim and Thummim divine direction was sought, but how it was given we are not informed. The words themselves, it is generally agreed, mean "light and perfection," but beyond this commentators confess their ignorance or deal in conjectures. The breast-plate contained twelve precious stones, arranged in four rows, set in gold, and having the names of the children of Israel engraved upon them. Many have identified these with the Urim and Thummim, but the statements of Scripture rather make a distinction between them. The breast-plate was fastened at the top by rings and chains of gold to the onyx-stones on the shoulders, and below with rings and blue lace to corresponding rings in the ephod, so as to keep it above the curious girdle. The robe of the ephod was a longer blue garment, on which the ephod rested; it was without sleeves, but had slits for the arms and an opening for the head to pass through. Its skirt was trimmed with pomegranates in blue, purple, and scarlet, alternating with bells of gold. In a few instances the ephod is mentioned as worn by others than priests, but it was then of coarse linen. It is also sometimes mentioned as used in idolatrous worship.

EPIDEMICS (Gr. *ἐπί*, "upon," and *δῆμος*, "the people"). An epidemic, in the popular sense, is something which is general, prevalent, affecting many people at the same time. It is commonly applied only to disease, but is also used metaphorically, as an

epidemic of speculation, etc. The term may be applied to any disease, since it denotes not a cause, but a result—it states not an essential characteristic of a disease, but one which may be either present or absent. An epidemic disease may or may not be endemic or specific. The older medical writers use the word in a narrower sense, which is perpetuated in the definition given by Dunglison, "A disease which attacks at the same time a number of individuals, and which is referred to some particular *constitutio aëris*, or epidemic constitution." In this sense an epidemic disease is one that is exceptional as well as widely diffused. The most extensively prevalent disease in the United States, and the one which has caused the greatest mortality, is consumption, yet it is not considered as an epidemic. Some French writers would limit the name "epidemic" to those diseases which never appear in isolated or sporadic cases in Europe unless imported—that is, to cholera, plague, and yellow fever. Others, as Monneret, characterize these as the "great epidemics." It is, however, impossible to maintain any essential distinction of this kind. A better classification is that of Leon Colin, who divides them into pestilential, endemic, and ordinary, corresponding very nearly with Dr. Guy's divisions of exotic, indigenous, and naturalized. The endemic diseases of Colin include only those which are confined to a limited locality beyond which they never extend.

In this article we shall consider only those forms of epidemic disease which are now generally supposed to be due to specific causes, and which are classed by modern German writers as the infective (not infectious) diseases. These have a special interest, not only because of their frequency and destructive effects, but because the belief is steadily gaining ground that they are all more or less preventable, and because such prevention requires something more than individual action. Few educated men now consider an epidemic as a manifestation of the anger of an offended Deity, which it is not only useless but impious to attempt to check, although there are still many who believe in the necessity of some mysterious entity called the epidemic constitution, or pandemic influence, to explain the course of extensive epidemics.

Epidemics have prevailed from the earliest times among all nations of which we have historic records. The Old Testament contains references to ten plagues, and the history of Rome before the Christian era includes thirty-two plagues. The first epidemic of which we have any definite account was the plague of Athens, 430–425 B. C., described by Thucydides, who ascribes its origin to Egypt. It is impossible to say positively what was the nature of this pestilence, but the probabilities are that it was a form of typhus. The first clear notice of the Oriental, or bubonic, plague is given by Rufus of Ephesus in the first century of our era. He refers to its existence in Libya, Syria, and Egypt. The Antoninian pest, 165–168 A. D., is described by Galen: it appears to have been a malignant form of small-pox by which, Ammianus Marcellinus says, the whole country, from Persia to the Rhine and Gaul, was filled with contagion and death. The next great epidemic recorded is the pest of 251–266 A. D., described by Cyprian. This appears to have been the Oriental plague, coming from Ethiopia and raging especially in Egypt. The sixth century after Christ was one of epidemics, including the great outbreak of the Justinian pest, which started from Egypt about 542 A. D., reached Italy in the following year, and spread through France and Germany in 545–546, recurring in 566.

Throughout the ninth, tenth, and eleventh centuries occurred a series of epidemics of a disease characterized by gangrene of the feet and hands. This affection, known to ancient writers as *Ignis sacer*, *Arsnea*, *Mal des Ardens*, and, after the twelfth century, as Saint Anthony's fire, is now known to have been, for the most part at least, what is now called ergotism,

due to the use of bread made from rye affected with ergot, a peculiar fungoid parasitic growth. The suffering and mortality from some of these epidemics were frightful, especially in France. Passing over numerous outbreaks of small-pox, typhus, and plague occurring between the seventh and thirteenth centuries, we come to the most destructive epidemic of which there is any extended record. This is the great outbreak of the Oriental plague in the fourteenth century which desolated Europe, Asia, and Africa, and which is known as the *Black Death*, or the *great mortality*. The very extensive literature relating to this outbreak has been carefully summed up by Hecker, whose work on the *Epidemics of the Middle Ages* is the great storehouse of information on this subject.

He traces the origin of this epidemic to China, where it was preceded by violent earthquakes and inundations, and by repeated famines. The disease appeared in 1347 in Constantinople, Cyprus, Sicily, and Marseilles, and in January, 1348, it reached Avignon and other cities in Southern France and Northern Italy. It reached England in August; Poland and Sweden in 1349, and Russia in 1351. The mortality was enormous; for instance, Florence lost 60,000, Venice 100,000, Paris 50,000, London 100,000. In many places in France not more than two out of twenty of the inhabitants were left alive. In Avignon the pope found it necessary to consecrate the Rhone, that bodies might be thrown into the river without delay, as the church-yards would no longer hold them. Italy lost half of its inhabitants. Hecker's estimate is that about one-fourth of all the inhabitants of Europe were carried off, amounting to not less than 25,000,000 persons.

The moral, social, and political effects of this epidemic were great and far-reaching. One of the most curious was the epidemic of convulsions which closely followed it, and which was called the dance of St. John or of St. Vitus, and is now generally known as the dancing mania. This was not really a new disease, since similar small localized outbreaks had been known and recorded in the previous century, and the phenomena have been observed in our own time, as in the "jerks," in Kentucky religious revivals about 1840. The dancing mania prevailed in the Netherlands and in Germany in 1374, and the following years. About the same time a very similar epidemic occurred in Italy. This was known as tarantism, being supposed to be due to the bite of a species of spider—the tarantula.

Throughout the end of the fourteenth and fifteenth centuries a series of epidemics, of plague, typhus, etc., occurred in Europe. The most remarkable of these was what is known as the sweating sickness, a disease which broke out in England in August, 1485, becoming conspicuous just after the battle of Bosworth. It rapidly spread throughout England and Wales, and produced great mortality, but it did not extend to Scotland or cross the Channel. A second outbreak occurred in 1506, also confined to England, as was a third in 1517. But in 1528 it again appeared in a very intense form, so that "between health and death there lay but a brief term of five or six hours," and in the following year it broke out at Hamburg, and thence traversed Germany, the Netherlands, and Scandinavia, causing many deaths and a terror entirely disproportionate to its effects.

The first epidemic of diphtheria of which we have any definite record is that which occurred in Spain, 1583–1618, where it was known under the name of *garrotillo*. It had been described, however, as early as the second century after Christ by Aretæus, under the name of *malum Egyptiacum*. In 1701 the disease appeared in the Levant, and in 1735 it broke out in New England. In 1739 it was generally prevalent in Europe, and since that date has rarely or never been wholly absent from all parts of the country. Between 1845 and 1856 it appeared over the larger part of Europe and North America, and between 1856

and 1865 it assumed the proportions of an epidemic. Recently it has prevailed in epidemic form in Poland and Southern Russia, and also in various towns in the northern and western portions of the United States.

The epidemics of the nineteenth century, which are the most noteworthy, are those due to cholera, cerebro-spinal meningitis, relapsing fever, and yellow fever. While cholera had been known for a long time, it attracted little or no attention as a specific pestilential disease until the outbreak in Bengal in 1817. This spread over a large part of Asia during the next six years, and then subsided. In 1826 and 1827 it reappeared in epidemic form in India, from which it spread gradually, reaching Russia in 1829, Western Europe in 1831, and North America in 1832, where it raged as an epidemic during that and the following year.

The second great pandemic of cholera occurred in 1847-48, and reached New York in December, 1848. It lingered in the United States until 1850. The third outbreak commenced in 1852, reaching North America in 1854, and the fourth occupied the period from 1863 to 1873, reaching North America in 1865. The fifth and last cholera period extends from 1873 to the present time. Its last prevalence in the United States was in 1873. (See CHOLERA IN AMERICA.)

The history of epidemic cerebro-spinal meningitis begins with its appearance in France in 1805, prior to which time it had attracted no special attention. In 1806 it appeared at Medfield, Mass., and from that date until 1816 it extended throughout the United States and into Canada. The second outbreak of this disease began in France in 1837, and for two years was limited to that country. It then spread until 1850, appearing in the United States in 1842, and again in 1848-49. The third outbreak began in 1854 in Sweden, which had not before suffered from this disease. From 1860 to 1864 it appeared in epidemic forms in the United States, and since that time has never been entirely absent from the country. The peculiarity of this disease, which it shares with influenza, is that it is a true pandemic, not propagated by contagion. The first epidemic of influenza, definitely recorded, occurred in Europe, in 1602, since which time it has repeatedly spread over a large part of the earth.

The epidemic of 1757-58 and 1772 commenced in North America. The most universal of all was the epidemic of 1781-82, which spread over all Asia and Europe, affecting more than half of the population.

Yellow fever, which, with cholera and plague, completes the trio of pestilential epidemic diseases, has been known for over two hundred years; but the first clear and definite accounts of it are connected with the great epidemic which prevailed in New York, Philadelphia, and other cities on the Atlantic coast of the United States at the end of the last and beginning of the present century. The first recorded epidemic in New Orleans occurred in 1796, and since that time it has frequently appeared. The last extensive epidemic of this disease in the United States occurred in 1878, when it spread from New Orleans through the Mississippi Valley. According to the report of the board of experts, appointed to investigate this epidemic, yellow fever has invaded the present territorial limits of the United States in eighty-eight different years, commencing in 1693.

Relapsing fever, also called "famine fever," has only been distinctly recognized within the last forty years, attention having been called to it by the English, Scotch, and Irish epidemics which began in 1842. It had, however, been endemic in Ireland for more than a century before this. In 1847 it was brought to New York. Since 1863 it has prevailed in Russia, and several epidemics have occurred in Germany. It has also spread to India. In 1870 it was epidemic in New York and some other American cities, having been imported by foreign immigrants.

Each of the above-mentioned principal forms of

epidemic disease, with the exception of influenza and cerebro-spinal meningitis, the peculiarities of which have already been referred to, has a certain limited local habitat where it is endemic. For the plague, this is the valley of the Nile; for cholera, the valley of the Ganges; for yellow fever, the West Indies; for relapsing fever, Ireland. From these points they occasionally spread far and wide, but do not become endemic elsewhere, and decline as rapidly as they spread. England is the country of scarlatina, France of typhoid fever, Russia of diphtheria and typhus. To explain these peculiarities some writers think that it is necessary to suppose the existence of what they call the epidemic constitution, a sort of cosmical influence, the nature and laws of which are unknown, but are supposed to depend upon changes in the earth. One of the most recent theories of this kind is that of Dr. Robert Lawson, who supposes that there is some influence connected with variations in terrestrial magnetism, forming what he calls pandemic waves, which gradually spread from south to north, and in the course of from three to five years pass from the latitude of the Cape of Good Hope to that of Ireland, giving rise to epidemics of yellow fever in the Gulf of Mexico and in Spain, pernicious malarial fevers in the southern part of the United States and in India, the plague in Asia, typhoid fever in the temperate zone, and typhus and relapsing fevers in the north.

The same theory in another form is advanced by Mr. Cushing in a paper entitled "Sun Spots, Cycles, and Epidemics," published in the *International Review*, April, 1880. The periodical variations of the so-called sun-spots have been shown to have a cycle of a little over eleven years, and to be connected with periodical variations in terrestrial magnetism and rainfall, the latter being connected with famines in India during the present century, such famines following after a drought occurring at the minimum of sun-spots. To put it in his own words: "Terrestrial epidemics depend largely on the disturbance in the economy of nature caused by the cyclical variation in the solar energy which coincides with the vast disturbances in the sun, appearing to us as spots on its disc." The last sun-spot minimum occurred in 1878, the maximum in 1881-2.

The great objection to these theories is that they do not take into account the influence of certain causes which are well known, and which certainly act in some, if not all epidemics. As a rule those who advance them practically overlook or deny the influence of contagion and infection, of insufficient and improper food, and of meteorological influences. The increase of susceptible, or, as they are sometimes termed, "epinosic" persons, in a locality, in the intervals of epidemics, explains, to some extent, the periodicity of those diseases which, as a rule, attack a person but once in his life, such as measles, small-pox, and yellow fever. A good illustration of this is found in the history of epidemics of small-pox in the last century. They came round in a given locality about once in five years—when enough unprotected children had accumulated to furnish material. The disease occurred chiefly in children under five years of age, because the older children and adults were the survivors of a previous attack. The history of epidemics is closely connected with that of famines, and the fact that mortality varies with the price of wheat is well known to statisticians. Relapsing fever is so emphatically the famine fever that it is known by that name. Typhus is so invariably associated with poverty, over-crowding, insufficient food, and over-work, that it seems as if the combination of these causes were sufficient to produce it. It is a disease of armies, and especially of unsuccessful armies, of sieges, of prisons, and attacks especially those weakened by scurvy, malaria, etc. The supposed dependence of typhus upon climate, and its increase in cold weather, is probably due simply to the over-crowding caused by the efforts of the poor to obtain

shelter. In short, the more each particular epidemic is studied, and the more complete the records with regard to it, the more we can see how its progress is influenced by well-known, every-day causes, and the less necessity appears for attributing it to a wholly mysterious thing like the epidemic constitution. One of the most interesting practical questions with regard to the larger number of those diseases liable to become epidemic, viz., the acute specific diseases which are capable of reproducing their own kind, being either contagious or infectious, or both, is whether they ever at the present time originate spontaneously, *i. e.*, independent of an antecedent case. The arguments on either side have been very well summed up by Dr. Thorne, who states them substantially as follows:

Those who think that such spontaneous origin cannot occur may be called the "contagionists." Their belief is grounded on the fact that such diseases do largely spread by mediate communication with other cases of the same disease. As this is the usual mode of spread, we are justified in assuming that often no direct proof as to the transmission of the specific poison, can be given. It must have passed in some undetected way. The opposite belief arises from negative evidence only. We are every day discovering new means by which the poisons of these specific diseases are either preserved through long periods of time, or conveyed from one person to another. It is now well known that typhoid fever and scarlet fever may be spread through the agency of milk. Numerous local epidemics of these diseases can now be explained in this manner. The same is true with regard to the spread of typhoid fever through an intermittent water surface leading to the specific poison being drawn into the mains during periods of intermission. In many cases where at first it might be supposed that the evidence was strong in favor of spontaneous origin, careful and skilled investigation has shown that it is due to infection from some prior case. The period of incubation, as it is called, for each specific disease is known to vary to a certain extent; but it seems likely that in exceptional cases this variation may be very great, and therefore form a series of errors in investigating the cause of a given outbreak. It may also be the case that the outbreak of an acute specific disease, apparently of spontaneous origin, may be really the result of infection from a case of the same disease which had occurred long previous. Some organisms do retain their vitality for long periods, and the organism in one of the acute specific diseases, viz., splenic fever, or malignant pustule, is found to exist in two states, in one of which it has great prevalence, and resists all ordinary influences of destruction. They can be reduced to dust, wetted and dried rapidly, and kept in liquids for weeks, and yet at the end of four years will still display an undiminished potency. There are many well-known instances where the poison of scarlet fever has remained dormant for a number of years and then acted with unabated virulence. Similar evidence is furnished with regard to typhoid fever. The long-continued and complete immunity from this specific disease which certain isolated countries have enjoyed, and the virulence which such diseases have exhibited when once introduced within them, is also an argument in the same direction. The freedom of the New World from small-pox prior to its discovery by Columbus, and the immunity of the Faroe Islands from measles for many years, with the disastrous results in each when these diseases were introduced, illustrate this fact. On the other hand there are many who, admitting that these diseases are self-propagating, assert that some of them are of spontaneous origin, and urge in proof of this view the outbreaks of typhus in ill-fed and over-crowded collections of men, especially in armies. The main argument, however, is that these specific diseases must at some time or other have had first cases, and that unless we are prepared to accept the view that the several contagia are the result of a definite act of creation, we

must assume that they did arise independently of antecedent cases.

Dr. Thorne states, as the result of his experience in investigations into the origin of outbreaks of diphtheria, that he has been specially struck with the fact "that in isolated districts, and in houses situated at times miles away from other habitations, in some instances in lonely spots among mountain ranges, where a visit to or from the nearest town or village would be a circumstance too important to be forgotten, I have met with instances of what appeared to me to be nothing more than a simple inflammation of the throat, at times so trivial that it is passed almost unnoticed, and yet it has led by transmission through other persons to cases of very marked and severe diphtheria; and I have hardly been able to refrain from drawing the conclusion that conditions very similar to those under which genuine diphtheria was epidemic in a limited degree existed, and that these conditions, leading to a somewhat general predisposition to simple and apparently known infectious inflammatory sore-throat, had tended to produce an infection capable of taking on the property of infectiousness. The possible explanation of this is that minute organisms, capable of producing a minor and uncommunicable disease in particular stages of their growth may in other stages, or by subsequent development, become capable of producing a specific disease communicable from person to person—that is, the production by means of evolution of special properties in an already existing organism."

This idea of the gradual development of specific infectious properties in minute organisms is one of special importance at the present time. The question is stated by Dr. Airy as follows: "If we suppose a community exposed in an equal degree to a number of diseases of equal fatality; any one of these diseases, which has in any appreciable degree the property of infectiousness, will attack more persons than a non-infectious disease, and those who contract the disease in the more infectious form will be more likely to transmit it to others. In short, the more infectious the disease becomes the more numerous will be the persons attacked by it, and the greater, *ceteris paribus*, will be its chance of revival by continued reproduction. The conditions are practically the same as those of fever variation in animal and vegetable life, enabling its possessors to leave more offspring after their own likeness than other less favored forms."

This tendency is, however, self-limited, owing to the fact that in most of the specific diseases an individual ordinarily suffers but one attack, and, in case of survival, is protected against future attacks. Whether we assume that infectious diseases arise from the reception into the body of specific living organisms, the so-called "germ theory," or from the reception or formation in the body of a certain virus or poison, the so-called "glandular secretion theory" of Dr. Richardson, the influences of natural selection in the matter must be very great. Dr. Richardson's theory is that when the poison of a specific disease, as, for instance, small-pox, has entered the system, it does not propagate absolutely in the system, but that setting up a new series of chemical results the blood is so modified that, brought to the excretal surface, the normal secretion is simply prevented, and the new special albuminous excrete is the result; that the process of development of these poisons, whether occurring in the body or out of it, though manifest always by the agency of organic matter, is essentially a chemical process, and when this occurs in the body the new chemical products are the causes of the symptoms as well as the pathology of the disease excited; that the virus of this disease is purely incidental to a modified chemistry in the organism, being as necessarily an excrete under the modified conditions as urea is necessarily an excrete in perfect health. In other words, he considers this disease as due to zymosis in which the external conditions and the supply of matter susceptible of zymotic change being supplied, the quantity of ferment added as a starting-point is a matter of comparatively small importance.

The opinion at present prevailing among physicians and scientific men is that the peculiar phenomena of epidemics of cholera, plague, yellow fever, typhus, typhoid and relapsing fevers, diphtheria, measles, small-pox, scarlet fever, and whooping-cough are best explained on the hypothesis that they are caused by minute living organisms. As regards typhus, typhoid and relapsing fevers, and diphtheria, the organisms which produce them, and by means of which they are propagated, may be produced from certain very common and harmless organisms, which are found

everywhere, by a process of development in which variations in the human body due to malnutrition play an important part. Such production is, however, rare, and as a rule a case of either of these diseases is due, directly or indirectly, to a preceding case of the same disease. As regards the other diseases mentioned above, there is no evidence of their spontaneous development in recent times. The influence of foul air and impure water upon their spread is very great, and their malignancy and contagiousness may be greatly increased by unsanitary surroundings—apparently upon somewhat the same principle as the increase in virulence which may be given by successive cultures to a given microzyme. The reverse of this is also true, and upon this fact depends the great interest which attaches to the recent investigations of Pasteur and Koch. For some of the contagious diseases it would seem that the contagion is subject to the laws of gravitation, and this is confirmed by the results of an investigation made by Dr. Power as to the effects of a small-pox hospital in spreading the disease in the vicinity. Dr. Buchanan has pointed out that the distribution of infection from a central point, if effected into space of three dimensions, will differ from that effected along a single plane. In the first case the relative force or probability of infection at a place will be inversely as the square of its distance from the centre; in the last case it will be inversely as the distance itself. When, however, we consider the frequency with which the contagia must be passing into the atmosphere at many different points in any large city—their small specific gravity, and the ease with which they may be carried by currents of air; and, on the other hand, the rarity of the diseases caused by them, and the fact that in most cases we can trace the causation of such diseases to comparatively close association with persons affected with them—it is evident that the virulent properties of the immense majority of such contagia must be speedily destroyed by exposure to air and light.

With regard to the origin and progress of epidemics, each disease has its own laws. The brief historical sketch given above shows the truth of the remark of Littré, that new diseases are developed, and that there is not only a geography, but a chronology, of disease. The ancient belief was that all great epidemics came from the east and travelled to the west, and this was borne out by the history of the plague, of small-pox, and of measles. When we remember, however, that all the civilized nations in whom there were persons competent to observe and record such events were denizens of Europe, and especially of Western Europe, so that they could only be invaded from the east, this is not strange, and it becomes still less remarkable when the character and habits of Asiatic nations are considered. The sweating sickness arose in England and travelled east and south. Yellow fever is a disease of the Western Hemisphere, and cholera has spread to the east as well as to the west. An epidemic of contagious and infectious diseases usually follows a tolerably uniform course of development in any given locality, so much so indeed that it has been made the subject of mathematical analysis. The following is the mode of calculation employed by Dr. Fan in estimating the probable course of an epidemic which is increasing with the gradually decreasing ratio of increase.

“Take nine weeks of the early course of the epidemic, in three groups of three weeks each; find the average deaths per week in each group; find the number by which you must multiply the first average to obtain the second, and the numbers by which you must multiply the second average to obtain the third; or, as simpler process, take the difference between the logarithms of the first and second, and between the logarithms of the second and third. The first of these differences may be called X , and the difference between these two differences, which should, to bear out this theory, be a negative quantity, may be called Z . We have now the data for constructing the series. The average of the first three weeks is the starting-point, and represents

the centre week of those three. The next number in the series is obtained by adding to the logarithm of our first number a number composed of $\frac{X}{3} + \frac{Z}{9}$, remembering that Z is a negative quantity. We continue to add to the logarithm for each place in the series a number gradually diminished by the addition in each place of $\frac{Z}{9}$; after a time the number to be added becomes negative, and the series gradually diminishes.”

The measures to be taken by a community to prevent the spread of epidemics may be divided into two classes. The first are those designed to prevent the appearance of the first cases. The second those intended to limit its spread and, to use a popular phrase, “to stamp it out.” The preventives of the first class are cleanliness, quarantine, and, as regards small-pox, vaccination. Those of the second class are isolation and disinfection, with vaccination for small-pox. The form of cleanliness which is efficacious is that which prevents accumulations of decaying organic matter, of excreta in vaults and cesspools, of garbage in cellars and alleys, and which prevents the pollution of the water supply. It is especially useful against cholera, typhoid fever, and diarrhoeal affections of all kinds, and also against diphtheria, typhus, erysipelas, and certain forms of inflammation of the lungs. Quarantine is of the greatest importance against yellow fever because that disease is terminated by frost, and every day's delay in its appearance is a decided gain, even if it passes the barrier at last. This is not the case with those diseases whose spread is not limited by temperature.

For preventing the spread of a contagious disease it is of the greatest importance that the first cases be promptly and effectually dealt with so as to prevent the spread of the virus. This implies early notification of the existence of such cases. The methods of treating the cases so as to protect the community vary with the different diseases. In cholera, for example, the poison is conveyed in the intestinal discharges; and hence attention is to be mainly directed to securing prompt and thorough disinfection of these and of whatever clothing, etc., has been soiled by them. In scarlet fever the poison is conveyed from the skin, throat, and perhaps also the excreta, especially the urine. In such a case the first object is to have the patient placed in a room by himself and to have in it no carpet, curtains, upholstered furniture, or anything which is not necessary. No one should enter this room but the nurse and the physician, and they should take special precautions. The patient should be kept thoroughly anointed from head to foot with some oily or fatty material, such as vaseline. The great object is to prevent the occurrence of dust in the room. All clothing, bed-linen, etc., should be placed in a disinfectant solution as soon as they are no longer needed. They should never be removed from the room while dry, and should not be shaken or disturbed more than is necessary before they are moistened. A good disinfectant solution for this purpose is composed of four ounces of sulphate of zinc and two ounces of common salt to the gallon of water. If this is not at hand place the articles at once in scalding water. All dust and dirt about the room should be removed by damp cloths, which are to be treated like the clothing. No sweeping or dusting in the ordinary way should be permitted. The excreta should be received in vessels containing a solution of sulphate of iron, $1\frac{1}{2}$ pounds to the gallon. Many other details might be given, but the above are probably sufficient to illustrate the principles involved, which apply also to diphtheria, measles, and small-pox. When the separate room and the constant intelligent care cannot be had, the best thing to be done is to remove the sick person to a hospital. This presupposes that proper hospitals for the reception of such cases have been provided, and without such hospitals a community is comparatively helpless.

The spread of scarlet fever and diphtheria is largely effected through schools, and it is sometimes thought necessary to close the schools in epidemics of these diseases. Such action, however, should be very rarely required. So long ago as 1793 Dr. Withering, speaking of scarlet fever, said: "For several years past I have never thought it necessary either to break up a school or to disperse a family. The allotting apartments or separate floors to the sick and the healthy, and prohibiting any communication between the sick and their attendants and the healthy, with positive orders to plunge into cold water all the linen, etc., used in the sick-chambers, has very universally been found to check the further progress of the infection." The great difficulties are to secure effective isolation. Nothing but great care and tact is sufficient for this purpose. The majority of people are too apt to rely mainly upon the action of gaseous disinfectants, such as chlorine or burning sulphur, in place of minute and constant cleanliness in the sanitary sense.

As regards individual prophylaxis in the presence of contagious diseases, when these are epidemic, little is known. It has been recommended to make use of the sulphites with the idea of making the blood of such a character that the supposed germs will not develop in it. The use of chlorate of potash and local applications to the throat of solutions of the salts of iron have been recommended as a preventative of diphtheria. As yet, however, there is no satisfactory evidence of the utility of these measures. In case of the pestilential diseases, where the locality becomes infected, the most certain means of putting a stop to their ravages is to abandon the place temporarily and place the inhabitants in camps. It is not necessary to remove any great distance to secure the desired results. The experience of the camps near Memphis in 1879 was very satisfactory, and the same has always been the case when a post has been abandoned by troops on account of yellow fever. This evacuation of an infected locality for a time until the virus can be destroyed gives excellent results in plague, yellow fever, and typhus. It does not work so well in cholera; in fact, as Colin remarks, it may aggravate it in case of a mixed population. With troops, however, where discipline can be enforced, it gives good results even in cholera, but it cannot be relied on alone. To put an end to a typhus epidemic the great remedy is fresh air and plenty of it, and the only way to obtain this in most cases is to evacuate the infected premises. The time to prepare for an epidemic is when no epidemic is threatening, when there is no panic or confusion. Unfortunately the great mass of people and of municipal administrators are unwilling to take any precautions in this direction, such as the providing hospitals for infectious diseases, proper sewerage and other means of securing cleanliness, and a system of notification of infectious disease, until the epidemic is at their doors, when it is usually too late. (J. S. B.)

EPILEPSY. There are three distinct affections to which the name of epilepsy is commonly applied. The first of these is the so-called *idiopathic* or *essential* epilepsy. This ordinary or true epilepsy is treated with sufficient fulness in the *ENCYCLOPÆDIA BRITANNICA*.

The second, called *reflex* or *eccentric* epilepsy, is related to the essential epilepsy in that it is capable of being converted into it, or, to speak more accurately, giving origin to it. In reflex epilepsy there is always a peripheral point of irritation in which lies the starting point of the convulsive paroxysm. This point is of various nature: thus it may be a scar, a tumor, an improperly developed genital organ, a parasitic intestinal affection, a developing tooth, etc. In such a case, so long as no secondary changes have been wrought in the nerve centres, the removal of the irritation puts an end to the series of convulsions.

The human nervous system has, however, a very

strong tendency to be affected by habitual action: thus, if for a sufficient length of time the nerve centres have, under the influence of a peripheral irritation, developed frequent convulsive discharges of nerve force, a condition of the centres themselves is induced by virtue of which the discharges recur, although the original point of irritation is removed. Under such circumstances the reflex epilepsy has been converted into an essential epilepsy. The important practical deduction is that in reflex epilepsies the peripheral irritation should be removed immediately, even, if needs be, at much hazard.

The discoveries of Dr. Brown-Sequard have thrown much light upon these reflex epilepsies. He found that Guinea-pigs, after recovering from certain injuries to their nerves, were epileptic. In a particular region of the face the character of the hairs was at this time distinctly abnormal, and at any moment titillation of this portion of the skin produced violent epileptic convulsions. If the altered skin were cut out the epilepsy was cured. It appears, therefore, that section of a sciatic nerve will cause in the Guinea-pig such alteration in the nutrition of a distant part of the skin that stimulation of its peripheral nerve-endings provokes a general convulsion. The fact that, before removal of the diseased skin, the Guinea-pig may beget epileptic offspring, shows a relation between this reflex and essential epilepsy.

In some cases of reflex human epilepsy handling of the scar, or other point of irritation, will cause a paroxysm, but epilepsy has been cured by removal of a scar which was apparently entirely inert.

An epilepsy which is not reflex, and first develops after the age of thirty, is in the great majority of cases either *toxic* or *organic*.

In toxic epilepsies the convulsions are caused by the presence, in the blood, of a poison, which may have either been generated in the body or received from without. The autochthonic poisons are, with rare exceptions, due to disease of the kidneys. Epileptic form convulsions are not merely a symptom of chronic alcoholism, but lead and other poisons may cause such attacks.

Organic epilepsies are those which result from gross lesions of the brain, such as tumors, syphilitic disease, etc. They are frequently to be distinguished by being localized; thus only one-half of the body, or even one limb, may be convulsed. The cases are, however, exceptional in which the movements are thus restricted during the whole convulsion, as they usually rapidly spread so as to involve the whole person. When the epileptic attack has first appeared, years after the completion of puberty, and the paroxysms persistently begin in one extremity, the patient is almost invariably suffering from organic brain disease, and close scrutiny should be made so as to discover other symptoms, and to decide the nature of the lesion. (H. C. W.)

EPISCOPAL CHURCH, PROTESTANT. This is the legal title of that branch of the Catholic Church which had its origin from the Church of England, and which claims jurisdiction in the United States. The name "Protestant Episcopal" came into use popularly at first as a matter of convenience, and was afterwards acquiesced in, rather than adopted, as the legal and corporate title of this church. As the claims of the church came to be better understood by her own members, it was seen that this title does not adequately indicate those essential and permanent characteristics which are expressed in the creeds and other formularies. Of late years an agitation has sprung up to bring about a change of name. This was made a definite issue in the General Convention of 1877 and 1883, but failed to obtain a majority. It is no new thing for a particular branch of the church to assume a special designation. Thus, the Holy Eastern Church is commonly known as the "Orthodox Church," in distinction from the numerous heretical sects of the East.

The titles, "Church of England" and "Church of Ireland," had their origin in the connection of church and state. It may be said also that the present title of the church in America expresses, in a measure, the peculiar mission which the state of religion here has imposed upon her.

The Protestant Episcopal Church is in entire accord with the Church of England in doctrine, accepting the same creeds and articles; in worship using services which are substantially identical, and in the essential principles of church government by bishops, priests, and deacons; but she is entirely independent of the state, and, as regards the law of the land, rests upon the same ground with other religious bodies. There are besides certain peculiarities in her constitution, which still further distinguish her from the mother church.

The history of this church exhibits, in a striking manner, "the vital energy of the episcopal system," and the tenacity of catholic principles under the most unfavorable circumstances. During the first 150 years, neglected by the authorities of the mother-country, her constitution left incomplete in the most essential particulars, her extension and welfare left almost entirely to individual and voluntary effort, the church nevertheless lived and grew. The adverse influences of the Revolution did not destroy her, and upon completing her organization with bishops of her own she soon entered upon a new period of rapid extension and vigorous life.

THE COLONIAL PERIOD (1607-1776).

The earliest expeditions fitted out in England, with the object of forming settlements in America, had in view the extension of the church as well as material interests. For example, in the expedition of Sir Humphrey Gilbert (1585) the religious objects proposed were, "compassion of poore infidels captived by the devil," and the establishment of a system of government "not against the true Christian faith professed in the Church of England." The letters patent granted to Sir Walter Raleigh contained similar provisions for the establishment of the "true Christian faith now professed in the Church of England." It was during the temporary occupation of the coast of North Carolina by one of Raleigh's expeditions that the first baptism of a native Indian took place, also the first recorded baptism of a white child.

Virginia.—The first permanent settlement was effected under a charter of 1606 at Jamestown, in Virginia. A decided religious feeling actuated its founders, and found expression in the letters-patent. The Rev. Robert Hunt accompanied the expedition, and did much to keep the spirit of true religion among the contentious and struggling colonists. The holy communion was celebrated by him for the first time in May or June, 1606. The services of the church were first held under an awning hung between the trees. "This," says the famous Capt. John Smith, "was our church till wee built a homely thing like a barne, set upon cratchets, covered with rafts, sedge, and earth." "Wee had daily common prayer, morning and evening, every Sunday two sermons, and every three moneths the holy communion, till our minister died. But our prayers daily, with an homily on Sundays, wee continued two or three years after, till more preachers came." A new charter was granted in 1609 to a company which included a number of bishops, and counted among its names Sir Edwin Sandys and Nicholas Ferrar, the friend of George Herbert. Under the influence of such men the religious interests of the colony were sure to be provided for. The arrival of a new governor at a critical juncture, known as "the starving-time," was celebrated by a service in the church, "which was neatly trimmed with the wild flowers of the country." In 1619 the first legislature of Virginia set apart for each parish a glebe of 100 acres, and fixed a yearly stipend for the payment of

the clergy. The bishop of London was applied to for a body of "pious, learned, and painful ministers," and was about this time appointed a member of the king's council for Virginia. Thus began the relation by which the bishop of London became, in a manner, the diocesan of the infant church in America. The charter of 1609 was annulled in 1625, and the company in which Sandys and Ferrar had been leading spirits was broken up. The whole property and government of the colony were assumed by the Crown. But the religious character originally impressed upon it was maintained until the period of the great Rebellion. Virginia had declared for the king, and during the troublous times which ensued became a place of refuge for the Cavaliers, many of whom were men of broken fortunes and reckless lives. During the Protectorate the church in Virginia became greatly demoralized. At the Restoration most of the parishes were without incumbents. Applications were now made to the mother-country "for help to preserve the Christian religion by supplying them with ministers." A new class of men made their appearance in answer to these petitions, "such as wore black coats and could babble in a pulpit, roare in a tavern, exact from their parishioners, and rather by their dissoluteness destroy than feed their flocks." Great scandals arose, and the urgent necessity for the presence of a bishop in America was clearly seen. A bishop was actually nominated, when the fall of Lord Clarendon put an end to the project. The bishop of London had been invested with formal jurisdiction over English congregations abroad since 1634. But this authority had, up to this time, never been effectively exercised in the American colonies. After the failure of the scheme for sending out a bishop, the bishop of London, as a partial substitute, in 1689 appointed the Rev. James Blair his commissary. This officer had power to hold visitations, to deliver charges, and, to a certain extent, enforce discipline, but he could not confirm, ordain, or consecrate, nor could he depose a priest from his office. Nevertheless, during the fifty-three years in which Blair held this position, he did much to remedy the prevailing laxity, and to improve the state of the church.

Early in the 18th century the external equipment of the church in Virginia seemed all that could be desired. There were fifty-four parishes, with about seventy places of worship. The supply of clergy was nearly sufficient, there were glebes and parsonages, and all wore a prosperous look. But, in reality, the state of affairs was far from satisfactory. The system, as an establishment, was very defective, and through certain evasions of the order provided by law the worst features of the voluntary system were introduced. By the act of 1642 a clergyman was to be inducted into his parish by the governor, and henceforth held a freehold in his living, and consequently could not be removed except after a fair trial upon charges regularly preferred. But the presentation was in the hands of the parish, and might be withheld indefinitely; this became the general practice, so that the majority of the clergy were hired from year to year. This, taken with the indifferent quality of many of those who came out from England after failure to obtain a living at home, and the fatal defect in organization by which it was rendered impossible to remedy existing evils, fully explains the low tone of the church in Virginia. The disuse of induction was in many cases accompanied by the withholding of the glebe by the vestry. This led to a legal contest, which was decided in favor of the clergy, and reaffirmed by an act of assembly in 1748. Another contest sprang up between the clergy and the provincial assembly in consequence of an attack made by the latter in 1757 upon the salaries of the former. An act was passed which compelled the clergy to accept a money-payment at a low valuation in lieu of the tobacco hitherto paid. This act was annulled by the king's council, and the clergy instituted suits for the recovery

of the full amount of their stipends. One of these was brought to trial as a test case, and by the exertions of the celebrated Patrick Henry was decided against the church (1763). The relation of the vestries to the clergy in the first place, and these contests in which, first, the clergy and the parish authorities were arrayed against each other, and afterwards the clergy and the legislature, brought the laity into a position of influence in the management of ecclesiastical affairs which, taken with a similar state of things in Maryland, had an important part in the formation of the constitution of the American church of a later period.

A second project for the establishment of bishops in North America had received the sanction of Queen Anne, but was defeated by her death. Petitions for this purpose sent in by the churchmen of the colonies were of no effect. A last attempt of this kind was made a short time before the Revolution. At the solicitation of the clergy of the Northern and Middle colonies a meeting of the Virginia clergy was held in June, 1771, which decided against the design, and the chief opponents received a vote of thanks from the legislature.

Maryland.—The first settlers of Maryland in 1634 were Roman Catholics. Freedom of religion was, however, granted to all comers. This was secured, in the first place, by the oath of office. The colony soon had a very mixed population as regards religion, and in 1646 an act of toleration was passed by the assembly. Under the Protectorate, upon the submission of the colony after a struggle, a law was passed tolerating all forms of Christianity except "popery, prelacy, and quakerism." The earliest trace of the Church of England is in 1676, when it appears that there were four clergymen in the province supported by private means. From 1688 to 1692 occurred the "Protestant Revolution," which ended in the establishment of the Church of England by act of assembly in 1692. The territory of the colony was divided into parishes, and a tax payable in tobacco laid upon the people for the support of the church. Sir Francis Nicholson, appointed governor in 1694, exerted himself in behalf of the church and brought the new act into operation. The number of clergy rapidly increased. Following the same course as in Virginia, the bishop of London in 1696 appointed Dr. Bray his commissary for Maryland. This officer arrived in 1700, and at a visitation held at Annapolis made a determined and partly successful effort to enforce discipline in the case of profligate clergy. At this meeting also arrangements were made to support a missionary among the Quakers of Pennsylvania. Dr. Bray was compelled in a short time to return to England in order to counteract attempts made to overthrow the Maryland establishment. In this he was at length successful. Although he never returned to America he did not relax his efforts in behalf of the church. One good work of his was the provision of numerous parish libraries for the colony, but by far the most important result of his labors was the foundation of the "Society for the Propagation of the Gospel," which is directly traceable to his influence. No new commissary was sent to Maryland until 1716, when two were appointed—Mr. Wilkinson for the Eastern Shore, and Mr. Henderson for the Western. The latter was a man of remarkable energy, but he was not able to contend successfully against the extraordinary difficulties in which he found himself involved, resulting from laxity of discipline within and hostile attacks from the civil power without. The contest in Maryland had two phases. The absence of any ecclesiastical authority empowered to enforce discipline induced the governor and assembly at different times to assert an undue control of the affairs of the church. This was carried so far as to resist all attempts to remedy existing evils through ecclesiastical channels; thus, in 1718, the assembly refused to recognize by a formal act the jurisdiction of the bishop of London, and in 1727, when the Rev. Mr. Colebatch was invited to come to

England to receive consecration to the episcopal office, he was prevented by a writ of *ne exeat* from leaving the colony. On the other hand, here, as in Virginia, attacks were made upon church property and the support of the clergy. Henderson at last, worn out by the conflict, ceased to exercise his office as commissary, and matters were henceforth allowed to drift. The church in Maryland, during the whole period of its existence before the Revolution, was under the same disadvantage as to discipline with that of Virginia, although there were periods when, by the energy and faithfulness of such men as Bray and Henderson in their office as commissaries, the tone of clerical character was high. On the other hand, the church in Virginia was, perhaps, never subjected to such extreme claims on the part of the civil power as that asserted by the governor and assembly of Maryland on some occasions.

The Carolinas and Georgia.—The early history of the church in the Carolinas unfolds the same tale of mismanagement in its relation to the civil government. Much the same arrangement also existed as regards the incumbent and his parish which was so fraught with evil in Virginia. As early as 1704 an act of assembly constituted a lay commission for the trial of causes ecclesiastical. This law was afterwards annulled on appeal to the home government, chiefly through the exertions of the Society for the Propagation of the Gospel. In 1707 Gideon Johnstone was appointed commissary of the bishop of London in this region, succeeded soon afterwards by Alexander Gordon. The administration of Gordon was judicious and faithful, but was chiefly remarkable for his collision with Whitefield. This famous teacher was producing great confusion in the infant church, but upon admonition he defied the authority of the commissary and treated with contempt the proceedings of the ecclesiastical court which convened at Charleston for his trial in 1740.

The Colony of Georgia was established through the benevolence of Oglethorpe in 1732. The early history of religion in this region was marked by the labors of the Wesleys, who had been recommended to Gov. Oglethorpe as fit persons to aid in carrying out his plans. Charles was engaged as the governor's secretary, while John became the first missionary at Savannah. Charles was soon so involved in disputes with the governor that he felt that his usefulness was at an end, and left the colony four months after his arrival. John Wesley endeavored to introduce, above and beyond the requirements of the church, a system of rigid asceticism for which the society about him was utterly unprepared. After a career marked by intense ardor and devotion he became involved in an unfortunate lawsuit turning upon an injudicious attempt to administer discipline, and without waiting for its final settlement shook off the dust of his feet against the colony and departed, after a ministry of 21 months. It is interesting to remember that at this time the brothers appeared as very high churchmen, contending for an exact literalness in carrying out the law of the church which was unknown at that day.

The Middle Colonies.—In New Jersey, Delaware, Pennsylvania, and New York the church was never established. That was precluded by the character of the first settlements. The Swedes and Dutch, who colonized these regions from 1608, brought with them the religious rites and usages of the Swedish Lutheran and Dutch Presbyterian worship. The English element in New Jersey and Pennsylvania came in with the Quakers, who founded Burlington in 1677, and Philadelphia under William Penn in 1681. Large bodies of Scotch Covenanters also emigrated to East Jersey in consequence of the severities inflicted upon them at this period in their native country. This whole region, therefore, was settled under influences adverse to the Church of England. But while this was true, it does not appear that opposition to the church ever

assumed an organized form or that laws were made of an intolerant character. In the charter of Penn it was expressly stipulated that whenever twenty inhabitants requested a Church of England minister, he should be allowed to dwell among them without molestation. In pursuance of this arrangement we find the first place of worship belonging to the Church of England erected in Philadelphia in 1695, and the Rev. Mr. Clayton appointed its first minister. But the growth of the church in these colonies, as in those of New England, was chiefly owing to the zeal of new converts to her fold and to the fostering care of the Society for the Propagation of the Gospel, founded in 1701. George Keith, a convert from the Quakers and the earliest missionary of the society, by his incessant activity in preaching, disputing, and the publication of tracts, spread the principles of the church and laid the foundation of many parishes in Pennsylvania and New Jersey. With him was associated John Talbot, who became rector of the church in Burlington, N. J., in 1704, and who remained a faithful and successful missionary of the society until 1725. The crying need of episcopal supervision, disregarded through so many years by the church at home, induced Mr. Talbot on a visit to England in 1624 to receive episcopal orders at the hands of the non-juring bishops. Dr. Welton, also consecrated by the non-jurors, came to America at the same time, and was made rector of Christ's Church, Philadelphia. This attempt to introduce episcopacy necessarily miscarried. The association of the non-jurors with the Jacobite party brought all connected with them under suspicion of disloyalty to the established government. The two bishops were compelled to keep their true position a secret, and it is not certain that they ever performed any episcopal acts, though there are traditions to that effect. When the facts became known, Welton was required to leave the colony and Talbot was discharged from the society and inhibited by the bishop of London. The latter, in obedience to the orders laid upon him, abstained from officiating in the public services of the church, and notwithstanding the unanimous petitions of the vestry of Christ Church, Philadelphia, and of his old congregation at Burlington, lived in retirement until his death two years later.

The province of New York was surrendered to the English by the Dutch authorities in 1664, but it was not until 1693 that any move was made in favor of the Church of England. An act was passed at that time for the maintenance of the clergy. In 1696 Trinity Church, then said to be "the finest church in North America," was built. The first rector was Mr. Vesey, previously a layman, but chosen by the governor and vestry and commended to the bishop of London for ordination, with the approval of all ranks of people. Vesey was rector from 1697 to 1756, and about 1713 was appointed commissary of the bishop of London. The parish was endowed soon after its foundation with the freehold of a neighboring property known as the "King's Farm." Vesey's assistant and successor, Barclay, opened St. George's as a chapel of ease, aided in the establishment of King's College, and designed St. Paul's, which was completed by his successor, Auchmuty. Under these rectors the church did effective work among the Indian tribes and the negroes. An earnest promoter of missionary work among the New York Indians was the celebrated Sir William Johnson, who was a faithful member of the church and conveyed to the Society for the Propagation of the Gospel shortly before his death 20,000 acres of land as a basis for the future endowment of the episcopate. Under the methods pursued in these Middle colonies—and the same is true of New England—the congregations were represented by vestries, who did not, however, in all cases, exercise the appointing power, but generally accepted the appointments of the bishop of London and the Society for the Propagation of the Gospel. In the case of Christ Church, Philadelphia,

we meet with an exception to this in the election of Dr. Welton in 1624 without waiting for authority from England. In the case of Trinity, New York, the power of the vestry to elect its own rector was conceded from the first. The support of the ministry depended chiefly upon the society, eked out by such contributions as the people were able to afford. In the absence of any establishment the contests, which were so disastrous to the spirit of true religion to the southward, could not arise. Nor was there here any such laxity of discipline as in Maryland and elsewhere drew the civil authorities into attempts to regulate the conduct of the clergy. The bishop of London, with the aid of the Society for the Propagation of the Gospel, was able to exert a direct and wholesome authority by withdrawing the stipends and cancelling the appointment of any of the clergy who failed to fulfil the requirements of their position.

New England.—The Puritans of New England were the most violently opposed to the church of all the American colonists. Puritanism in that region was a theocracy in which church and state were identical. Penal laws were brought to bear upon dissenters, under which fines, imprisonment, and banishment were the principal penalties. Two brothers among the original settlers at Salem, Mass., ventured to "uphold" in their own house, "for such as would resort unto them, the common prayer worship," and were ignominiously expelled from the colony. There were attempts on the part of royal governors, under the favor of Charles II., to introduce the church service, but so little pains was taken to conciliate the prejudices of the people that they were rather the more exasperated against the whole system. This was especially the case under Gov. Andros in 1686, who took forcible possession of the Old South meeting-house. King's Chapel was built in 1689, and received many gifts from the king and queen, with a valuable library from the bishop of London. This church afterwards fell into the hands of the Unitarians, who have held possession ever since. For a long time the church remained to the people of the Eastern colonies an alien institution. But at length a spontaneous development, springing up in the heart of New England itself, changed the aspect of affairs and produced results of permanent importance. After the establishment of the Society for the Propagation of the Gospel Keith and Talbot had visited Connecticut, and in 1707 the parish at Stratford was organized by the Rev. Geo. Muirson, a missionary of the society. But the movement referred to sprang up within the precincts of Yale College, in 1722. Seven gentlemen connected with the college, including Timothy Cutler, the first president, and Samuel Johnson, the first president of King's College, N. Y. (now Columbia), were led by the perusal of certain theological works sent out from England for the college library to declare for the Church of England. They were all ordained pastors among the Independents, and were men of mark in the colony. Four of these men subsequently went to England for holy orders, and, one having died, three returned to exercise a strong and active influence in the formation of the church in New England. Cutler became rector of Trinity Church, Boston; while Johnson continued many years at Stratford. This movement spread rapidly, and, being grounded in the study of first principles and conducted in the face of violent opposition from the authorities of both church and state, it assumed a character of strength and vigor which made an indelible impression upon the State of Connecticut, and affected all New England.

Education in the Colonial Period.—The most important educational foundations to which church influences gave rise during this period were William and Mary College, Va., founded by Dr. Blair in 1693, and King's College, N. Y., established in 1754. King's College received as an endowment a portion of the "King's Farm" from Trinity Church, on condition

that the "president forever, for the time being, should be in communion with the Church of England," and that the church service should be used in the college chapel. Churchmen were also largely concerned in the establishment of the University of Pennsylvania (1749), eighteen out of twenty-four members of the first board of trustees being attached to the church, while a large part of the funds was collected in England by the endeavors of Dr. William Smith, the first provost of the college. Dean (afterwards Bishop) Berkeley came out to America in 1728 in order to establish a college in the Bermuda Islands for training American missionaries, but, owing to the failure of the government grant, which had been promised, was unable to carry out his project. His residence of some years in Rhode Island was not without benefit to the cause of education, which he promoted by liberal donations of books and other property to Yale College, and subsequently by similar gifts to Harvard. He also gave valuable assistance in the establishment of King's College, N. Y. The Society for the Propagation of the Gospel from its foundation adopted education as a proper branch of its work, and sent out schoolmasters as well as missionaries. A considerable number of parochial schools were sustained from a very early date in Philadelphia and other places of Eastern Pennsylvania. In New York city, Trinity School, which still flourishes, was established by the aid of the society in 1709.

Summary.—Under the widely different conditions which existed in the Southern, Middle, and Eastern colonies respectively, the tone and character of the church were so far affected that three distinct phases are readily discerned. In the South the church was organized in feeble imitation of the church at home. The system had more than the faults and none of the merits of the English establishment. In the intermediate region the rise of the church proceeded from missionary effort, and as it met no determined hostility anywhere, it grew quietly and healthfully, but attention was rarely directed to first principles. In the Eastern colonies the real foundation of the church is due to the movement at Yale College. It proceeded from deep and candid study, and made its way in the face of a hostile religious establishment and amid the strongest popular prejudice. The result was a thorough knowledge of church principles and firm conviction of their truth.

THE ORGANIZATION OF THE PROTESTANT EPISCOPAL CHURCH.

The entire dependence of the American Church upon the mother country which her peculiar position entailed upon her prevented the growth of sentiments in accord with the principles of the Revolution. In the great national movement the clergy generally found themselves out of sympathy with their countrymen. The majority of the Northern clergy, as missionaries of the Society for the Propagation of the Gospel, were in constant communication with their superiors in England. Moreover, the theological principles accepted in the North, especially in New England, were of a High Church tendency, carrying with them at that period the strongest convictions of the duty of loyalty to legitimate authority. Especially they felt themselves hampered by their oath of allegiance taken at the time of ordination. The result was, that the majority of the clergy throughout the North were found on the loyal side. Many voluntarily resigned their cures, while others continued their ministrations until they were silenced by force. In the Middle region some influential churchmen, of whom Dr. William White was a representative, favored the cause of the Revolution. In the South the clergy did not, on the whole, maintain the same attitude as in the North. In fact, one-third of those in Virginia and Maryland advocated the Revolution. It was generally felt, however, that the tone and temper of the

church was opposed to extreme measures, and though Virginia and Maryland might present exceptions to this, the church establishments which existed in those provinces were peculiarly odious to a majority of the people, both for their inefficiency and because they represented English ideas. In Virginia acts were soon passed repealing all former laws in favor of the church. Only the glebes and church edifices were preserved. The incomes of the clergy were summarily stopped at a time when it was impossible to make new provision. They were driven from the country unless they espoused the popular cause without reserve. Churches were everywhere abandoned, flocks broken up, and the sacraments continued to be administered only from time to time by a few zealous men who travelled through the country for the purpose. In Maryland the Declaration of Rights in 1776 secured to the church her property, but during the war a measure was proposed which threatened the very existence of the church as an episcopal body. This was the attempt on the part of the legislature, in 1782, to reorganize the church, and in particular to appoint ordainers to the ministry. This movement was defeated by the energy and earnestness of one man, the Rev. Samuel Keene, who obtained a hearing before the legislature and defended the cause of the church. The close of the war found the church utterly prostrate. In the North and East the work could only be resumed upon an entirely new basis, since the aid of the Society for the Propagation of the Gospel could no longer be obtained. In New York Trinity Church had been burned. A few scattered parishes remained in Pennsylvania and New Jersey. Virginia, from 164 churches and chapels, with 91 clergy, was reduced to 38 in actual operation, with only 28 clergymen. In Maryland the clergy had fallen from 44 to 20. Thus at the declaration of peace, in 1783, the church was disabled and utterly disorganized. The relation which had existed with the bishop of London was dissolved, and the bond of union with each other and with the mother church which the society had fostered among the clergy was now destroyed, so that nothing was left to constitute, or even symbolize, ecclesiastical unity. Without bishop or even provisional headship, without diocesan constitutions, every parish autocephalous, a slight impulse might have sent the congregations of some regions into the arms of the most congenial sect or might have led to the adoption of such a system as would have changed the character of the church in essential particulars. We have seen measures of this kind attempted in Maryland. About the same time, White, despairing of better things, proposed a scheme of organization without the episcopacy, committing to elective officers the powers of discipline and ordination.

But, depressed as the church was, her traditions were still strong enough to preserve her from destruction or perversion. The civil division of State lines and the fellow-feeling between the clergy of the same locality led to the first movement in the direction of harmonious organization. The earliest formal meeting of the clergy was in Connecticut, in March, 1783, which led to the selection of Seabury as bishop, and his departure for England to obtain episcopal ordination. The policy pursued here was to complete the organization by obtaining a bishop before any measures were taken for settling the constitution of the church. Seabury, unable to obtain his purpose in England without undue delay, was finally consecrated in Scotland by Bishops Kilgour, Petrie, and Skinner, on Nov. 14, 1784. At meetings held in Maryland, in 1783-84, no steps were taken to obtain the episcopacy, but declarations were agreed to defining the inherent power of bishops and the rights of the clergy in a Low-Church direction; giving the appointment to a particular cure into the hands of the congregation; asserting the right of the laity to representation in ecclesiastical synods; and proposing that judicial and disciplinary

powers be exercised only by such a body of clergy and laity. A meeting in Philadelphia, in 1784, took substantially the same ground, and issued a call for a general convention. The first convention of a general character assembled accordingly in Philadelphia in 1785. It represented seven States. Against the wish of Connecticut and Seabury, it was decided to proceed at once to the adoption of a permanent constitution and the revision of the Prayer Book. The constitution thus framed, in addition to the rights conferred upon the laity of sitting in council, made bishops amenable to their diocesan conventions. The Prayer Book was radically changed, and even its orthodoxy was brought into question. These measures delayed instead of hastening the desired union and the acquisition of bishops from England. Seabury and the church to the eastward declined to submit to this organization, and the English bishops refused to consecrate for America while fundamental principles were left in doubt. These difficulties being subsequently removed, Provoost of New York and White of Pennsylvania were finally consecrated in the chapel at Lambeth, Feb. 4, 1787. Connecticut was satisfied by the removal of the objectionable features from the constitution, and, at the convention of 1789, Bishop Seabury was present. At this time the Proposed Book was set aside, but two principles still contended—the one on the side of tradition and continuity, the other disregarding precedent and insisting upon proceeding *de novo* in the settlement of the Liturgy. The influence of the bishops turned the scale, and the more catholic position was maintained, as set forth in the Preface of the revised Book: "This Church is far from intending to depart from the Church of England in any essential point of doctrine, discipline, or worship; or further than local circumstances require." Two influences are traceable in this revision in the daily offices and litany, that of the Proposed Book, or rather of the remote attempt of the latitudinarian commission of 1689; in the Communion office the influence of Seabury prevailed, and the Scotch office was adopted, of even higher liturgical and doctrinal value than that of the Church of England. In 1792 the convention assembled in New York with three bishops of the English line—Provoost, White, and Madison—besides Seabury of the Scotch succession. The bishops now felt themselves authorized, consistently with engagements entered into with the English prelates, to perform consecrations. The first consecration to the episcopate, therefore, performed on these shores, took place at this convention, the candidate being the Rev. Thomas James Claggett of Maryland, and all four of the bishops present uniting in the act.

The organization of the Episcopal Church was completed in accordance with sound principles in all essential particulars. The peculiarities of this organization, while they have been defended on general principles, are easily seen to be based not upon theoretical schemes, but to be a natural development from causes previously existing. The constitution thus embraces ideas derived from the experience of the church in Virginia and Maryland and the South generally, modified by the church principles of the Northern clergy. The most radical innovation was the part assigned to the laity in the government of the church. It will readily be seen how naturally this grew out of the previously existing state of things. The subsequent history of the church seems to justify the experiment, and the laity have often been found to be more conservative than the clergy. The limits of lay-power in legislation and government have, however, been left to adjust themselves in accordance with general principles as they may be instinctively perceived. Such limits have never been expressly defined by legislation.

PERIOD SINCE THE REVOLUTION (1783–1882).

Growth of the Church.—The growth of the church after the organization was at last completed was for a

long time exceedingly slow. The reputation which she had acquired during the Revolution, of sympathy with the mother-country, her necessary connection with the Church of England, the rigidity of her working system, and its lack of special adaptation to the conditions about her—all combined with the general prejudice against episcopacy to obstruct her influence and impede her growth. Many faithful churchmen almost despaired of the future. But, though progress was slow, it soon became apparent that the church was by no means dead. In New England there was always life and activity. Pennsylvania had the advantage of Bishop White's fatherly guidance for fifty years; he died in 1836. The episcopate of Bishop Moore (1814–41) did much to build up again the broken foundations of the church in Virginia. But the chief impulse to church life and growth was given by the influence of John Henry Hobart, D. D., bishop of New York (1811–30). His firm grasp of the distinctive principles of the church, and his ability in maintaining them, his activity and the vigor of his administration, produced permanent effects of the highest value to the whole church. The consecration of Bishop Philander Chase in 1819 marked the first great step in the advance of the church westward. He afterwards (1835) became first bishop of Illinois. An important step in the same direction was the consecration of Jackson Kemper in 1835 to be missionary bishop of the North-west. A voluntary movement of great interest and importance was the formation of the "Associate Mission" at Nashotah, Wis., under the leadership of James Lloyd Breck (1842). This association of young priests, fresh from the seminary, living in common, and devoting themselves to missionary work, evangelized Wisconsin and founded the famous theological school at Nashotah. Out of the same movement sprang subsequently the theological school at Faribault and the foundation of missions among the Indians of the North-west. Other bishops appointed over missionary jurisdictions were Kip (California, 1853) and Scott (Oregon and Washington Territory, 1854). But it was only from 1865 that the principle has been definitely acted upon that the bishop ought rather to lead than follow missionary enterprise, and the number of missionary jurisdictions has been increased as fast as circumstances seemed to warrant. The first domestic and foreign missionary society of the Protestant Episcopal Church was organized under the authority of the General Convention in 1820. It was reorganized in 1835, and became the "Board of Missions of the Protestant Episcopal Church," comprehending "all persons who are in baptism members of this church." Through this board the missionary bishops and their clergy are for the most part maintained. The earliest bishops consecrated for foreign work were Boone for China and Southgate for Constantinople (both in 1844). The board was reorganized in 1877, and a reconciliation effected with the American Church Missionary Society, a voluntary organization founded under Low-Church auspices by those who disapproved of the general board. The most successful missionary work among the Indians has been carried on in the North-west. Such missions were commenced in Minnesota by Breck, and afterwards renewed and fostered with great zeal by the Rt. Rev. H. B. Whipple, of that diocese. From these efforts have sprung also a number of flourishing missions along the Missouri River in Nebraska and Dakota Territory, which now constitute the missionary jurisdiction of Southern Dakota. The numerical increase of the membership of the church has been constant, and often rapid. Meanwhile, there has been a constant struggle, as her mission has opened before her, to adapt her system to the needs of all sorts and conditions of men, and to escape whatever trammels obstruct her growth and extension. This is seen in the increasing number of free churches; in attempts to make the public services attractive; in the formation of

various parochial agencies for effective work among all classes of society; in the establishment of guilds and societies for special ends, as, for instance, the promotion of temperance; in the rise of sisterhoods consecrated to a life of charity and devotion. The conservative spirit proper to a branch of the catholic church prevents sudden and radical changes, and secures thorough discussion of all questions which arise, but does not in the end defeat the great objects to be attained. During the trying period of the great Civil War the Episcopal Church was enabled to maintain an attitude of dignity, a general freedom from the bitterness of party spirit, which made her walls a refuge for many who were wearied and disheartened at the strife and confusion of the times. The church in the South, anticipating the success of the Southern arms, in pursuance of the principles asserted after the achievement of American independence, organized as a separate national body. But at the close of the war this arrangement was immediately dissolved, and at the convention of October, 1865, the reunion of the church was effected without difficulty. In 1873 occurred the defection of Dr. Cummins, assistant bishop of Kentucky, who withdrew from the church soon after a meeting of the "Evangelical Alliance," in New York city, in which he had taken part, and had united in a Presbyterian communion service, for which he was severely criticised. The reasons assigned in a published letter for his withdrawal from the Episcopal Church were the growth of "Ritualism" and the "Romanizing tendencies" which he discerned in the Prayer-Book and the life of the church. He was formally deposed by the presiding bishop, Dr. B. B. Smith, but shortly afterwards he instituted a new denomination called the "Reformed Episcopal Church," in which he continued to exercise the episcopal office by ordaining ministers and consecrating bishops. His most prominent associate was Dr. C. E. Cheney, of Chicago, who had been deposed in 1871 for contumacy after refusal to submit to the sentence of the ecclesiastical court of the diocese, which had tried him for mutilating the service for baptism by omitting the words "regenerate" and "regeneration" whenever they occur. It was supposed that they would be joined by a considerable number of influential members of the Low-Church party. But many leaders of that party promptly repudiated the movement, and it has had little perceptible effect upon the Episcopal Church.

Interesting and important circumstances in the later history of the church were the first "Pan-Anglican" conference at Lambeth in 1867, at which a majority of the bishops of the Anglican communion assembled for "fraternal council and spiritual communion;" also, the sympathy officially expressed by resolution of the House of Bishops with the Old-Catholic movement of Germany in 1871, and further exhibited in the presence of prominent bishops of the American church at the meetings of the Old-Catholic congress. The consecration of James Theodore Holly for Haiti in 1874, and of Henry Chauncey Riley for Mexico in 1879, were also events of considerable significance. Bishop Riley's subsequent course was not marked with that prudence which was necessary in his peculiar circumstances, and in 1884 he resigned his office and withdrew from further effort to establish the church in Mexico.

Ecclesiastical polity.—The ecclesiastical polity with which the church emerged from the conflicts and confusion of the Revolutionary period is as follows: The union of the whole church was maintained by a "General Convention," to meet every three years, consisting of two houses—that of the bishops and that of clerical and lay-deputies elected from each diocese. This body has the power to pass general canons and under certain restrictions to make alterations in the liturgy and fundamental law. The senior bishop in order of consecration is called "the presiding bishop."

He is president of the House of Bishops, and is "the presiding bishop for all other purposes contained in the canons." This rule, however, was not formally adopted until 1832. The organization, therefore, represents, according to early precedents, a single province with its metropolitan and provincial council. With the spread of the church over the continent this arrangement has become inadequate. The General Convention has become too unwieldy to fulfil its proper functions satisfactorily. Questions of great importance are postponed from year to year. It is impossible that such a body should be able to hear appeals, while, on the other hand, it is an abnormal state of things that no appeal should be open from the decisions of diocesan courts. One result of this is a growing tendency to result to the civil courts whenever the case can be brought under their jurisdiction. Both legislative and judicial functions, therefore, are hampered and obstructed by the present constitution. These evils have led to the agitation of the "provincial system," which was first discussed in the convention of 1850, but without result. Two methods of provincial organization have been proposed—one looking to an association of the dioceses of several States; the other to the union under one system of the dioceses within a single State. The progress of the church within the several States meanwhile has been so great that the assignment of a single bishop to each State was soon found to be inadequate. The plan of appointing assistant bishops in such cases was tried, and still meets with favor in some quarters, but a different expedient has met with much more general approval. This is the division of dioceses. The first instance of this kind was the formation of the diocese of Western New York in 1838. The division of the diocese of Pennsylvania followed after a long interval with the erection of the diocese of Pittsburg in 1865. Since that date the process of subdivision has gone on with rapidity. There are now (1884) in New York five dioceses, in Pennsylvania three, New Jersey two, Maryland two, Ohio two, Illinois three, Wisconsin two, California two, Texas three. This process has brought the second plan of provincial organization into prominence. It is natural that dioceses which have formed part of one whole should desire to remain in some sort united. Moreover, by this means the undue multiplication of organizations for special purposes may be avoided. This plan has also the advantage of bringing the associated dioceses under the laws of a single State. With this view a scheme for a "federal council" of the dioceses within a State was authorized by the General Convention of 1868, but was never brought into operation. The dioceses within the State of Illinois have now entered into a provincial arrangement which gives some promise of success. It includes provision for a court of appeals.

Doctrine and ceremonial.—The doctrines of the Protestant Episcopal Church are contained in the creeds and in the acts of the undisputed general councils. She has received them as expressed in the formularies of the mother-church of England. It is, nevertheless, true that the long period of imperfect or perverted organization, and the deep depression which she had experienced, had left her hardly conscious of her true character and claims. But the keynote had been struck with a firm hand by Seabury. Hobart revived and strengthened the spirit of the church. Long before the *Oxford Tracts* appeared he had defended the order of the church as apostolic, and upheld the doctrine of the sacraments. The Oxford movement in England (1833) met with a quick response in this country. The church was soon stirred to its foundations by the controversies to which it gave rise. The strife culminated in connection with the ordination of Arthur Carey in 1843 by Bishop B. T. Onderdonk, of New York, against the protest of two priests, who accused Carey of Romanizing tendencies. Bishop Onderdonk was brought to trial in 1844,

and was suspended from his sacred office. The charges were directed against his moral character, but the case was inextricably connected with the party strife of the times. His own diocese petitioned, in 1850, for a remission of the sentence of suspension, but the effort was unsuccessful, and a provisional bishop was appointed in 1852. Bishop Onderdonk lived in retirement a blameless life, and died in 1861 protesting his innocence. Upon the defection of Newman, in 1845, some of his followers in this country, as in England, left the ministry of the church, but the whole number amounted only to about thirty in ten years, including Bishop Ives, of North Carolina. The effect of the movement, on the whole, was to spread the knowledge of church principles and to strengthen the conviction of their truth in the minds of churchmen themselves. The catholic character of the church and her mission in the world came to be apprehended with a thoroughness unknown before, and a new enthusiasm was aroused.

Closely connected with this great doctrinal revival came the so-called "Ritualistic movement." In the colonial days the architecture of the churches, the arrangement of the interior, and the mode of conducting the services, had naturally taken form from the contemporaneous fashions of the mother-church, chiefly in the period following the accession of William and Mary. This, as is well known, was a period of extraordinary coldness in the Church of England. Church architecture was ill-suited to its purpose. The arrangement within was rather with a view to private comfort than the common worship of God. The services were cold and perfunctory. The American church at the beginning of this century had inherited this state of things. Externally, the church edifice was hardly to be distinguished from the meeting-house; internally, the advantage was on the side of the latter. The pulpit, commonly what is known as the "three-decker" arrangement, completely overshadowed chancel and altar. The high, square pews were arranged primarily for the comfort of the worshipper and the exclusion of the stranger. Chanting was unknown; hymnology remained uncultivated. Gradual improvements were made as new life made its influence felt, but it was not until the great doctrinal movement of 1833 had made considerable progress that there was any marked change. A wise writer of the Church of England, many years before, had said: "Just and adequate views of the sacraments, the church, and the Scriptures must precede all subordinate auxiliaries; the latter must be regulated by the former. Labor to make religion impressive will be much worse than doing nothing until it be clearly ascertained what religion is." (*Alex. Knox*, 1820.)

The development of ceremonial followed naturally the revival of doctrine. There was an immediate improvement in church architecture. The internal arrangements began to exhibit more clearly the proper relations to each other of the different elements of divine service. Chanting and choral services, rendered by surpliced choirs, were introduced. Still later, as the study of patristic theology and the ancient liturgies brought the conviction that the Holy Eucharist was the central and all-important act of worship, great attention began to be paid to the ceremonial adjuncts of that office in particular. In England the movement took the "Ornaments' Rubric" as its authority. Six usages especially were insisted upon: "the eastward position," "vestments," "lights," "the mixed chalice," "unleavened bread," "incense." The legal position of the so-called "Ritualist" in the American church depends either upon the principle that English canon law must prevail here, except in so far as it is expressly repealed or modified, or, according to others, in the absence of explicit regulations regarding the ceremonial of divine worship, the church is thrown back upon the customs and usages

of the Catholic Church in general. In 1865 appeared a tract, entitled *The Law of Ritualism*, by the venerable presiding bishop, Dr. Hopkins, of Vermont. In this little treatise, written in answer to the request of a number of eminent churchmen, lay and clerical, the author calmly considers and defends most of the usages above mentioned.

The advance of the ritualistic movement from this time was so rapid in all parts of the country that it soon aroused great opposition. In 1868 the subject was brought forward in general convention and referred to a committee of bishops to report to the next succeeding convention. At this time (1871) a repressive "canon of ritual" was proposed, but, after prolonged discussion, the convention contented itself with the passage of two resolutions of a general character. In 1874 the attempts at legislation culminated in a canon forbidding certain devotional acts which were considered as symbolizing "erroneous or doubtful doctrines." This canon has, however, remained inoperative, and is considered by many to be unconstitutional, since it contains directions for the proper mode of conducting the services of the church in addition to those contained in the Prayer-Book. The testimonials of the Rev. Dr. G. F. Seymour, bishop-elect of Illinois, came before this same convention. A determined attack was made upon him as a partisan of ritualism, and the convention, by a close vote, refused to accept the testimonials. In 1875 Dr. DeKoven was elected to the same episcopate, and in his case also the canonical testimonials were rejected, this time by the standing committees of a majority of the dioceses, to whom the testimonials of a newly-elected bishop are submitted when the general convention is not in session. This action called general attention to these officers, and a searching discussion took place as to their true position and the proper limits of their powers.

With regard to the ritualistic movement in general, it is now for the most part conceded that great good has resulted from it, whatever may have been the extravagances or the errors of individuals. It has in particular led to the movement for the enrichment of the Prayer-Book, in which all parties happily united in the General Convention of 1883.

Education.—The Episcopal Church has always been distinguished by the high importance assigned to education within her fold. Her share in the foundation of some of the most important institutions of learning in the early colonial days has already been referred to. The necessity of special efforts for the advancement of theological learning was strongly felt after the Revolutionary War, and in 1817 the organization of a general theological seminary was resolved upon. It was finally established in the city of New York in 1821. Other theological schools of importance are—that at Alexandria, Va., famous for the large number of missionaries among its graduates; the Berkeley Divinity School, Middletown, Conn.; the school in Kenyon College, at Gambier, O., founded by Bishop Chase; that at Nashotah, the result of the labors of Breck and his companions; and schools founded more recently at Philadelphia, Faribault, Minn., Cambridge, Mass., and the theological department of the University of the South. A great impulse was given to the cause of education in church schools by the zeal of Bishop Doane, of New Jersey (1832–59), who founded St. Mary's School for girls, and Burlington College for boys, both at Burlington, N. J.; and within thirty years schools of this character have multiplied rapidly in every part of the Union, many under diocesan authority, besides a great number under private management.

Educational statistics.—Theological seminaries and schools, 16; church colleges, 17; academic institutions, 99; other educational institutions, 56.

General statistics in 1883.—Dioceses, 48; missionary jurisdictions, 15; bishops, 68; priests and deacons,

3559; parishes, about 3000; ordinations of deacons, 146; priests, 132; total, 278; confirmations, 26,133; baptisms, 46,945; contributions, \$8,319,191.39.

Books relating to the History of the Protestant Episcopal Church.—Anderson's *History of the Colonial Church*; Wilberforce's *History of the American Church*; Rev. Dr. Hawks's *Contributions to the Ecclesiastical History of the United States*; *Fac-Similes of Church Documents* (Historical Club); Bishop White's *Memoirs of the Protestant Episcopal Church*; Beardsley's *History of the Church in Connecticut*; Bishop Perry's *Handbook of the General Convention, 1785-1877*; Caswall's *America and the American Church*; Dr. Hills's *History of the Church in Burlington, N. J.*; G. G. Perry's *History of the Church of England* (Am. ed., with continuation by Dr. Spencer); Denison's *History of the Foreign Missionary Work of the Protestant Episcopal Church*. (W. J. G.)

ERCKMANN-CHATRIAN. Under this name two French writers—EMILE ERCKMANN and ALEXANDRE CHATRIAN—have published a long series of novels, sketches, and plays. Emile Erckmann was born May 20, 1822, at Phalsbourg (now Pfalzburg) in Lorraine. He was the son of a bookseller, and, after some study in the college of his native town, went to Paris in 1842. Although his intention had been to study law, he was drawn aside to literature. In 1847 he became acquainted with Chatrian, who was born at the hamlet of Soldatenthal, near Phalsbourg, Dec. 18, 1826, and was then an instructor in the college of that town. The two became fast friends, and soon formed a literary partnership. Their earliest efforts, published in local journals, met with little encouragement, and Erckmann, returning to the law, passed the examination in 1858, while Chatrian entered the employ of the Eastern Railway Company. In 1859 they achieved their first success by the publication of *L'Illustré Docteur Mathéus*, which gave some popularity to their combined name. Their reputation, however, rests on a series of simple stories describing faithfully and minutely the common life of their native province. With this was deftly interwoven the peasants' view of the military glory and subsequent reverses of the French Revolution and the First Empire. Among these works the chief were—*Madame Thérèse, ou les Volontaires de '92* (1863); *L'Ami Fritz* (1864); *Histoire d'un Conscrit de 1813* (1864); *L'Invasion, Waterloo* (1865); *Histoire d'un Homme du Peuple* (1865); *La Maison Forestière* (1866); *La Guerre* (1866); *Le Blocus de Phalsbourg* (1867); *Histoire d'un Paysan* (1868). These apparently simple sketches of peasants' lives and thoughts were really admirable artistic exposures of the hollowness and sham of imperial government, and contributed indirectly to the enlightenment of the French people in regard to the tendency of the Napoleonic system. After the downfall of the empire the authors were able to speak more freely of the system under which the French people had been crushed for years. Their *Histoire du Plébiscite racontée par un des 7,500,000 oui* (1872) was a graphic exposure of the devices by which the empire had been supported, and made a great sensation. Their later works comprise—*Le Brigadier Frédéric* (1874); *Une Campagne en Algérie* (1874); *Maitre Gaspard Fix* (1876); *Souvenirs d'un chef de Chantier à l'Isthme de Suez* (1876); *Contes Vosgiens* (1877); *Le Grandpère Lebigre* (1879). Their play, *Le Juif Polonais*, founded on one of their stories, and brought out in 1869, was highly successful. In 1876 they dramatized another of their early stories, *L'Ami Fritz*, with a view of mitigating the hostile feeling towards the Germans, and, in spite of newspaper denunciation, it was well received. Their works have always been remarkably pure in moral tone, and free from sensationalism. They have been translated into several foreign languages.

ERDMAN, AXEL JOACHIM, Swedish geologist, born Aug. 12, 1814; died Dec. 1, 1869. In addition to numerous articles in scientific publications, he pub-

lished as separate works: *Lärebok, Mineralogien* (1853; 2d ed., 1860); *Vägledning till bergarternas Kännedom* (1855); and *Bidrag till Kännedom om Sveriges quartära bildningar* (1868).

ERDMANN, JOHANN EDWARD, a German philosopher, was born at Molmar, in Livonia, June 13, 1805. He studied theology at the University of Dorpat from 1823 to 1826, and afterwards at Berlin, under Schleiermacher and Hegel. He returned in 1828 to his native town, where, the following year, he was appointed deacon, and, in 1831, pastor to the church. In 1832 he returned to Berlin, graduated in 1834, and being already favorably known by his writings, was appointed, in 1836, extraordinary professor of philosophy in the University of Halle, and in 1839 became professor. Erdmann's principal work is his very valuable *Versuch einer wissenschaftlichen Darstellung der Geschichte der neueren Philosophie* (3 vols., 1834-53). He has also written *Ueber Glauben und Wissen* (1837); *Natur oder Schöpfung* (1840); *Leib und Seele* (1837; 2d ed., 1848); *Grundriss der Psychologie* (1840; 4th ed., 1873); *Grundriss der Logik und Metaphysik* (1841; 4th ed., 1864); *Vermischte Aufsätze* (1847); *Vorlesungen über den Staat* (1851); *Psychologische Briefen* (1851; 6th ed., 1882); *Grundriss der Geschichte der Philosophie* (1866). He has also published a large number of sermons and addresses.

ERICSSON, JOHN, LL.D., an American engineer and inventor, was born in Wermeland, a province of Sweden, July 31, 1803. At a very early age he showed decided mechanical ability, and in 1814, having been appointed a cadet in the engineer corps by the favor of Count Platen, he was employed as a leveller in constructing the grand canal between the Baltic Sea and the German Ocean. In 1820 he entered the Swedish army as an ensign, and was employed in the northern part of Sweden. After rising to the rank of captain he resigned in 1826, and went to England to introduce his flame-engine, but though it had succeeded with a wood-fire it failed with coal. He now devoted himself entirely to mechanical pursuits, and did much to improve the steam-boiler. He introduced artificial draft, and though his original method was afterwards superseded the principle is still used. In 1829, when the directors of the Liverpool and Manchester railway offered a prize for the best locomotive-engine, the "Novelty," which Ericsson built and guided, was successful in the competition. It ran fifty miles an hour, and was the lightest engine exhibited. Applying the same principles, he next constructed a steam-fire-engine, which was highly successful. His caloric or hot-air engine, exhibited in London in 1833, attracted much attention among scientific men as well as the general public. In 1836 he first applied the screw to the propulsion of steam-vessels, but not receiving sufficient encouragement from the British admiralty he came to New York in 1839. Under his direction the United States steamer Princeton was built in 1841, and in it he displayed a wonderful fertility of invention. The propelling machinery was placed under the water-line, the steam-engine, though powerful, was simple and compact, the chimney could be raised or lowered at pleasure, and the recoil of the guns was counteracted by mechanical devices. He continued to produce inventions, some of the most practical kind, while others were for theoretical science. In 1852 he applied his caloric engine in a new form to the propulsion of vessels. The Ericsson, a ship of 2000 tons, sailed on a trial-trip from New York in February, 1853, and attained a moderate speed with a very small consumption of fuel. The caloric engine has been found better adapted to light work than steam, and Mr. Ericsson has spent years in making improvements in it to fit it for the work required. Soon after the outbreak of the civil war he was employed by the United States government to construct iron vessels with revolving turrets for guns. The first one, the famous Monitor, built in

100 days, reached Hampton Roads, in the Chesapeake Bay, March 8, 1862, just in time to save the United States fleet there from complete destruction by the Confederate iron-clad Virginia, which had been constructed out of the United States ship Merrimac. On the next morning the famous conflict took place, the Confederate vessel was defeated and driven into Norfolk harbor. Mr. Ericsson constructed several monitors, and has, since the war, been engaged in the construction and improvement of his numerous inventions. Among these are a pyrometer, an alarm barometer, a sea-lead, and a hydrostatic gauge. In recent years he has devoted much time to constructing a solar engine, whose motive power is to be concentrated solar heat.

ERICSSON, NILS (1802–1870), Swedish engineer, brother of the preceding, was born Jan. 31, 1802. He became a sub-lieutenant in the engineer corps of the Swedish army, and rose to the rank of major in 1832. He was afterwards transferred to the navy and was made head of the mechanical corps. From 1855 to 1863 he was chief of the Swedish railroads, in which time the most of the railroads in Sweden were built. The canal-locks at Trollhättan, the locks near Stockholm, and the Saima Canal in Finland were engineered by him. He was also in part the projector of the Dalsland Canal. For his eminent services he was knighted in 1854 and made a baron in 1860. He died at Stockholm Sept. 8, 1870.

ERIE, a city of Pennsylvania, county-seat of Erie co., is on Lake Erie, 117 miles N. of See Vol. VIII. p. 462 Am. ed. (p. 522 Edin. ed.). Pittsburgh. It is on the following railroads—the Lake Shore and Michigan Southern, the Philadelphia and Erie, and the Erie and Pittsburgh. A large and handsome Union dépôt, built of brick in the Romanesque style, affords facilities for the passengers and traffic of these roads. The New York, Chicago, and St. Louis Railroad also passes through Erie, and has a separate dépôt. The city is finely situated on a bluff, commanding an extensive view of the lake, and is regularly laid out with wide streets. The harbor, formed from a natural bay, which has been greatly improved, is protected by a breakwater and by Presque Isle, originally a peninsula, lying in front of the city. Two light-houses guard the entrance to the harbor, which is $3\frac{1}{2}$ miles long, more than a mile wide, and from 10 to 25 ft. deep. There are extensive docks, some of which have railroad-tracks for the direct transfer of freight between the cars and the vessels. The principal shipments are of coal, iron-ore, petroleum, and lumber. The total value of the exports from Erie for the year 1883 was \$1885, and of the imports was \$896. Of the vessels entering the port 8 were American, with a tonnage of 590, and 12 were foreign, with a tonnage of 841. Of the vessels cleared for foreign trade 8 were American, with a tonnage of 581, and 12 were foreign, with a tonnage of 866.

Erie has 4 national banks, with an aggregate capital of \$850,000, 3 savings banks, 4 insurance companies, and a safe deposit and trust company. There are 3 daily and 9 weekly newspapers, two of which are German. The leading industry is the manufacture of iron, including steam-engines, car-wheels, stoves, and machinery of various descriptions. There are several large rolling-mills, and also petroleum refineries, manufactories of leather, pumps, bricks, and several beer- and ale-breweries. Among the public buildings are the court-house, the custom-house, and post-office; there are also an opera-house, academy of music, marine hospital, and city hospital. There are 35 churches of various denominations, 57 schools, including a high school and 18 grammar schools, besides parochial schools and a female academy.

For municipal purposes the city is divided into 6 wards, each of which elects 2 members to the select council and 3 to the common council.

The city is lighted with gas, and has an excellent

supply of water, pumped from the lake to the top of a tower 200 ft. high and thence distributed through the mains. There are several parks or squares, and near the city limits is the Erie cemetery, comprising 75 acres, laid out with good taste and carefully kept.

On the site of the present city of Erie the French built a fort about 1746, called Fort de la Presqu'isle, but the town was not laid out till 1795. In 1805 it was incorporated as a borough, and in 1851 as a city. At this place Com. O. H. Perry, in the summer of 1813, equipped a fleet of 9 vessels, which, on September 10, defeated the British squadron and established American supremacy on the lakes.

ERIE, LAKE, the most southern of the Great Lakes, on the boundary between the United States and the Dominion of Canada, is the last but one in the series. It receives at its upper end, through the Detroit River, the accumulated waters of the three upper lakes, and discharges them, through the Niagara River, into Lake Ontario, whence they are carried by the river St. Lawrence to the Atlantic Ocean. The axes of these two lower lakes are both nearly in the straight line of a prolongation of the St. Lawrence, in a general direction S.W. to N.E. Lake Erie is contained between the parallels of $41^{\circ} 24'$ and $42^{\circ} 54'$ N. lat., and between the meridians of $78^{\circ} 55'$ and $83^{\circ} 30'$ W. long. It is bounded on the N. by the Province of Ontario, on the S.E. and S. by the States of New York, Pennsylvania, and Ohio, and on the W. by the State of Michigan. It is nearly elliptical in form—the length about 250 miles; the mean width $38\frac{1}{2}$ miles; circumference about 650 miles; area about 9600 square miles.

It is the shallowest of the Great Lakes, its greatest depth being 204 ft., near its eastern end. Its bottom area may be regarded as consisting of three portions. The western, from a line between Detroit and Toledo to the line of the southward prolongation of Pointe Pelée—32 miles in length—has a mean width of 27 miles, and an average depth of 30 ft.; this is the only part of the lake containing islands (if we except that formed recently by the cut-off of Long Point). The five principal are Pointe Pelée, Kelley's, Put-in Bay, Middle Bass, and Isle St. George. Some of these are under good cultivation, have a fertile soil, and are well wooded. The middle and larger portion of the lake, from Pointe Pelée to a line crossing the lake S. of Long Point—135 miles in length—has a mean width of 43 miles (maximum, 57 miles), and a depth from 60 to 80 ft. The eastern portion, ending at the outlet of the Niagara River, near the city of Buffalo, is 81 miles in length, has a mean width of $25\frac{1}{2}$ miles, and an average depth of 100 ft.

The ordinary elevation of the surface of the lake above mean sea-level has been determined to be 573 ft. Its level has been found to be variable—it has both an annual fluctuation and a general one extending over a series of years, known as the secular fluctuation. According to the observations and compilations of Col. Charles Whittlesey, the lowest known level was in February, 1819—after which time it rose more or less each year until June, 1838—in the extreme to 6 ft. 8 in.; the difference between 1819 and 1838 was 5 ft. 2 in. The average annual rise and fall (mean of 12 years) is 1 ft. $1\frac{1}{2}$ in. The surface is also acted upon by the winds, tending to drive the water from one end of the lake and to heap it up at the other.

The lake is surrounded by a surface formation of drift-clay and gravel—the deposits of the great glacial action from the north—covering the upper Silurian formation and strata of the Devonian system which appear—the former at the extremities; the latter around the greater part of the lake. The coast is generally low—rarely cliffs or bluffs are found. On the southern shore an elevated plateau surrounds the lake, at no great distance, the general dip of the strata and surface being to the southward. Through this plateau the rivers have cut deep channels, and the

water-courses and the waves of the lake undermine it and keep up an incessant degradation, tending to fill up and shallow the basin.

The principal rivers and creeks, naming them from E. to W., are the Cattaraugus, Conneaut, Ashtabula, Grand, Chagrin, Cuyahoga, Rocky, Black, Vermilion, Huron, Sandusky, Portage, and Maumee. The coast is but little indented by bays, and there are but few harbors, natural or improved. The principal of these on the S. shore (from E. to W.) are those of Buffalo, Dunkirk, Erie, Ashtabula, Fairport, Cleveland, Sandusky, Port Clinton, and Toledo. Some of the foregoing have been greatly improved by the United States Government. On the north (or Canadian) shore the harbors are Ports Colborne, Maitland (at the mouth of Grand River, the only considerable stream on the Canadian side), Dover, Barwell, Stanley, and Talbot.

The meteorological elements affecting the climate of the shores of Lake Erie may be thus summarized: mean temperature of the year at the S.W. end of the lake, $48\frac{1}{2}^{\circ}$; at the N.E. end, $46\frac{1}{2}^{\circ}$; mean temperature of the three summer months, 70° and 68° , and of the three winter months, 28° and 27° , at these ends respectively. The mean annual rain-fall around the shores of the lake is about 34 in. The lake is usually closed by ice in the early part of December, and continues more or less frozen over until March or April.

During the season of navigation an enormous amount of transportation is carried through Lake Erie from the upper lakes, the outlets eastward and to the ocean being—at Buffalo, the Erie Canal, 352 miles long, to Albany, N. Y.; and at Port Colborne, in Canada, the Welland Canal, 27 miles long, which connects with Lake Ontario, avoiding the falls of Niagara. There are two other great canal systems, on the southern shore of Lake Erie, crossing the State of Ohio—the Ohio and Erie Canal, from Cleveland to Portsmouth, and the Miami and Erie Canal, from Toledo to Cincinnati.

The larger cities on the southern shore are Buffalo, N. Y., and Cleveland and Toledo, O. Five lines of steamers connect these and other ports. There are no large cities on the Canadian shore. Great railway systems are run close to and parallel with both shores.

The fisheries of Lake Erie are very extensive, the catch exceeding that in any of the other lakes, that of Lake Michigan being next in amount. The census of 1880 gives for Lake Erie: number of fishermen, 1470; value of apparatus, etc., \$503,500; number of steam-tugs, other vessels, and boats, 538; total catch in lbs., 26,607,300; value, \$412,880—consisting principally of herring, white-fish, sturgeon, trout, pike, bass, muskalonge, catfish, and lake-shad.

It was in the western part of Lake Erie, near Put-in Bay, that on Sept. 10, 1813, the American commodore, O. H. Perry, with 9 vessels, carrying 54 guns and 490 men, gained a decisive victory over the British captain, Barclay, with 6 vessels, carrying 63 guns and 502 men. (W. L. N.)

ERIES, a tribe of American Indians, who formerly occupied the shores and islands of Lake Erie, but have entirely disappeared. Their history is of interest. They adjoined, and perhaps formed, the principal tribe in a confederacy known as the Neutral Nation, who were prominent in the region of Western New York at the date of the first French settlements in Canada. They occupied a position of neutrality between the Wyandottes or Hurons, the allies of the French, and the Iroquois, the allies of the English, and suffered the usual fate of neutrals. Great obscurity surrounds their history. The power to kindle the council-fire of peace, which they maintained, is said to have been held by female hands before its final extinction. The Eries, or Cats, as the French called them, were a powerful tribe, numbering about 12,000. They were attacked by the Iroquois about 1650, and a long and bloody war ended in their destruction or ex-

pulsion in 1655. In this war all the neutral tribes seem to have been involved, and the whole Neutral Nation disappeared. There are traditions of the Catawbias of South Carolina which render it possible that they were descendants of some of these tribes. West of the Neutral Nation was a cognate tribe, the Andastes, or Kahquas, who were next attacked by the Iroquois, and vanquished in 1672, after a well-sustained war, which lasted sixteen years. These powerful tribes, who stood first in the way of the vigorous and aggressive Iroquois confederacy, were utterly swept away, so that no positive trace of them now exists upon the earth.

ERRETT, ISAAC, A. M., an American theologian and author, was born in New York city, Jan. 2, 1820. When he was five years old, his father, Henry Errett, died, leaving a widow with seven children. His mother was married again in 1829 to Robert Sutor, and moved to New Jersey, where two or three years were spent on a farm. Then they removed to Pittsburg, Pa., where the rest of Isaac's boyhood was spent in hard work in grist- and saw-mill, farming, bookstore, printing-office, and school-teaching. His leisure hours were spent in study, and his winters in attendance at school. During five years in a printing-office his nights were given to reading and writing for the papers. His education was therefore largely self-conducted. In his thirteenth year he became a member of the Church of the Disciples, in which he had been reared, and in 1840 he was set apart to the Christian ministry. He spent three years in pulpit service in Pittsburg, Pa., five years at New Lisbon, O., two years at North Bloomfield, O., five years at Warren, O., ten years in Michigan—two at Detroit, and eight in Ionia county. Since 1866 he has had no regular charge, being engaged mainly in editing, in preaching on special occasions, or holding protracted meetings. He was one of the founders of the school at Hiram, O., which has grown into Hiram College. Three years were spent in the service of the Ohio Christian Missionary Society as corresponding secretary, and three years in the service of the National Christian Missionary Society in the same capacity. During these last three years, in addition to a large evangelizing work, and the care of a farm, he travelled about 10,000 miles a year in the service of the missionary society, lifting it out of its financial straits and starting it on a career of prosperity. He was also at this time a co-editor of Alexander Campbell's monthly, the *Millennial Harbinger*, and wrote for it regularly. Bethany College bestowed on him the honorary degree of A. M.

In 1866 he started a religious weekly in Cleveland, O., *The Christian Standard*, of which he still continues editor-in-chief. It has grown to be the largest, most widely circulated, and most influential of the journals published by the Disciples. In 1868 he was elected to the presidency of Alliance College, Ohio; but as the interests of his paper required its removal to Cincinnati, in 1869 he resigned this position, and has since declined similar offers. He was president of the Ohio Christian Missionary Society for six years; of the General Christian Missionary Society for three years, and since 1875 has been the president of the Foreign Christian Missionary Society. He has been largely engaged in all the general enterprises of the Disciples. He has published several volumes: a *Debate on Spiritualism* with Joel Tiffany; *Walks about Jerusalem*; *Talks to Bereans*; *Letters to a Young Christian*; *Letters to an Inquirer*, besides numerous pamphlets. He now lives in Cincinnati, O., still editing the *Christian Standard*, along with other religious periodicals.

ESCANABA, the county-seat of Delta co., Mich., is on the west shore of Little Bay de Noquette, a part of Lake Michigan, near the mouth of Escanaba River, and is on the Chicago and North-western Railroad, 325 miles north of Chicago. It has a fine harbor, with two iron docks, costing \$400,000, and is the

principal outlet for the iron ore mined in adjoining regions, as well as trade in lumber and fish. It has a foundry, furnace, and machine-shops, saw-mills, a weekly newspaper, a bank, 5 churches, and a graded school. It was laid out in 1863. Population, 3026.

ESCAPE is (1) the going away by one lawfully in custody from the place where he is confined, and (2) the allowing voluntarily or negligently of such prisoner to leave his confinement. It is the duty of every man to submit himself to the inquiry and judgment of the law, and therefore one who removes himself from its custody, though without the exertion of any force or breaking, is guilty of a misdemeanor; nor is it material whether or not he is guilty of the crime with which he is charged; it is sufficient that he is lawfully in custody to answer a charge. Where force is exerted in any way to effect the escape, the offence falls under the head of prison-breach or rescue. As said above, the name escape is also applied to the act of any one who voluntarily or negligently allows a prisoner in his custody to go at large; and the escape is complete when the prisoner is allowed to go beyond the limits of the place where he should be confined, nor is it remedied by a retaking of the prisoner. This offence may be committed by any one—even a private citizen—who has a prisoner lawfully in custody. If the party voluntarily allows his prisoner to escape, he makes himself an accessory after the fact in felonies; is guilty of treason, if the prisoner's crime was treason; and of a misdemeanor, if the prisoner's offence falls in that grade. The negligent allowing of an escape is a misdemeanor; and, so far as it is considered the duty of the officer to retain the prisoner in custody (*salva et arcta custodia*) that it is not necessary on the trial of one for allowing an escape to prove negligence on his part, but it will be presumed from the mere fact of escape; and he cannot avoid the presumption of such negligence except by affirmatively proving that he had exerted all due diligence to prevent escape. Besides this criminal liability for an escape, the sheriff and jailer or bailiff, when a prisoner in custody in a civil case regained his freedom, were liable to a civil action by the plaintiff at whose suit the prisoner had been arrested. If the prisoner was in custody on mesne process, the plaintiff could recover in an action on the case against the sheriff or the under officer such damages as he could have recovered against the original defendant; but, if the officer could rearrest the prisoner, he escaped this liability. But in an escape from imprisonment on final process, the officer became liable in an action of debt for the full amount of the judgment which had been recovered against the defendant; and this, too, irrespective of the question of the solvency of the original defendant, and whether or not he was rearrested. This branch of the subject has, of course, been materially altered by the general abolition of imprisonment for debt. The law on the subject of escape is to-day in its general principles as above described, though its details have been more or less altered by statute in the different American States. (W. M. M.)

ESMARCH, JOHANNES FRIEDRICH AUGUST, the most eminent German surgeon of the present day, was born Jan. 9, 1823, at Tönning in Schleswig-Holstein. His father was a physician of considerable repute, and was also a local magistrate. The son, after passing through the usual course in the gymnasia at Rendsburg and Flensburg, studied medicine at Kiel and Göttingen. In 1846 he became Dr. Langenbeck's assistant in the surgical hospital at Kiel, and in the Danish war of 1848 he served first as a lieutenant and afterwards as assistant surgeon. Being then made chief physician of the citizens' hospital at Flensburg, he had abundant opportunity of acquiring proficiency in military surgery. During the armistice Dr. Esmarch returned to Kiel, but when hostilities were resumed he served in the two following campaigns as adjutant of Stromeyer, to whom he is greatly indebted for his success in his profession. He was promoted to be chief

surgeon Aug. 8, 1850, and having meantime received from the state license to teach, he delivered lectures at Kiel on gun-shot wounds. The year 1851 he spent in visiting the medical institutions of the principal cities of Europe and attending the lectures of the great masters of surgery, but after his return the Danish government revoked his license. In February, 1854, he married the daughter of his preceptor, Stromeyer, and when his father-in-law a month later was called to Hanover as general staff surgeon of the army of that kingdom, Esmarch succeeded him in the surgical clinic. In October, 1857, the government was compelled to acknowledge his abilities, and he was appointed professor and director of the hospital at Kiel. His vacations were spent in various journeys to increase his knowledge of his art, and especially the management of hospitals. During the Schleswig-Holstein war of 1864 he held high official positions, serving in the hospitals at Flensburg, Sundewitt, and Kiel. In July, 1866, he was summoned to Berlin to become a member of the hospital commission, and, though he was not immediately successful in securing the adoption of many improvements suggested by the experience of the civil war in America, such as barrack-hospitals, sanitary trains, etc., yet his labors were not in vain. At the outbreak of the Franco-German war of 1870 Dr. Esmarch was just recovering from a serious and tedious illness, and therefore did not enter the campaign. In July, however, he was appointed surgeon-general and consulting surgeon of the army. He had already organized at Kiel a volunteer aid commission in behalf of the Schleswig-Holstein troops and assisted in a similar movement at Hamburg. He was again summoned to Berlin Aug. 3, 1870, to direct the construction of large hospital barracks in accordance with his former suggestions. Here he was unremittingly employed as consulting surgeon till the close of the war. In April, 1871, he resigned his position in order to enjoy a much-needed rest. Since his return to Kiel he has been constantly engaged in his work as professor and surgeon. At the surgical congress in the year 1873 he explained the great invention in surgery by which he is now known to the medical profession throughout the world, the bloodless method of operating on the extremities. By passing around the limb to be operated upon tight rubber bands gradually from the extremity to a point above the place of operation the amount of blood in the limb can be so much reduced that the formerly great risk of excessive bleeding is removed. In 1874 Dr. Esmarch visited Great Britain and was received with special honor by the surgeons of the country. In the hospitals he was more than once called to illustrate the method which already bore his name. He has in turn acknowledged the merit of the antiseptic method of Lister and has combined it with his own. His wide experience, his keen insight and his valuable inventions cause his suggestions in all matters pertaining to surgery, and especially on gun-shot wounds, to be received with great deference. Hence, too, his censure of the treatment of President Garfield after his assassination excited unusual interest in the surgical profession of both Europe and America. In February, 1872, some years after the death of his first wife, Dr. Esmarch married the Princess Henriette of Schleswig-Holstein.

Dr. Esmarch has published many professional works, among which are *Ueber Resektionen nach Schusswunden* (Kiel, 1851); *Beiträge zur praktischen Chirurgie* (Kiel, 1853-60); *Verbandplatz und Feldlazarett* (Berlin, 2ded., 1871); *Der erste Verband auf dem Schlachtfelde* (Kiel, 1869); *Ueber künstliche Blutleere bei Operationen* (Leipsic, 1873); *Die erste Hilfe bei Verletzungen* (Hanover, 1875); *Die erste Hilfe bei plötzlichen Unglücksfällen* (Leipsic, 1882).

ESPARTERO, DON JOAQUIN BALDOMERO, duke of Vitoria, prince of Vergara (1792-1879), a Spanish general and statesman, was born at Granatula, in La Mancha, Feb. 27, 1792. Being the youngest of nine

children of a wheelwright, he was on account of his weak constitution intended for the church, but during the French invasion of 1808 he enlisted as a volunteer in a battalion composed of students. In 1811 he was appointed a sub-lieutenant of engineers at Cadiz, but afterwards, not being able to pass the examination in that service, was transferred to the infantry. In January, 1815, he accompanied the expedition to South America under Gen. Morillo, and became his chief of staff. He fought in Venezuela and Peru, and was for some months a prisoner. During the ten years of his sojourn in America by successive promotions he rose to the rank of colonel, and also acquired considerable wealth. In 1824, after the capitulation of Ayacucho, by which Spain abandoned her possessions in South America, Espartero returned to his native land. Being stationed at Logroño, with the rank of brigadier-general, he married a daughter of a wealthy resident of that place. In 1832 Ferdinand VII. attempted to abolish the application of the Salic law to Spain, and Espartero declared in favor of the succession of the princess Isabella to the throne. On the death of the king (Sept. 29, 1833) the general offered to march against the northern provinces, which had risen in favor of Don Carlos, who claimed the throne under the former law. Espartero was made commander of Biscay and afterwards field-marshal and lieutenant-general. He displayed considerable ability, and in 1837 saved Madrid from capture by a raid of the Carlists. As a reward he was appointed general-in-chief of the Army of the North, viceroy of Navarre, and captain-general of the Basque provinces. Being chosen a member of the Cortes, he gave his approval to the new constitution of 1837, and was henceforth an advocate and supporter of constitutional liberty. In September, 1837, he saved Madrid from capture by Don Carlos himself, drove him across the Ebro, captured Lucana, and raised the siege of Bilbao. For these exploits he was made duke of Lucana, but his victorious career was embarrassed by quarrels with the ministry. He then undertook the difficult task of restoring discipline in the army and establishing order in the conquered provinces, which was effected only after severe executions at Pampeluna and elsewhere. He defeated the Carlist Generals Negri and Guergué, and in 1839, taking advantage of dissensions in that party, concluded with Gen. Maroto the famous convention of Vergara, in consequence of which Don Carlos retired to France, though Gen. Cabrera maintained his cause a few months longer. As a reward for his services Espartero was made a grandee of the first class and duke of Vitoria. His success led him to demand also rewards for his favorite aide-de-camp, Linage, which Narvaez, the minister of war, attempted to resist. The latter was compelled to resign, and the rest of the Cabinet in their blind rage aimed a blow at the liberties of the municipalities, which Espartero was known to favor. An insurrection ensued at Madrid, and the victorious general was called to be the head of a new ministry. In October, 1840, Queen Christina, who had still resisted all liberal movements, was compelled to abdicate the regency and retire to Paris. Espartero was elected to that position May 8, 1841, and displayed his accustomed energy in suppressing the republican movement in Valencia, crushing the insurrection of O'Donnel at Pampeluna in favor of Christina, as well as defeating the plots of Generals Concha and Diego-Leon, the latter of whom he caused to be shot. By severe measures he again restored order in the Basque provinces and made himself for a time master of the situation. He resisted the extreme demands of the Church party and prevented the abduction of the young queen. At the end of 1842 a new insurrection at Barcelona was excited by the partisans of Christina, and Espartero bombarded the city. In 1843 the progressive party, of which he had been the leader, united with the moderates, and

his refusal to dismiss his secretary Linage and generals who had taken part in the conquest of Barcelona brought on a crisis. His treaty of commerce with England was denounced as disadvantageous to Spain, and several of the provinces rose in revolt. A revolutionary junta at Barcelona, June 13, 1843, proclaimed that Isabella II., though only twelve years of age, had attained her majority, and a provisional government composed of Lopez, Caballero, and Serrano declared Espartero a traitor to his country and deprived him of all his dignities. Narvaez at the head of the insurgents marched on Madrid, and entered without resistance, July 22, 1843. Abandoned by his troops, Espartero embarked at Cadiz July 30, and sought refuge in England, where he was received with all the honor due to his former rank. In 1848, the queen having annulled the decree which had deprived him of his rank, he returned to Spain and resumed his place in the senate, but soon retired to his estate at Logroño. In July, 1854, when Christina was compelled to leave Spain, Queen Isabella sought to save her throne by calling the veteran statesman to be head of her ministry at the very time when the revolutionary junta at Saragossa had chosen him commander-in-chief of the national forces. He formed a new cabinet, in which, as the only means of saving the nation from bloodshed, O'Donnel, the leader of the partisans of Christina, was made minister of war and the queen was banished. But between these two leaders, the progressive and the reactionary, there could be no harmony. A financial crisis added to the difficulties of the situation, and the Cortes which met in November spent its time in discussing the constitutional limits of monarchy, even questioning its right to exist. Finally, after a struggle of two years, the whole ministry resigned, and O'Donnel, whom the queen favored, was requested to form a new cabinet. Fresh insurrections followed at Madrid, Barcelona, and Saragossa, but Espartero refused to engage in these contests made in his name. Resigning his dignity as senator, he again retired to Logroño. After the revolution of October, 1868, and the expulsion of Queen Isabella, he gave his adhesion to the provisional government under Marshal Serrano, but took no active part in affairs. While the question of the form of government to be adopted was still under discussion a deputy proposed to the Cortes in May, 1869, to restore the monarchy and place Espartero on the throne. Though the proposal met with little favor, it was renewed with no better success a year later. After a long period of suspense, Amadeus, Duke of Aosta, son of Victor Emmanuel, was elected king in the autumn of 1870. After his arrival in Spain the new king bestowed many marks of favor on Espartero, conferring on him the order of the Annunciation and visiting him at Logroño, Sept. 30, 1871. Espartero, on his part, declared his adherence to the new dynasty, yet he gave no assistance in the troubles with which the young king was surrounded, and was with difficulty induced to accept the title of prince of Vergara, January, 1872. After the abdication of Amadeus, when Castelar was at the height of his power in the short-lived republic, Espartero thanked that statesman for referring to him as "the veteran of liberty." Two years later the republic had passed away, and Espartero gave his approval of the accession of Alfonso XII. He took no further part in public affairs, and died at Logroño, Jan. 9, 1879.

ESPARTO. This material, well known in connection with paper-making, is derived from two different grasses—*Lygeum Spartum* and *Macrochloa tenacissima*. It was well known to the ancients in connection with cordage, basket-making, and other work. Pliny devotes considerable space to "Spartum" in his 19th book, and says that it was known long before his time. It seems, however, not to have been much noticed in modern times till the

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advent of the American war for the Union, when the scarcity of cotton from the Southern United States made an unusual demand for paper-making material. England uses over thirteen pounds of paper per head of her whole population, and esparto came in well to supply part of the deficiency of cotton. The demand once opened, increased to such an extent that by 1868 England was importing nearly 98,000 tons, 93,000 of which came from Spain. In 1870 England received 100,000 tons, and in 1871 150,000, notwithstanding the enormous increase in price. England paid for the little it bought the year before the American war about \$20 per ton in American money; in 1870 it cost \$50, and was still regarded as profitable. For a considerable time after the war above referred to, very large quantities were imported directly from Spain to the United States, but now the importation has measurably fallen off through the discovery of cheaper material in that country. Some paper-makers in Philadelphia who used it extensively at one time have wholly abandoned its use.

In the old world attention seems to be growing towards it, and countries which seemed able to do without it are gradually coming to regard it with favor. A large company was formed in Germany during 1881 for paper-making from esparto grass, the first in the empire. Esparto is Spanish for sedge. Sedge, as we now understand it, is confined to *Carex* or *Cyperus*, but the esparto plants are true grasses. The Spanish people seem to retain the name "Esparto" for the material, the two grasses being distinguished, the *Sygeum* as *alfa*, and the *Macrochloa* as *atocha*. The former is chiefly from strong clayey land in Spain; the latter grows farther west in dry sandy land, even extending to the Desert of Sahara. A most remarkable fact in its history is that it takes ten or fifteen years from seed before it is strong enough to pay for cutting, but after it has once come into use it will allow of an annual cropping for forty or fifty years without showing signs of depreciation. In consequence of the long time it takes to produce a paying crop, the French are looking to legislation to prevent the destruction of the esparto grounds in Algiers as they look for similar legislation in forestry elsewhere. Much is destroyed by wanton fires, and stealing from the esparto public grounds is also a matter for Algerine legislation. For the increase of young esparto plantations fire is used, as the seeds seem to vegetate and the young plants to come sooner into profit from burned land than from elsewhere. The gathering of the grass commences at once after the wheat harvest. At that time the leaves and stalks part readily from the rhizomes, which remain in the ground for future crops. The stalks are from six to ten feet high, and are gathered in large handfuls, the gatherer wearing leather gloves to protect the hand. Sometimes a short stick is used, the gatherer dexterously twisting the tops around the stick, when a slight pull upwards and sideways draws the stalks out without any damage to the roots. The material is tied in small bundles by a piece of the grass, dried a little, and then in burdens of about two hundred weight carried across the deserts on the backs of asses to the commercial dépôts. In Spain the town of Crevilente is the headquarters for the esparto trade, though much business with it is done in Madrid.

The manufacture of paper from esparto requires some peculiar management. The grass is laid on tables and weeds and foreign material sorted out, the refuse usually amounting to about four per cent. of the original weight. The cleaned grass is then boiled by steam, ten pounds of caustic soda being used with every one hundred pounds of grass. After being boiled and stirred for six hours the water is drawn off. It is then boiled again in fresh water for an hour. It then receives two washings with cold water. Two and a half hundred weight of bleaching powder to the ton is added, and the mass revolved through bleaching

tubs till white. It is again washed to free it from all traces of the bleaching powder, pressed to clear out the liquor, when it is ready for use. The pulp yielded is about one-half the original weight of the grass. Large amounts of esparto are exported from Tripoli and Tunis.

Attempts have been made by the United States Department of Agriculture to introduce the plant into the United States, but its slow growth will always be against its value. In New Mexico are some native species, *Stipa Sparteae* especially, closely allied to the European and African forms. In recent industrial literature there is some confusion made between esparto and the fibre of *Spartium junceum* or Spanish broom, a totally distinct plant. (T. M.)

ESPY, JAMES POLLARD (1785-1860), an American meteorologist, was born in Westmoreland co., Pa., May 9, 1785. Ten years later his father died and the family removed to Ohio, where young Espy worked on a farm, but did not learn to read till he was 17 years old. From that time he was eager in pursuit of knowledge, and before reaching manhood he was a school-teacher. He removed to Philadelphia, where he became professor of mathematics in the Franklin Institute. His scientific researches led him to investigate the origin of storms, and after a time he formed a theory on the subject and asserted the possibility of producing rain by artificial means. He had meantime sought aid from the national government to prosecute his experiments, but he was disappointed and his suggestions ridiculed. He then began to lecture in the principal cities and thus obtained the friends and the means necessary. In 1839 he went to England and was able to show sufficient confirmation of his theory to attract the notice of the British Association. In Paris, too, Prof. Arago made an extended report on it to the French Academy of Sciences. Encouraged by this aid he published his work, *The Philosophy of Storms* (1841), and at last in 1843 the United States government appointed him to a position in the Washington observatory that he might conduct meteorological researches, being assisted by observers in various parts of the country. The results were published by the War Department in several volumes. Prof. Espy died at Cincinnati while on a visit, Jan. 24, 1860. Though his theory is discarded, some parts of it still hold an important place in meteorology, but by the aid of the telegraph and further investigation the science has been extended far in advance of what was thought possible in his time.

ESTRAY. In law, cattle found straying about from point to point, the owner of which is unknown. At common law all estrays belonged to the crown, unless there had been a special royal grant to the lord in whose manor the same were found of all estrays therein. In order to vest an absolute property in the king or his grantees it was necessary that the estrays should be proclaimed in the church and two market towns next adjoining to the place where they were found. If no man claimed them they became the property of the crown after the lapse of a year and a day. At any time before the expiration of that period they might be claimed by the owner, upon his paying the reasonable charges of finding, keeping, and proclaiming them. In the United States the right of the finder of an estray to detain it until his reasonable charges are paid by the owner is generally secured by statute. Provision is also made for the sale of all unclaimed estrays by the officers of the township in which they have been found, after due proclamation and advertisement. The proceeds are usually applied either for the support of the poor or some other public purpose. (L. L., JR.)

ETEX, ANTOINE, a French artist, was born at Paris, March 20, 1808. He is descended from a family of artists, and at an early age devoted himself to such pursuits. He frequented the studios of Dupaty and Pradier, and received instruction from

Ingres and Duban. In 1828 he obtained the second *prix de Rome* by his *Hyacinthus slain by Apollo*. After spending two years in Italy he visited Algeria, Germany, and England. At the salon of 1833 he exhibited a colossal statue of Cain, the originality and boldness of which so impressed M. Thiers, then minister of public works, that he gave Etex a commission for two of the groups for the Arc de l'Etoile. Yet many of his works were rejected at the salons, and for a time he refused to compete. In 1841, however, his *Tomb of Géricault* obtained for him the decoration of the Legion of Honor. In the revolution of 1830 he fought, and in 1848 he presented himself as a Republican candidate for the Assembly, but without success. He has not confined himself to sculpture, but has also been a painter, engraver, and architect. Among his statues are—*Hero and Leander*, at the museum of Caen; *Blanche of Castile*, at Versailles; *Charlemagne*, at the Luxembourg; *St. Augustine*, at the Madeleine; *St. Benedict* (1865); the *Genius of the 14th Century*; the *Shipwrecked*, which was exhibited at the exposition of 1867; *Sleeping Child*; *Susanna surprised at the Bath* (1875). He has executed also a large number of bas-reliefs and busts of the principal men of France, both in marble and bronze. Among his paintings are—*Joseph Relating his Dreams*; *Christ Preaching*; *Eurydice*; *Sappho*; *Romeo and Juliet*; *Dante and Beatrice*; *The Great Men of the United States* (now in City Hall, New York); *Jacob Going Down to Egypt*; *Jacob Blessing the Sons of Joseph*; *The Flight to Egypt*; *The Ancient Slave*; *The Modern Slave*. He has also made many water-colors and pastels. As an architect he has executed designs for monuments and public works. Among these is the monument of Francis I. at Cognac. The principal of his engravings are comprised in *La Grèce tragique*, a series of designs from the Greek tragic poets. As an author he has contributed to various journals political and critical articles, and published *Essai sur le beau* (1851); *Cours élémentaire de dessin* (1859), and an autobiography, under the title *Les Souvenirs d'un Artiste*.

EUGÉNIE, empress of France and wife of Napoleon III., was born in Granada, Spain, May 5, 1826. Before marriage she was known as Eugenia Maria Guzman de Montijo, Countess of Teba, being the daughter of Count Montijo, a grandee of illustrious descent. Her mother was Doña Maria Manuela Kirkpatrick Closeburn, a lady sprung of an old Scottish family, expatriated at the fall of the Stuarts; her father was at one time British consul at Malaga. In 1851 Eugénie lived with her mother at Paris. Here her beauty and mental accomplishments, no less than the dignity and refinement of her manners, attracted much attention. The future emperor had known her during his residence in England, and was believed to be one of her admirers. After the failure of the project for a marriage with a Swedish princess, the emperor, on Jan. 2, 1853, apprised his ministers of his intended marriage to the Countess Montijo. The wedding was celebrated Jan. 29, 1853, at the church of Notre Dame. The imperial court owed much of its brilliancy to Eugénie's tastes; and she gave largely to charitable and pious enterprises. To the ultramontanes her support was unfailing, and her influence unquestionably affected the imperial policy at many important junctures. The affairs of Italy and of Rome (1859-65), and, later, the Mexican question and the disputes which ended in the Franco-German war of 1870-71, are believed to have been greatly complicated by her prejudices. But, though her political sagacity was often at fault, her high personal and moral qualities were never open to question. On the fall of the second empire (Sept. 3, 1870) she left Paris for England, where she was joined by the prince imperial (1856-79), her only child, and, in the following March, by her husband. The emperor died Jan. 9, 1873, and her son was killed in the Zulu war, June 1, 1879. This event was a

terrible blow to Eugénie and to the imperialist cause. Her residence in exile is at Chiselhurst, Kent.

EUPHORBIA. A well-known genus of plants, the type of the natural order *Euphorbiaceæ*, which probably embraces 3000 species, of which Boissier, in 1862, enumerated 720 species in *euphorbia* alone. The flowers are of separate sexes on the same peduncle. The female flower consists of little more than a three-lobed pistil, terminating a three-celled ovary elevated on a short pedicle, around which are several monostaminate male flowers; and beneath this an involucre often highly colored. Besides this, the plants abound with a milky, highly-acrid juice. There are some exceptions to these general characteristics; yet euphorbiaceous plants are readily recognized by them.

These plants abound in the warmer parts of America. Indeed, about one-fourth of all the species known are found on the American continent. Of the genus *euphorbia* there are 27 species found in the United States east of the Mississippi, and 19 recorded in the botany of California. Some of these are, however, common to both continents.

Plants of this genus have had a medical reputation from the earliest times on account of their great aperient powers. They have the common name of spurge, and the whole order is called spurge-wort in Europe. These properties are said to have been discovered by Euphorbus, a physician to King Juba, of Mauritania; but, as the Greek *euphorbus* signifies well-fed, the name may have been derived from the fact that the African plants had thick, succulent stems, like our cactus, and were filled with milky juice. The juice of these euphorbias is extremely acrid, and its medical application is scarcely ever quite safe. Since the discovery of castor-oil, obtained from *Ricinus communis*, also a euphorbiaceous plant, the juice of the *euphorbia* has fallen into disrepute. At one time it was considered so important that a supply of euphorbia should be always on hand, that Charlemagne ordered *Euphorbia Lathyris* to be planted in all the monastic gardens of his empire. Perhaps among the most famous in its time has been the "cypress spurge," *Euphorbia cyparissia*, which, near two hundred years ago, was the basis of a popular medicine, known as Rulander's extract, which was to cure scurvy, dropsy, jaundice, gout, rheumatism, and other disorders. The belief in the medicinal value of this plant must have been very strong, for the early German settlers of Pennsylvania brought it with them from their fatherland, and we find it still in most of the farm gardens in the older portions of the Atlantic United States. Yet no one now regards the plant as good for anything but to destroy warts. Of American species *Euphorbia corollata* was in use by the Indians as an emetic. They called it "pehac," and it is yet known as "wild ipecac." The root of another species, *Euphorbia ipecacuanha*, has been used as ipecacuanha, but is not equal to it in medicinal properties. Some of the South American Indians use the juice of a species of that region to poison their arrows, and *Euphorbia maculata* of the United States has been charged with making the mouths of horses sore and inducing what is known as "slobbers." But heat seems to drive out the acrid properties, and from some of the more fleshy rooted kinds farinaceous food is prepared. One species—*Euphorbia edulis*—is boiled as greens in China. The albumen in the seeds is nutritious. The agricultural ants of America make good use of them. In Colorado stores of *Euphorbia maculata* seeds have been found in the ant-nests, and in Texas the ant-granaries are largely supplied with croton seeds—croton being a very large genus of euphorbiaceous plants. Some of the tropical euphorbias are cultivated as greenhouse plants. Among the more interesting species are the tree-euphorbias, which abound in certain parts of Africa.

EUREKA, the county-seat of Eureka co., Nevada,

is 90 miles south of the Central Pacific Railroad, with which it is connected by the Eureka and Palisade Railroad. It contains a court-house, costing \$60,000, 2 banks, 2 daily papers, 3 churches, a good school. It was founded in 1871. The rich mines of silver in this vicinity have yielded altogether \$60,000,000. Population, 4207.

EUREKA SPRINGS, a city of Carroll co., Ark., is at the headwaters of a branch of White River, 8 miles south of the Missouri boundary and 250 miles S. W. of St. Louis. A branch railroad is now in construction from Seligman, 18 miles N. W. on the Arkansas division of the St. Louis and San Francisco Railroad. It was settled July 4, 1879, and has already become noted as a health-resort on account of its medicinal springs. Situated on the sides of the White River Mountains, in the midst of a wilderness, it is resorted to by thousands of invalids, for whose accommodation there are numerous hotels and boarding-houses. The city was organized in 1880 and has a bank, 2 daily and 3 weekly newspapers, 7 churches, and 5 schools. The following analysis of water from one of the medicinal springs was made by Potter and Riggs, of Washington University, St. Louis: chloride of sodium, .19; sulphate of soda, .09; bi-carbonate of soda, .15; sulphate of potash, .13; bi-carbonate of lime, .47; bi-carbonate of magnesia, 4.43; iron and alumina, .08; silica, .31; total solids, 5.85 grains. It contains also free and albuminoid ammonia; the gaseous contents are estimated at 28.52 cubic inches in each gallon of water. Resident population, 3984.

EVANS, FREDERICK WILLIAM, presiding elder of the community of Shakers at New Lebanon, Columbia co., N. Y., is the foremost representative of that religious body in America. He was born at Bromyard, Herfordshire, England, June 9, 1808. His mother having died when he was four years old, he lived for some years on his uncle's farm, but in 1820 his father brought him to America. After settling at Binghamton, N. Y., Frederick, who had formerly been considered stupid, showed eagerness for knowledge and became a materialist and an extreme Democrat. In 1829, accepting the socialistic theories then in vogue, he travelled on foot to Ohio to join a "community," which however disbanded two months after his arrival. He then paid a visit to his relatives in England, and returning to New York in Jan., 1830, went to New Lebanon, N. Y., where he joined the Shaker order. He then commenced a new study of the Bible, and has since claimed to find in it confirmation of his present belief. In 1838 he was appointed assistant elder in the young believer's order, and in 1855 he became first elder. The statements of doctrine put forth by him in numerous lectures and publications vary considerably from those made by the earlier Shakers. All however agree in maintaining the duality of God, represented as fatherhood and motherhood, the former manifested on earth in Jesus and the latter in Ann Lee, the founder of Shakerism. Celibacy is required of all members, and none are admitted to the community under twelve years of age except when parents join with their children. Evans has had great influence upon the internal management as well as the external relations of the society. In 1871 he went on a special mission to England, lecturing and publishing some books. He has been joint editor of the *Shaker and Shakeress*, a monthly journal, and has also published an *Autobiography* (1869), a *Life of Ann Lee* (1871), *Shaker Communism* (1871), and other works, in which he displays considerable literary power.

EVANS, OLIVER (1755-1819), American mechanician, especially remarkable for his improvements in flour-mills and for his introduction of the high-pressure steam-engine. He was born near Newport, Del., in 1755, and was a descendant of the Rev. Evan Evans. He served an apprenticeship to a wheel-

wright, and afterwards removed to Queen Anne county, Md., and there opened a store. He early developed a pronounced mechanical turn of mind, and possessed great ingenuity and fertility of resource. At the age of twenty-two he invented and perfected machines for making the teeth of wool-cards and for perforating the leather for their insertion, operations until that time (1777) performed exclusively by hand. In 1782 he contracted with two of his brothers who were practical millers to put up a merchant flour-mill in New Castle co., Del. The mill was completed and began to manufacture Sept. 5, 1785, but during its erection Evans became extremely dissatisfied with the cumbersome and laborious methods and machinery then in use, and devised many labor-saving contrivances which, after sturdy opposition from millers and mill-owners, were finally adopted almost universally, and have remained, with few essential changes, in use ever since. His chief aim was to reduce the manual labor required to transport the grain and flour from one place to another during the various operations to which they were subjected. Among those which he considered the most important of his inventions were the elevator, the conveyor, the hopper-boy, the drill, the descender, and the crane-spout. The elevator, which had its prototype in the "Persian wheel" of the Nile, and later in the chain-pump, was simply a series of buckets attached to an endless band passing over pulleys, so arranged that the buckets filled as they passed under the lower pulley and emptied as they went over the upper one; and was employed not only for the elevation of grain or meal from one story of the mill to another, but also for the removal of grain from the holds of vessels moored beside the mill. The hopper-boy spread the meal to cool it before bolting; while the drill, the descender, and the conveyor (which, Evans says, was suggested by the Archimedes screw) were devices for moving the meal or grain from one machine or one place to another. The crane-spout was pivoted so as to deflect the descending grain into any one of several receptacles into which it might be desired to send it. Together, they performed, in the inventor's words, "every necessary movement of the grain or meal through all the various operations from the time the grain is emptied from the wagoner's bag or from the measure on board the ship until it is manufactured into flour and separated ready for packing into barrels."

Although Evans's mill-machinery probably constituted the most valuable of his inventions, he is perhaps more widely known from his invention of a high-pressure steam-engine and his persistent efforts to secure its introduction. As early as 1772, when he was but seventeen years old, and still apprenticed to the wheelwright, he turned his attention to the discovery of "some means of propelling land-carriages without animal power." His attention being accidentally directed to the expansive force of steam, he fancied that he had discovered an original source of power, which, however, he saw at first no means of utilizing. About this time he met with a description of the atmospheric steam-engine, and was surprised to find that steam was only used to produce a vacuum, while the piston was moved by atmospheric pressure. This he believed to be an erroneous application of the force of steam, and he conceived the idea of a high-pressure steam-engine, using steam at perhaps 120 pounds pressure per square inch. The cylinder and piston did not at first satisfy him, as it did not immediately produce circular motion, and he invented and described four forms of rotary engines, the chief of which he called his "circular steam-engine No. 2." Having satisfied himself by much study and some experiments that he could make steam-wagons, and also steamboats driven by paddle-wheels, and having perfected his improvements in flour-mills, in 1786 he petitioned the legislature of Pennsylvania for the exclusive right to use his improvements in flour-mills and also "of propelling land-carriages by steam in that State for twenty-one years." In March, 1787, an

See Vol. VIII. p. 637. Am. ed. (p. 726. Edin. ed.).

act was passed granting the flour-mill patent, but ignoring the remainder of the petition. Delaware granted the same year like privileges, but the legislature of Maryland, May 21, 1787, granted both patents for a term of fourteen years, and New Hampshire granted them for seven years. The Maryland patent also gave him the exclusive right to use steamboats on the waters of that State. Evans then endeavored, unsuccessfully, to interest some capitalist in his invention, and up to 1801 had done little towards the perfection of his engine except to try a few experiments on a small scale. In 1791 he surrendered his State patents and took out United States patents, and in 1792 he filed drawings and specifications in the U. S. Patent Office. In 1794-95 he sent drawings and descriptions of his steam-engine to certain English engineers. In 1801 he began, unaided, the construction of his "steam-wagon," actuated, he affirmed, by the feeling that he owed it to the State of Maryland to accomplish, if possible, the undertaking for which he had been granted a patent. He had made some progress when it occurred to him that, as his engine differed from any then in use, he might obtain a patent for it as applied to driving mills of various sorts; he therefore changed his plans somewhat, and began the construction of a small high-pressure steam-engine of 6-inch cylinder, 18-inch stroke, and in the winter of 1802 he had his engine at work on Market Street, Philadelphia, sawing stone with a gang of twelve saws. In 1804 he constructed for the Board of Health of Philadelphia a steam-dredge which he called the "Orukter Amphibolos;" it consisted of a scow 30 feet long by 12 feet wide, carrying an endless chain of buckets to bring up the mud, and hooks to clear away stones, sticks, etc. This apparatus was actuated by a small vertical steam-engine of 5-inch cylinder and 9-inch stroke. Boat and machinery, together weighing about 43,000 pounds, were roughly mounted on wheels, to which the engine was connected by belts, and this unwieldy vehicle propelled itself to the Schuylkill River, a distance of one mile and a half. When launched, a simple paddle-wheel was rigged up at the stern, and the scow steamed down the river to its junction with the Delaware, and thence against a head wind back to Philadelphia. It is asserted that the drawings which Evans sent to England fell into the hands of Andrew Vivian, a mechanical engineer, and were incorporated in the high-pressure engine and locomotive of Trevithick & Vivian, which undoubtedly had many features in common with the Evans engine, notably the use of the exhaust steam to heat the feed-water. Their patent is dated 1802, and their locomotive was tried in 1804. Evans's mill-machinery was widely and successfully introduced during his lifetime, and many of his steam-engines were built for manufacturing and steamboat purposes; but the great goal of his ambition he never reached—that is, the construction of a locomotive to run on ordinary turnpike roads. He made a model engine somewhere about 1817 which would run perhaps 200 or 300 yards, but his most persistent efforts and convincing arguments never elicited the necessary means for the accomplishment of this scheme. He put himself on record, however, as a very early, if not the very earliest, projector of steam-locomotion, and demonstrated its feasibility as clearly as anything short of actual accomplishment could do. He even made offers to a turnpike company to accept its order for an engine, with the proviso that it should cost them nothing if it did not perform what was promised for it. Great success attended the introduction of his stationary and steamboat engines, and in 1816 he claimed between 50 and 100 engines in use. In 1817 one of his engines, 24" × 48", was employed in the Philadelphia Waterworks at Fairmount, and at an earlier date one was used successfully at the Centre Square Waterworks in the same city. The advantages which may be claimed for Evans's engine over the low-pressure condensing engine then in use consist chiefly in greater simplicity, diminution of weight, and consequent ease of construction and reduction of first cost—

qualities which made it peculiarly adapted to the requirements of a sparsely-settled country, and especially to the needs of river-navigation. Evans's improvements consisted principally of the use of high-pressure steam; the use of the exhaust blast; the use of the exhaust to heat the feed-water; and the use of an excellent form of boiler, generally of cylindrical shape, with large internal flue containing the fire, return flues on the sides, and re-return flue underneath. He also applied the exhaust steam to the warming of apartments, and suggested the use of steam-power for the propulsion of fire-engines. The success attending the use of his engines, and his earnest advocacy in various publications of the use of high-pressure steam, dispelled in America at least the distrust with which it had since the time of Watt been regarded, and the high-pressure, high-speed, non-condensing engine of small cylinder and long stroke remained for many years the distinctively American engine.

Evans's first and most important work was *The Young Millwright's and Miller's Guide*, which first appeared in 1795, and has since been repeatedly republished, the fourteenth edition having been issued in 1853, while a French translation was issued in Paris in 1830. This work seems to have absorbed the author's whole attention for three years, to the neglect of his business and his family; so that, as he has recorded, his faithful wife sold tow cloth of her own making to buy food for her children. The book was published by subscription at \$2 a copy, assisted by a loan of \$1000, and the first edition was of 2000 copies. The book contained, along with some questionable theories, a great deal of valuable practical information, and remained for many years the best authority on the design and erection of flour- and saw-mills, the construction of gearing and water-wheels, etc.

In 1804, Evans petitioned Congress for an extension of his patents on flour-mill improvements, claiming that a continuation of his fees and royalties would enable him to prosecute certain useful discoveries and inventions which he was about consummating; and during the favorable consideration of his bill he issued proposals for a new work to be entitled the *Young Steam Engineer's Guide*. The petition was, however, defeated on its third reading, and Evans, in the consequent period of despondency, declaring his hopes blasted and his new schemes abortive, called his family together and solemnly renouncing all further efforts for the benefit of a thankless generation, committed to the flames the drawings and specifications of eighty new inventions.

In 1805 he published his contemplated book in an abridged form, and called it *The Abortion of the Young Steam Engineer's Guide*. He therein explained the operation of the steam-engine as then understood, gave rules for the proportions of the various parts, and determined the proper point of cut-off, which he placed at from $\frac{1}{4}$ to $\frac{1}{2}$ of the stroke, according to the steam-pressure and the work to be done. He also set forth at length the peculiar merits of his own form of steam-engine, and described various others of his useful inventions, including an ice-machine to work by mechanical evaporation and recondensation of ether; and finally forswore all further investigations for the benefit of an inappreciative public. In 1805 he had a somewhat bitter discussion, through the columns of the *Medical Repository*, with Col. John Stevens of Hoboken, N. J., wherein each writer claimed priority and pre-eminence for his own improvements in the steam-engine and in steam-navigation. The publication of the *Engineer's Guide* left Evans at fifty years of age again impoverished and with a large family to support. He applied himself strictly to business, and in three or four years claimed to have made himself "independent and saved \$20,000." In the summer of 1807 he commenced as an iron-founder and steam-engineer, and opened the "Mars Works" in Philadelphia at the corner of Vine Street and the Ridge Road. The following year he advertised that he had "the necessary apparatus and machinery for an iron-foundry, a pattern-

shop, a blacksmith-shop, a steam-mill for turning and boring heavy iron and grinding plaster, a steam-engineer's shop, a burr-millstone factory, a furnace, foundry, and shop for manufacturing iron castings, wrought-iron work, and machinery for flax, cotton, and wool spinning, for the construction of sugar-mills, patent steam-engines, etc." As early as 1800 Evans had a mill at No. 275 Market Street, and appeared also as a "manufacturer of burr-millstones and seller of bolting-cloths." He had a high reputation as a millwright, and seems to have done a good business in mill-machinery and supplies. Having been non-suited in a suit against some infringers on his mill-machinery patents, he again applied to Congress for relief, and after a hard struggle on both sides he got a bill, January 22, 1808, granting a reissue of his patents for a term of fourteen years.

During the proceedings Evans published a pamphlet entitled *Oliver Evans to his Counsel who are engaged in the Defence of his Patent Rights for the Improvements he has invented, containing a Short Account of Two out of Eighty of his Inventions, their Use and Progress in despite of all Opposition and Difficulty, and Two of his Patents, with Explanations*. After the successful termination of his appeal to Congress he appears to have increased the price of his license, which, he argued, had been far too cheap, and then had cause to complain of the great difficulty he experienced in collecting from the mill-owners. The law appears to have been retrospective in its action, and the courts sustained him when he endeavored to collect royalties from those millers who had put in his improvements after the expiration of his original patents before their reissue. April 15, 1811, Evans obtained a patent for a saw-mill, and the following year he gave notice that he claimed a patent for a "cylinder or globular boiler," and warned infringers to desist.

Evans died of apoplexy in New York, Thursday, April 15, 1819, soon after he had heard of the complete destruction of the Mars Works by an incendiary fire four days previously. (C. S., JR.)

EVANSTON, a village of Cook co., Ill., is on Lake Michigan, 11 miles north of Chicago, on the Milwaukee division of the Chicago and North-western Railroad. It was commenced as an educational town in 1854 by some prominent Methodists, and is the seat of the Garrett Biblical Institute and the North-western University. The village has gas, good supply of lake water, good sewer system, and is a favorite place of residence for the business men of Chicago. It has a weekly and a bi-weekly newspaper, 2 banks, 7 churches, a high school and private schools. Population, 4400.

EVARTS, JEREMIAH (1781-1831), an American editor and advocate of foreign missions, was born in Sunderland, Vt., Feb. 3, 1781. He graduated at Yale College in 1802, studied law, and was admitted to the bar in New Haven in 1806. He afterwards became editor of the *Panoplist*, a religious monthly magazine published in Boston. In 1812 he was chosen treasurer of the American Board of Commissioners for foreign missions, and still edited the *Panoplist* and its successor, the *Missionary Herald*. In 1821 he was appointed corresponding secretary of the board, and remained in that position till his death. He died at Charleston, S. C., May 10, 1831.

EVARTS, WILLIAM MAXWELL, LL. D., an eminent American lawyer and statesman, son of the preceding, was born in Boston, Feb. 6, 1818. He graduated at Yale College in 1837, studied at the Harvard Law School, and was admitted to the bar in New York in 1841. He soon became eminent in his profession, and is regarded as one of the most eloquent advocates in the United States. He has been a Republican in politics since the organization of that party. When Pres. Andrew Johnson was impeached before the Senate in the spring of 1868, Mr. Evarts was the leading counsel for the defence, and made a masterly argument in behalf of the President. On July 15, 1868, he was appointed attorney-general, and he held

this seat in the cabinet till the end of Pres. Johnson's administration in March, 1869. Pres. Grant appointed him one of the counsel for the United States before the tribunal of arbitration on the Alabama claims at Geneva in 1872. In 1876, as an orator of the highest national reputation, he was appropriately selected to deliver the oration at the centennial celebration in Philadelphia. On the accession of Mr. Hayes to the Presidency in 1877, Mr. Evarts, who had made a strong argument in defence of the validity of his election before the electoral commission, was made Secretary of State. He remained in that position till 1881, discharging its duties with faithfulness and efficiency. He has since held no public position. His high scholarship and fine literary taste have been displayed in many orations and addresses.

EVE, PAUL FITZSIMMONS (1806-1878), an American surgeon, was born near Augusta, Ga., June 27, 1806. He graduated at Franklin College, Athens, Ga., in 1826, and received the degree of M. D. from the University of Pennsylvania in 1828. After practising for a year in Georgia he went to Europe, where he studied in London and Paris. He was present and assisted professionally in the French Revolution of July, 1830, and he took part in the Polish Revolution of 1831. After the fall of Warsaw, Sept. 8, 1831, he was for a short time prisoner. Returning to America he was elected professor of surgery in the Medical College of Georgia in June, 1832. In 1850 he was called to the chair of surgery in the University of Louisville, and in the following year to a similar position in the University of Nashville, then being organized. In 1857 he was elected president of the American Medical Association. In 1859 he went to Europe, and, having visited the seat of war in Northern Italy, published the results of his observations in the *Nashville Medical and Surgical Journal*. After the outbreak of the American Civil War he was made surgeon-general of Tennessee, and held other positions in the Confederate service till the end of the war. In 1868 he was elected professor of surgery in the Missouri Medical College, but resigned a year later and returned to Nashville, where he resumed his professorship in the university. In 1877 he became a professor in the newly-established Nashville Medical College, and remained in connection with this institution till his death. He died at Nashville, Jan. 10, 1878. He was the foremost surgeon of the South-west, and at the international medical Congress in Philadelphia in 1876 was the most distinguished representative of his department. His publications comprise 600 articles. His most important works are—*Remarkable Cases in Surgery* (1857); *One Hundred Cases of Lithotomy* (1870); *What the South and West have done for American Surgery*.

EVERGREENS. In America "Evergreens" usually represent simply coniferous trees; when other evergreens are referred to, they are distinguished as "Broad-leaved Evergreens." Evergreens are so named because the trees always have leaves on them, though the leaves themselves mostly die annually. In the case of deciduous trees the leaves are developed in spring, and die when the autumn or winter approaches. But the leaves of the broad-leaved Evergreens have the power of resisting frost or drying winds, and retain some vital power till the new growth starts in the following year, when they gradually fall. In other words the fall of the leaf in deciduous trees is in the autumn, but in broad-leaved evergreens the fall of the leaf is not till the following spring. A large number of plants which are evergreens when protected by snow, or the shelter of woods, are deciduous when in exposed places. Some of the honeysuckles, oleasters, and burning-bushes are illustrations of this class, hence we find the greater number of broad-leaved evergreens in those climates where but little frost prevails. Some trees have the leaves with the power of cohering with the bark. Many *Coniferæ*, such as arbor vitæ, cedars,

juniper, some pines, and spruces, are illustrations. The leaves in all these are wholly or in part adnate with the stem. This gives them a greater power over the usual leaf-destroying elements, and they continue longer than one year. They in fact become a part of the bark, and partake of the comparative longevity common to the cortical system. Even with this advantage the cohering leaves do not often continue more than two years, as may be seen by examining the branches of arbor vitæ and some pines, where they may be found, at the end of that period, peeling off in the form of lanceolate and membranous scales. The leaves of some spruces and firs, as we may suppose from analogy with pines, partly united with the stems, often last several years, as do the secondary leaves or bundles of needles of true pines. A large number of herbaceous plants preserve their leaves from one spring to another, the vicinity of the earth and proximity to the roots—the sources of food—aiding their vital power; and they are evergreens in the same sense as many trees and shrubs are; but the term is generally confined to plants of a ligneous character, and to the two classes described.

In America the greater number of broad-leaved evergreens are found in the beautiful natural order *Ericaceæ*. Some of the huckleberries and bilberries (*Gaylussacia* and *Vaccinium*) are evergreens. *Arbutus* and *Arctostaphylos* are also evergreens. *Epigæa*, the trailing arbutus, the *Ganetheria* or tea-berry, some andromedas—the old genus *Andromeda* being now divided into several others—are also evergreens. Then there is the beautiful section *Rhododendreæ*, in which, besides the well-known laurels *Rhododendron* and *Kalmia*, are *Ledum*, *Leiophyllum*, and other genera. Most of these are appreciated for the great beauty of the flowers as well as for their evergreen character. Some are found high up in the Arctic regions, and they extend thence down to the tropical regions. There are some evergreens among the berberries and hollies, and others scattered through other genera. (T. M.)

EVICTION. The original meaning of this word in Anglo-Saxon law was an expulsion of one holding real estate from such estate by legal process consequent upon the assertion of a paramount title. The word did not cover the case of one who was turned out by other means than legal process; such case would have fallen under ouster. But the word is undoubtedly not confined at present to so narrow a meaning, but covers the case of any expulsion from possession by a paramount title, whether by the aid of legal process or not. Total eviction occurs where one is wholly deprived of his right to the premises, partial where he is deprived of the possession of some part. There may be an eviction in cases where the purchaser or lessee has not made any actual entry into the lands, but found them in the actual and lawful possession of another when he went to them for the purpose of entering; it is, of course, necessary, in this case to show that the party in possession actually had a good title, paramount to that of the purchaser or lessee. An actual physical dispossession is not always necessary to an eviction; for, if a landlord erect a nuisance near the demised premises or in any way materially interfere with the tenant's rights under his lease, this also will constitute an eviction. The remedy for eviction in the case of a lessee is ordinarily simple, as the contract of lease falls at once, and he need pay no more rent. In the case of a purchaser, the remedy depends largely upon the covenants contained in the deed of purchase. Formerly the party had only a writ of *warrantia charta* upon his warranty, by which he could recover a recompense in lands of equal value with the freehold of which he had been deprived; now, this remedy is entirely replaced by a personal action in some one of the covenants which it is almost universally the custom to insert in deeds. This matter depends largely upon the covenants which exist in the special case, under the language of the deed, and under

the statutory provisions which frequently exist, to define what shall be the exact effect of certain words commonly used in deeds, and it is impossible to go into it closely here. Some of these covenants are said to run with the land, *i. e.*, they enure to the benefit of purchasers from the first purchaser as well as to the benefit of that person himself; they may therefore be asserted by such second purchasers in case they are evicted. Other usual covenants do not run with the land but enure only to the benefit of the first purchaser. The measure of damages for a purchaser who has been evicted is ordinarily the price he paid for the land with interest. If the land has increased in value since his purchase, the increase does not belong to him but to the grantor; and this is the case even where the rise in value is due in whole or in part to improvements erected by the grantee—or the lessee, in a case between landlord and tenant—such improvements belong to the grantor or lessor, for he should not be burdened with the cost of may be expensive buildings which he would not himself have erected.

(W. M. M.)

EWBANK, THOMAS (1792–1870), an American writer on mechanics, was born at Barnard Castle, Durham, England, March 11, 1792. When thirteen years of age he was apprenticed to a tin- and copper-smith, and worked for some years in London. He emigrated to New York about 1819, and in the next year began to manufacture metallic tubing, but in 1836 retired from business to devote himself to literature and science. In 1842 he published a *Descriptive and Historical Account of Hydraulic and other Machines* (last ed. 1872). In 1845 he went to Brazil, and afterwards published *Life in Brazil*, 1856. Pres. Taylor in 1849 appointed him commissioner of patents, and he held that office till 1852. He afterwards published *Reminiscences of the Patent Office* (1859), and other works. One of his discoveries was a method of increasing the resisting power of building-stones. He died at New York, Sept. 16, 1870.

EWELL, RICHARD STODDARD (1816–1872), an American Confederate general, was born in the District of Columbia in October, 1816. He graduated at West Point in 1840, and served on the Western frontier till 1846, when he was engaged for a time in the coast survey. During the war with Mexico he was brevetted captain for gallantry at Contreras and Churubusco, Aug. 20, 1847. Afterwards he served in New Mexico on expeditions against the Apaches. When the State of Virginia seceded he resigned, May 7, 1861, and entered the Confederate army as brigadier-general. He served in the Manassas campaign in 1861, and at the first battle of Bull Run his troops were twice repulsed. Yet he did not lose the esteem of his superiors, and was soon promoted to be major-general. He was at the battles of Union Church, White Oak Swamp, and Cedar Mountain, and was defeated at Kettle Run. He was engaged in the second battle of Bull Run, and was wounded in the Maryland campaign in 1862. He became lieutenant-general May 20, 1863, and, when Stonewall Jackson died, was, at his request, appointed to succeed him in command of the Second corps. He fought at Winchester, Gettysburg, and in the Wilderness, May, 1864. He was finally captured by Gen. Sheridan, April 6, 1865, at Sailor's Creek, near Appomattox River. When the war closed he accepted the result in good faith and lived a retired life. He died at Spring Hill, Tenn., Jan. 25, 1872. He was one of the ablest and bravest Confederate generals, yet expressed his desire that nothing might be placed on his tombstone reflecting upon the Government of the United States.

EWER, FERDINAND CARTWRIGHT, D.D. (1826–1883), an American Episcopalian divine, was born at Nantucket, Mass., May 22, 1826. He graduated at Harvard College in 1848. By birth a Unitarian, he became, before entering college, an enthusiastic Epis-

copalian of the Pusey, Keble, and Newman school, and intended entering the priesthood, but the onset of painful doubts regarding the truth of Christianity led him to adopt another profession. He studied civil-engineering, but went to California in 1849, and became a successful journalist. In 1857 the difficulties which had beset his faith were overcome, and he was ordained a deacon, and in 1858 a priest. In 1860 he removed to New York, where he was (1860-62) assistant-rector of St. Ann's Church. In 1864 he became rector of Christ Church, but resigned in 1871, on account of differences with some members of his vestry regarding ritualistic practices. In 1871 he took charge of the new parish of St. Ignatius, of which he remained rector till his death, which occurred at Montreal, Oct. 10, 1883. His published writings include—*The Failure of Protestantism* (1875); *Catholicity, Protestantism, and Romanism* (1878); *The Operation of the Holy Ghost* (1879); *The Grammar of Theology* (1880).

EWING, THOMAS, LL.D. (1789-1871), an American statesman, was born near West Liberty, Ohio co., Va., Dec. 28, 1789. His father had been an officer in the Revolution, and in 1792 removed to Ohio, where he was one of the settlers of Amestown. Thomas was taught at first by an elder sister, and, while employed in the Kanawha salt-works, prepared himself for college by study at night. In 1815 he graduated in the Ohio University at Athens, receiving the first degree of A.B. conferred by that institution. He studied law, was admitted to the bar in 1816, and practised with success in Ohio and before the Supreme Court of the United States. He was elected to the United States Senate in 1831, and acted with the Whig party. In March, 1841, he was appointed by Pres. Harrison Secretary of the Treasury, but in September, when Pres. Tyler vetoed the bill for a national bank, he resigned, with other members of the cabinet. He was Secretary of the Interior, under Pres. Taylor, from March, 1849, to July, 1850. In the latter part of that year he was appointed to the seat in the United States Senate left vacant by the appointment of Thomas Corwin to a position in the cabinet. He opposed the Clay compromise bill and the fugitive-slave law. Returning to private life in 1851, he resumed the practice of law at Lancaster, O. In February, 1861, he was a member of the peace convention at Washington. He died at Lancaster, O., Oct. 26, 1871.

EXPLOSIVES. An explosion is simply a chemical reaction between molecules, by which a volume of heated gas much larger than that of the original explosive substance is formed suddenly. Upon the degree of suddenness depends the possible intensity of the action. In *mechanical* mixtures, as gunpowder, these reactions can occur only after the lapse of sensible though very short intervals of time (0.01 seconds). With *chemical* compounds, like nitro-glycerine, the atoms are already in position and the reaction may be said to take place instantaneously, producing a *detonation*. The relative values of all explosives, whether mechanical or chemical, depend largely upon the circumstances under which the explosion is produced, such as the nature of the resistance to be overcome, the condition of the explosive, the rapidity with which it is fired, etc.

Gunpowder.—The Chinese are said to have possessed a knowledge of gunpowder prior to A. D. 80, but it is believed to have been invented in Europe in 1320 by Berthold Schwarz. In 1397 powder mines were used at the siege of Merat, but it was not until 1613 that Martin Weigel, mine superintendent of Freiberg, first proposed its use for ordinary mining operations.

In 100 parts of gunpowder there are from 80 to 60 parts of saltpetre, from 21 to 12 of charcoal, and from 19 to 8 of sulphur. The grains must be firm, hard,

angular, free from dust, of uniform color, and should not readily absorb moisture. The explosive force of good blasting powder is about 64,500 pounds per square inch or 303,786 foot-pounds. Its specific gravity is about the same as water, hence 1 lb. = 28 cubic inches. The weight of powder required to fill one foot of holes of various diameters is given in the following table:

Weight of Powder in one foot Depth of Hole.

Diameter. Inches.	Weight. Avoirdupois.		Diameter. Inches.	Weight. Avoirdupois.	
	lbs.	oz.		lbs.	oz.
1	0	5.03	3½	3	13.6
1½	0	7.86	4	5	0.4
1½	0	11.30	4½	6	5.8
2	1	4.11	5	7	13.7
2½	1	15.42	5½	9	8.1
3	2	13.24	6	11	5.0

Powder may be ignited by impact, but only with great difficulty and uncertainty. In such cases it is most readily fired by a blow from iron upon iron, and least readily from copper upon copper; hence the use of copper priming wires, etc.; but it is best ignited by rapid heating to a temperature of 578° to 608° F., by introducing a red-hot substance, as iron, tinder, a burning brand, wire, or by a fulminate surrounded by some sensitive powder in a cap. The gases evolved by combustion are carbonic acid, nitrogen, and carbonic oxide, which are so deleterious as to cause delays in mining until the air can be removed, or sufficiently diluted with fresh air, so as to be inhaled without discomfort or danger.

Powder is usually packed in 25 lb. kegs. Amongst the various grades of powder may be mentioned *mortar*, *musket*, *cannon*, *mammoth*, *orange-lightning*, and *Oliver*. The safety compound of the Oriental Powder Company, which consists of an intimate mixture of potassium, chlorate, and crude gamboge, is very sensitive to friction and is justly regarded as dangerous. It has been driven from the market by nitro-glycerine, which is both stronger and safer to handle.

Other Explosives.—A safer and stronger explosive than powder, known as *haloxyline*, is composed of charcoal, saltpetre, ferrocyanide of potassium, and some cyanide of potassium. It is granular, burns slowly in open air with a violet flame without exploding, is not ignited by pressure or impact even of powerful blows of iron on iron. Ignition is only effected by a spark or flame; no smoke results from combustion, and the gaseous products are neither unpleasant nor injurious. When rammed firmly into the bore hole its effect is said to be twice that of an equal weight of powder, although acting more slowly, so that the rock is not scattered but lifted and rent—that is, the cones of rupture and of projection are more nearly coincident.

A modification of haloxyline known as *Horseley's Powder* consists of chlorate of potassa mixed with resin or with powdered nut-galls, and, later, with 25 per cent. of nitro-glycerine.

Gun-cotton, discovered by Schönbein in 1846, is prepared by exposing dry cotton to a mixture of nitric and sulphuric acid, and then thoroughly washing the cotton to remove excess of acid. When kept wet and compressed it is one of the safest of explosives. It can be fired in this state by a primer made of a cake of the dry gun-cotton with a fulminating fuse attached. In soft rock it exerts twice, in hard rock five to six times, the energy of gunpowder. It is unaffected by moisture or cold and leaves no deleterious gases when completely exploded. *Glyxoline* is a preparation of gun-cotton pulp and saltpetre saturated with nitro-glycerine.

Nitro-Glycerine, or *Glonoine*, is the most important

of all modern explosives. It was discovered in 1847 by Sobrero, but it was not until 1863 that Alfred Nobel brought it into general use as a blasting agent. Its use in the United States was greatly stimulated by its successful introduction at the Hoosac tunnel in Massachusetts in 1866. Three varieties are manufactured, known as mono-, di-, and tri-nitro-glycerine, between which there appears to be no difference in the intensity of the action, but for safety of storage and handling the tri-nitro-glycerine, as manufactured by Prof. George W. Mowbray, of Massachusetts, appears to be unrivalled. "It is a light yellow, clear, oily liquid, odorless, has a pleasant, sweet taste, is poisonous when inhaled, swallowed or introduced into the system through the pores, producing headache and sickness. It has a specific gravity of 1.6 and freezes at about 46° F." When pure it is said not to explode by friction or percussion, but when partially decomposed it is readily fired by a blow, and in such condition should never be stored nor transported in tin canisters, but in open frangible vessels covered with water.

The phenomena of explosion, according to Charles L. Kalmbach, who has had a long and intimate experience with it, can only be effected by any cause producing a temperature of 360° F. Percussive compression, as that produced by a blow from a hammer or pick, or by a bullet or rock fired into or dropped upon it, will invariably produce an explosion accompanied by enormous heat and the liberation of about 12,000 times its volume of gas.

The destruction of the Mosel at Bremerhaven, Jan. 8, 1876, was supposed to have been due to the small chest of nitro-glycerine, which had *congealed*, having been carelessly dropped on the pavement; hence it was inferred that in a frozen state it was exceedingly dangerous. This was only disproven by an effort to carry some fluid cartridges over the Hoosac Mountain in winter, when the sleigh was upset and the contents frozen. The journey was completed in great trepidation when it was discovered that in that condition a primer would not explode them until thawed out. The only absolutely safe rule appears to be "to pack it in non-metallic or frangible vessels, closed if need be, but holding, with the nitro-glycerine, at least an equal bulk of atmospheric air; and to store it when not in transit in perpendicular or flaring-sided open vessels of similar nature covered only by a film of water." Attention to these rules would doubtless have prevented the serious explosion at West Berkely, San Francisco Harbor, on Sunday, Jan. 21, 1883, by which 23 men were killed. The works were in full operation when at 4 P. M. an explosion took place in the packing house, followed a few minutes later by one in the mixing house, whereby eight tons of giant powder were destroyed. A magazine containing 200 tons of powder was fortunately saved, or the wreck of the works would have been complete.

Dynamite.—Numerous compounds of nitro-glycerine exist known under the generic term of *Dynamite* or *Giant Powder*, in which some absorbing material is mixed with the explosive to prevent leakage. For this purpose, silicious marl, tripoli, rotten stone, sawdust, corn-meal, sponge plaster, and "keiselguhr" (an infusorial earth) have been used with various success. Two grades of dynamite are manufactured, designated as No. 1 and No. 2, the first containing 75 per cent. by weight of nitro-glycerine with infusorial earth, and the second 40 per cent. of nitro-glycerine with other substances.

Fulgurite.—A mixture of four parts of corn-meal to six of nitro-glycerine is said to be stronger and more compact than dynamite or dualin. It makes a dough which can be inserted in holes inclined upward, without a cartridge. Being nearly pure starch it yields a large volume of gas; it is very porous and elastic, and consequently safer than pure nitro-glycerine; it freezes at 45° F., when it is practically inexplorable.

Dualin consists of nitro-glycerine, mixed with cellulose, nitro-cellulose, nitro-starch, or nitro-mannite, in various proportions, according to the strength required. Its best form is that containing nitro-cellulose

(Schultze's powder) obtained by subjecting woody fibre to the joint action of nitro-sulphuric acid. It is generally prepared from sawdust, is sensitive to heat, cold, and friction, and can readily be exploded when frozen.

Lithofracteur, or *rendrock* (1866), contains nitro-glycerine, 52 per cent.; infusorial silica and sand, 30; carbon, 12; nitrate of soda, 4; and sulphur, 2. It is more sensitive to temperature than dynamite, exploding at 248° F., while that of dynamite is 356, while it is said to be inferior in power (*Trauzl*).

Vulcan powder is a mixture of from 16 to 33 per cent. of nitro-glycerine with mealed gunpowder, and is merely a modification of the general mixtures classed as dynamite No. 2.

Hercules powder consists of a mixture of 77 parts of nitro-glycerine; 20 of magnesium carbonate; 2 of wood pulp, and 1 of sodium nitrate. Numerous other mixtures exist, known as *Neptune*, *Thunderbolt*, *Vigorate*, *Potentia*, *Titan*, *Electric*, etc.

Mica powder is a No. 1 dynamite, in which the "keiselguhr" or sawdust is replaced by finely divided mica scales, which act as a carrier rather than as an absorbent. In this capacity it is found to contain only 52 per cent. of nitro-glycerine, while the keiselguhr will contain 75 per cent.

Of the *picrates*, the potassium and ammonium salts are the only ones that have been much used in explosive preparations; thus *Designolles'* blasting powder is a mixture of potassium nitrate (saltpetre) and potassium picrate, discovered in 1788. It decrepitates with violence when heated to 600°, is very sensitive to friction, and dangerous. Its chief use is as a fulminate rather than an explosive agent.

Brugere powder is a picric compound, in which ammonium picrate is substituted for the potassium salt. It is not liable to accidental explosion from rough handling, but when fired is much more violent than gunpowder.

Explosive gelatine is the latest invention in explosive agents. It is a peculiar kind of gun-cotton, entirely soluble in nitro-glycerine, and forming with it a gummy substance more powerful than nitro-glycerine. The proportions are 93 parts of nitro-glycerine and 7 of soluble gun-cotton. It is insensible to water, and the addition of a small percentage of camphor renders it proof against heavy blows or shocks. It requires a peculiarly powerful primer to insure its explosion. Other compounds may be derived from it. The difficulty of exploding and its great power render it peculiarly valuable as a blasting agent. It is exploded when in a soft state by a service fuse charged with 24 grains of fulminating mercury contained in a copper cap. The results of experiments to determine its strength, made by Gen. H. L. Abbot, U. S. Engineers, show it to be 1.17 stronger than dynamite in a horizontal plane; 1.13 stronger vertically over the charge, and 1.25 stronger under the charge, from which he concludes that for use in subaqueous explosions it is the strongest agent known to modern science. His experiments also disproved the assertion that an increased effect could be obtained by a mixture of several explosives over that produced by an equal weight of the several ingredients taken separately.

Fulminates are salts of fulminic acid. The mercury salt is the only one of practical value. They are easily exploded, and some are exceedingly sensitive. Fulminating mercury explodes violently when forcibly struck, when heated to 367° F., when touched with strong sulphuric or nitric acid, and by sparks from flint, steel, or electricity. When wet it is inexplorable. Its chief use is as a detonating powder in primers, where it is of great value in developing the full effect of high explosives.

The relative strength of explosives may practically be taken as follows: For gunpowder, 1; gun-cotton, from 4 to 6; dynamite, 6; and nitro-glycerine, 8. The distinction should also be made in practice between the slow-burning

(explosive) agents used for rending, and the quick or detonating agents used for shattering rock, and their resisting effects. Thus it will always be found that around the crater or base of the *cone of projection* there is a mass which has been more or less disturbed and broken, but not ejected: this is known as the *cone of fracture*. The relation between these cones is a function of the material operated upon, the position and strength of the charge and other minor quantities. As the very high explosives throw more and loosen less than those of less intensity, these cones will be more nearly coincident in the first case than in the second. The general polar equations for the radii of the corresponding spheres of projection and rupture may be represented by $R = R_n \sqrt{\sin \alpha}$ and $\rho = \rho_n \sqrt{\sin \beta}$ in which R and ρ = the slant-heights of the cones or radii of the spheres; R_n and ρ_n the radii of the spheres of projection and rupture for a given medium and charge just sufficient to reach the surface, or to disturb a single central element, and α and β are the angles between the elements of the cones and their bases. The cone of fracture attains its *greatest volume* when $\beta = 48^\circ 11' 23''$, but the crater, or base, will be the largest when $\beta = 35^\circ 15' 30''$. To determine the charge for a cone of fracture for a given explosive and medium, we have only to determine experimentally the radius of the cone of rupture (r) produced by a given charge C , and substitute these values in the formula $C' = \frac{C}{r'^2} r^2$

in which C' is the desired charge, and r and r' the radii of the corresponding cones of rupture. The quantity $\frac{C}{r^2}$ is called the charge co-efficient and may be represented by K . If we represent that of any other explosive by K' and call W and W' the corresponding fracture values, and P and P' the market prices per unit of weight, then $\frac{K}{K'} = \frac{W}{W'}$ and if $\frac{W'}{W}$ is greater than $\frac{P'}{P}$ then the explosive whose price is P' should be selected in preference to that whose price is P . (*Höffer on Theory of Blasting.*) (L. M. H.)

EX POST FACTO LAW. A law whereby an act is declared a crime and made punishable as such, though it was not a crime when done; or whereby the act, if a crime, is aggravated in enormity or punishment; or whereby different or less evidence is required to convict the offender than was required when the act was committed.

By the Constitution of the United States (Art. I., sect. 9, § 3) Congress is forbidden to pass any *ex post facto law*, and a like prohibition is imposed upon the legislatures of the various States (Art. I., sect. 10, § 1). Like clauses occur in many of the State constitutions.

The phrase "*ex post facto law*" was in common use among lawyers and legislators long prior to the American Revolution. Hence it had acquired a distinct technical meaning quite separate and apart from that which it apparently possessed. It was very early decided that the intention of the framers of the Constitution was to apply the phrase to acts of a criminal nature merely, and such has been the construction since uniformly put upon it.

It must be carefully observed, however, that it is not essential in order to render a law invalid as *ex post facto* that it should expressly assume the action to which it relates to be criminal or provide for its punishment on that ground. Any law which subjects an individual to a pecuniary penalty for an act done which, when done, involved no such responsibility, or any law which deprives any party of any valuable right for acts which were innocent, or at least not punishable when the offence was committed, is *ex post facto* in the constitutional sense, notwithstanding it does not in terms declare the acts to which the penalty is attached criminal. A law is not *ex post facto* which merely alters the method of procedure with relation to crimes which have already taken place. The legislature may, therefore, wholly alter the constitution of a court before which a criminal is to be tried subsequent to the commission of the offence. It may also authorize amendments of indictments to a greater extent than before,

and preclude the defendant from taking advantage of immaterial variances on the trial. It may authorize a change of venue, confer upon the government additional challenges, diminish the number of the prisoner's peremptory challenges, and modify, simplify, or reduce the essential parts of the indictment, provided the offence remain distinctly the same.

By far the most difficult question connected with this subject is, What is such an increase in the punishment for a past offence as to render the law enacting such increase void as an *ex post facto* law? No definite rule can be laid down which will apply in all cases, the matter depending to a great degree upon the sound discretion of the court. In Illinois the substitution of imprisonment in the penitentiary for a term not exceeding seven years, in place of a whipping not exceeding one hundred stripes, has been held not to be an increase of the punishment; and a law making such alteration was accordingly held applicable to an offence consummated prior to its passage. In Texas it has been held that the substitution of stripes for the death penalty was an increase in the punishment, while in South Carolina a directly contrary conclusion has been reached. In New York a law prefixing a year of hard labor in the State penitentiary to every sentence of capital punishment has been held an increase in the punishment, and therefore as applied to offences prior to its passage *ex post facto*, and this though the act was evidently designed for the benefit of parties convicted, and, among other things, to enable advantage to be taken for their benefit of any circumstances coming to light which might show the injustice of the judgment, or throw any more favorable light on the action of the accused. This decision has been several times since followed in New York, and it may now be regarded as the settled law of that State that any law changing the punishment for offences committed before its passage is *ex post facto* and void, unless the change consists in the remission of some separable part of the punishment before prescribed, or is referable to prison discipline or penal administration as its primary object. Laws providing for heavier penalties for a second or any subsequent offence than for the first have not been deemed objectionable, on the ground that they authorize a conviction to be taken into account in fixing the penalty which may have taken place before the law was passed. In such case it is the second or subsequent offence that is punished, not the first.

Extradition treaties providing for the surrender of persons charged with offences previously committed are not open to objection as *ex post facto* laws.

(L. L., JR.)

EXPRESS. The express business in America had its origin in the custom among the people of intrusting packages for delivery to travellers, stage-drivers, clerks of vessels, and conductors of trains, and giving them orders to execute. The absence of any systematized method of conducting business of this kind suggested to William F. Harnden, a railway employé in Boston, of talent and energy, the idea of arranging for the carriage of packages by special messenger between the great centres of industry and travel. Being encouraged by others, he contracted in 1838 with the Boston and Worcester Railroad for the carriage of packages over its line. Harnden at this time lived at Boston, and recorded himself as an "express package carrier." In 1839 he arranged with the Providence Road and the New York Steamboat Company to operate over their lines between New York and Boston four times a week. Harnden himself was the messenger, and carried his packages at first in a small hand-bag, afterwards in a stout trunk.

In 1840 Harnden extended his business to Philadelphia; he also established agencies in the great centres of Europe for the carriage of transatlantic packages, the soliciting of emigrants, and the purchase and sale of foreign exchange. In 1841 he extended his

business to Albany, and contemplated its introduction throughout the West, but he devoted the greater part of his time and energies to his European enterprises. He seems not fully to have anticipated the possibilities of the inter-state business. He died Jan. 14, 1845.

Harnden's success and enterprise served to incite others to enter the business. Accordingly, Alvin Adams (the originator of the Adams Express Company) in 1841 commenced to operate an express line between New York and Boston. His business was for several years limited to New York, New London, Norwich, Worcester, and Boston. The Adams line slowly extended its business, and in 1861 occupied, through extension and by means of consolidation with local companies, the Southern States, a portion of New England, and the border country between the Northern and Southern States.

The American Express Company originated in Henry Wells, an employé of Harnden, who established a weekly line between Albany and Buffalo in 1841. In 1843 trips were made daily, and a line was opened on the Hudson River. About this time the express business was extended to Cincinnati, St. Louis, Chicago, and Detroit, and intermediate points, to the great convenience and profit of the public. The express carriers were greatly strengthened in their early efforts by the carriage of letters, the excessive rates charged by the government at that time enabling the express lines to do the business at about one-fourth government price with great profit to themselves. The American Express Company established a transatlantic line, with agencies in London and Paris, in 1846. Its lines extend throughout New England and the Northern and Western States and Territories, and included lines in Canada. The United States Express was originated in 1854 for the purpose of doing business over the New York and Erie Railway. It operates in the Middle, Northern, and Western States. The National, operating in Northern New York and Canada, was originated by one of the early operatives of the express business. Thompson & Co. operate the line between Boston, Springfield, and Albany, started in 1841 by Harnden. Wells, Fargo & Co. established in 1852 a line from New York to San Francisco by water, and about this period an overland express from the Missouri River to California. Subsequently, by purchase and extension, they monopolized practically the business of California and the Western Territories. The Southern Express Company was organized at the breaking out of the civil war in 1861 for the purpose of taking charge of the Adams Express business in the South. It has greatly extended and enlarged its business, and occupies the Southern and South-western States. The express business in Canada is largely performed by the Canadian Express Company.

The foregoing is a brief history of the origin and progress of our express system, which has suggested the parcel traffic in Europe. The general management of the express companies is intrusted to a president and a board of directors, under whom the business is directed by division superintendents and other officers, much as the local affairs of railroad companies are conducted. These officers have immediate charge of the servants of the company, regulate their salaries, adjust claims, fix the tariff rates, and perform other important functions. The property of the companies, including the valuables intrusted to them, is under the immediate care of the agents at the various stations, and they are responsible to the companies for its safe custody. The companies employ experts called route agents, whose duty it is to examine the affairs of the agencies and see that their accounts are kept in accordance with the prescribed form, and that they duly account for all moneys coming into their possession. The messenger has immediate charge of the property intrusted to it while it is being transported from the point of shipment to the place of destination. He receipts to the agents for the property they deliver to him at the

various stations and exacts a similar receipt for the property turned over to them by him. The expedition with which the business is conducted renders it impossible at the time to methodically compare the articles with the receipts which pass between the different officials of the company. Hence the element of good faith between subordinates assumes an importance that cannot perhaps be found in any other business of equal magnitude. It thus becomes necessary that the greatest care should be exercised in introducing new men into the service. The various blanks employed by the express companies in connection with their business conform generally to those used in connection with the goods traffic of railroads, but with some necessary changes and modifications. The methods of accounting pursued by express companies differ more or less in form, but the principles observed are the same with all companies.

The express business is the least bulky and relatively the most profitable that is handled by common carriers. It is made up of innumerable items that, while singly of little importance, are yet in the aggregate of great value and of a character that can pay a better price than ordinary freight. The business embraces the carriage and insurance of property and valuables (save baggage for which no special charge is made by the carrier) transported on passenger trains. It also embraces the collection of accounts and the execution of papers, and the carriage of valuable documents and letters. While the express business is still relatively very profitable, it is not now as productive as it was at one time. The introduction of the money-order department in connection with the postal service, whereby the people are able to remit small amounts of money through the mails for a merely nominal fee, with other concessions made by the government, has greatly reduced the demand upon the companies for services of this kind, and necessitated also an immediate and marked reduction in the rates asked for doing such business. The express business has also been greatly undermined by the use of refrigerator cars and the introduction of fast freight trains and other improvements and appliances in the freight department of railroads. The parcels that make up the traffic of our express companies embrace the articles requiring transportation that are too valuable to be intrusted to the comparatively rude appliances of the goods department of carriers. It includes a class of property that requires the constant guardianship of a trustworthy messenger. Much of the business that is done by this department of the service requires quickness of delivery. Especially is this the case with such articles as vegetables and fish and game. The most profitable branch of the express business is comprised in the collection of notes, drafts, and accounts; in the attention given to the execution of deeds, conveyances, and contracts; in the transportation of gold and silver coin, bank-notes, currency, deeds, contracts, bullion, precious stones, jewelry, watches, clocks, gold and silver ware, plated articles, costly pictures, statuary, and other articles of *virtu*; also musical instruments, laces, furs, silks, china, stained glass, birds, valuable animals, delicate fruits, fresh vegetables, and fish. The distribution of newspapers, magazines, and books is conducted largely through the medium of the express business, and yields a handsome income. All the great dailies and many of the weekly papers find their way to interior cities, towns, villages, and hamlets in this way. Promptness is here, also, one of the chief requirements of the service. The conduct of the business, therefore, requires watchfulness upon the part of the carrier, and it involves precision, harmonious action, and efficient service. All these are happily combined in the conduct of the service upon our different lines. In the large cities the carrier provides the facilities, including men and teams, required to traverse the streets from door to door for the purpose of collecting and delivering the goods consigned to his

care. Convenient offices that are accessible to the business community are also needed in handling the traffic, and capacious and costly vaults must be at hand in which to store the more valuable articles. Agents, accountants, and laborers, of capacity and tried experience, are also required to transact its business and protect its dépôts, and finally the property while in transit must be accompanied by skilful and trustworthy messengers. The responsibilities attending the handling of the express business are so peculiar and so exceptionally great that there cannot be any wide division of the labor attending its operation. The traffic must in the main be regulated and carried on entirely by officials intrusted with its particular care, and those connected with the transportation service not immediately identified with the express business must be prohibited from attempting to discharge any of its functions or duties, more particularly those embraced in the carriage of valuable packages and the making of collections. The conduct of the express business by companies organized for the purpose is a tacit acknowledgment on the part of other carriers that the former are able to do the business with exceptional economy and efficiency. The measure of success that characterizes the conduct of the express business by separate organizations is, however, directly dependent upon the good-will and co-operation of the companies owning the lines over which they operate; and while the latter cannot perhaps exclude the express lines, still there is nothing that can prevent them from carrying on the business independently if they see fit; and the fact that this is so places the express companies at their mercy. The basis upon which the express companies do business with the railroad companies varies upon different roads according to the extent and character of the business done. Upon the bulk of our roads there is a minimum rate per diem for a stipulated amount of traffic, and when the amount of business it provides for is exceeded, an additional charge is made by the railroad companies. Of the measure of security that the express companies afford the public for the property intrusted to them there can be no question. They not only carry the valuables of the community, including the government, but in many instances those of the owners of the lines over which they operate as well. The principal express companies in the United States touch at all the great commercial centres, and are thus able individually to do most of the business that is offered them without the intervention or co-operation of other organizations. This fact adds greatly to the security and convenience they offer the public, as in the event of loss or damage settlements can be made without reference to other companies.

The basis for the rates charged for handling express matter are speed, distance, quantity, value and character of goods, the space occupied, the nature of the services rendered, and insurance. In determining the rate the value of the property and the speed with which it is transported are more important than any other two factors. The element of speed may be said to be the occasion of the most important differences in rates as between goods carried by passenger trains and those carried by freight trains. In the former case it may be said to operate uniformly upon all classes of goods. In the latter, however, the rate of speed varies according to the urgency or nature of the business, this variation in every case having its influence upon the rate charged by the carrier. In examining the published tariffs of the express companies we find that the rate charged for packages transported a thousand miles is about 25 per cent. less relatively than on packages transported half that distance. Where the goods are exceptionally bulky, or especially liable to damage, or require special attention in transit, a proportionate addition is made to the regular rates. Small packages and isolated shipments are charged greater rates relatively than large packages and regular shipments. The rate for transporting 100 pounds a given distance is usually made the unit, packages weighing more being charged on this basis, while on those weighing less the rates are relatively much higher. No package is taken any distance for less than a minimum sum—usually 25

cents. Having established a grade based on weight for the transportation of merchandise parcels of an average character (which rate may be said to be twice the ordinary rate for goods carried by freight trains), a certain additional charge (serving as insurance) is made on the basis of values when said values exceed a certain amount, say \$50. On such articles as looking-glasses, pictures in frames, statuary, plate-glass, show-cases, poultry in coops, and live-stock, exceptionally high rates are charged. In making rates on money and valuable papers the charge is based primarily on the declared value of the same. Distance is also considered, but not to the same extent as in making rates on ordinary parcels. In practice the rate for transporting \$1000 in currency is made the unit, sums over this amount being charged on this basis; on smaller sums an arbitrary rate is made which is proportionately higher, but is modified to meet somewhat the very low rates made by the government on postal money-orders and registered letters. The transportation of gold and silver brings a material element of weight into the problem. An additional rate per thousand dollars or fraction thereof as compared with currency is therefore made. The addition for gold is about 25 per cent., and for silver 50 per cent. Papers, the value of which is only nominal, or which can be replaced in case of loss, are usually charged only a fraction of the rate for currency and papers having intrinsic value. When papers are received for collection a fraction of the currency rate is charged for carrying the papers and making the collection, and full currency rates for returning the money. When, however, the papers taken for collection have a specific value, for which the carrier would be liable in case of loss, such as bonds and coupons, full currency rates are charged both ways. Where goods are sent to be collected for on delivery, the regular rates are usually charged for the transportation of the property and for the return of the money.

(M. M. K.)

EXTRADITION of criminals is now generally conceded to be dependent almost exclusively upon treaty regulations. Treaties on the subject exist between the United States and many other nations, including the following: Great Britain, Austria, France, Sweden and Norway, Germany, Italy, Switzerland, Mexico, Venezuela, and Belgium. The crimes for which extradition is usually granted are: Forgery, burglary, bigamy, embezzlement, counterfeiting, grand larceny, manslaughter and murder, perjury, rape, and other offences amounting to a felony. But different treaties specify different offences, and there is no uniform law of extradition applicable to all nations. Political offences are excluded from the category of extraditable offences, except in rare instances and under special conventions, and the exception occurs only when the offence partakes largely of the purely criminal character. Much discussion has arisen in recent times in regard to the *status* of the accused after answering the charge in the country to which he has been extradited. There is great diversity of opinion and practice as to whether the accused can be tried for any offence except that specified in the demand for extradition. The principle which is gradually becoming established is that the person surrendered cannot be prosecuted or punished for any offence not mentioned in the demand. Treaties between France and several other countries expressly affirm the doctrine that the person extradited can in no case be prosecuted for a political offence. The treaty between the United States and Italy recognizes the principle that the prosecution should be limited to the offences comprised in the demand.

(A. P. S.)

EXTRA-TERRITORIALITY. See TERRITORY. EYE, JOHANN LUDOLF AUGUST VON, a German art historian, was born at Fürstenau, in Hanover, May 24, 1825. He was educated at the gymnasium in Osnaburg and at the University of Göttingen, where he studied jurisprudence, philosophy, and history. He was a tutor in various parts of Germany, and in 1853 he was appointed director of the collection of art and antiquities in the newly-founded German museum at Nuremberg. Here, in company with J. Falke, he published the illustrated works, *Kunst und Leben der Vorzeit* (3 vols., 1854; 3d ed., 1868); *Galerie der*

Meisterwerke alt-deutscher Holzschnidekunst (1857). He also published *Deutschland vor drei hundert Jahren in Leben und Kunst* (1857); *Leben und Wirken Albrecht Dürers* (1860); *Eine Menschenseele, Spiegelbild aus dem 18 Jahrhundert* (1863); *Wesen und Werth des Daseins* (1870). In 1874 he accepted a professorship in Rio Janeiro, but in the following year he was summoned by the Saxon government to take charge of the museum of the newly-founded art school in Dresden. While holding this position he published his long-meditated work, *Das Reich des Schönen* (Berlin, 1878), in which the whole system of æsthetics is treated in the inductive method. In 1881 Prof. von Eye returned to Brazil.

EYRE, EDWARD JOHN, an English colonial governor, was born in August, 1815. His father, Rev. Anthony William Eyre, was vicar of Hornsey, in Yorkshire; and the son, at the age of 17, went to Australia as a settler. Arriving at Sydney in 1833 he engaged in sheep-farming and the transportation of cattle. After some preliminary journeys, he undertook to explore the barren south coast of Australia from 134° to 118° E. long. On June 20, 1840, he started on an expedition to explore the region north of Lake Torrens. After suffering dreadful hardships, and having been given up as lost, his party reached Albany, in West Australia, July 7, 1841. A large lake which he discovered, but supposed to be part of Lake Torrens, has since been named Lake Eyre. He was, in 1841, made a resident magistrate, with special power to protect the aborigines. In 1845 he returned to England, and published his *Discoveries in Central Australia*, in which he calls special attention to the condition and needs of the natives. For these discoveries the gold medal of the Royal Geographical Society was awarded to him. In 1846 he was appointed by Earl Grey lieu-

tenant-governor of New Zealand, with special charge of the administration of the Middle Island. In April, 1853, he returned to England, and in 1854 he was appointed lieutenant-governor of the island of St. Vincent, West Indies, and in 1859 was transferred to administer the government of Antigua and the Leeward Islands, but in 1860 he returned to England to recruit. In the spring of 1862 the duke of Newcastle commissioned him to administer the government of Jamaica, and July 15, 1864, he was appointed captain-general and governor-in-chief of that island. Its affairs had been in bad condition for many years, and were growing worse; and in October, 1865, a serious rebellion broke out at Morant's Bay, in which many Europeans were massacred. It spread rapidly over a large tract of country, and Gov. Eyre promptly proclaimed martial law. In addition to other severe measures of repression, George William Gordon, a mulatto of considerable wealth and influence, was tried by court-martial, condemned, and executed. While Gov. Eyre had succeeded in crushing the rebellion, the report of his arbitrary acts excited a fierce agitation in England. The government sent a commission of inquiry to Jamaica, which in June, 1866, exonerated him from the charges, and declared that the rebellion was put down by his "skill, promptitude, and vigor." He was, however, recalled from his post, and his opponents determined to prosecute him and some of his subordinates. Large sums were raised for the purpose, while his friends rallied to his defence. In the public discussion of the case, Carlyle was conspicuous for his support of Eyre and his denunciation of the negro and his friends. The local magistrates refused to commit Mr. Eyre on a charge of murder, and other proceedings which were instituted against him failed. He is now living at Steeple Aston, Oxfordshire, in receipt of a pension.

F.

FACTORY. The factory system of manufacture means the production of goods from the raw material by consecutive processes carried on as a harmonious whole, and necessitates the congregation of labor in large works in order to secure the combined operation of many orders of workpeople in tending a series of productive machines impelled by a central power. According to Dr. Ure (*Philosophy of Manufactures*, p. 13) the factory involves in its strictest sense the idea of a vast automaton, composed of various mechanical and intellectual organs, acting in an uninterrupted concert for the production of a common object, all of them being subordinated to a self-regulated moving force.

At the close of the American Revolution the domestic system of manufactures prevailed in this country. The results of the great inventions which had revolutionized labor in England had not reached across the Atlantic; in fact the legislation of England forbade the exportation of either machinery, models, or plans of machinery. These inventions, which related to spinning yarn, had been made by Hargreaves and Arkwright in 1767-9, and marked the inauguration of the regime of machinery and of the factory system of labor. The inventions of the spinning-frame, the spinning-jenny, and subsequently of the mule-spinning machine, could not of themselves have created a sudden and radical change in the existing system of labor; but the extension of the canal system of transportation, the improvements in the steam-engine, the release of capital caused by the suppression of the slave-trade, and the opening of the war with the colonies, the influence of Adam Smith's works on political economy—all these mechanical, political, and moral forces combined, made

possible the rapid change in England from the domestic to the factory system of labor.

At the close of the war the States of the Union found themselves in want of fabrics, and the British manufacturers readily and rapidly supplied this market as soon as the American ports were opened. The power-loom, invented in England soon after, brought the completion of a series of inventions, which, for positive influence upon the politics and civilization of the world, must stand beside that of printing with movable types. When the people of the States saw that the treaty of Paris had not brought industrial independence to the United States their patriotism took a new form, and associations were formed, the members of which pledged themselves to use and to wear only domestic productions, and the State legislatures were besought to protect home manufactures. The Constitution of the United States, adopted in 1789, gave Congress the power to legislate on commercial affairs. This Constitution was really the outcome of the industrial necessities of the people, because it was on account of the difficulties and irritations growing out of the various commercial regulations of the several States that a convention of commissioners from five States was held at Annapolis in September, 1786, which convention recommended in turn the one that framed the present Constitution.

The non-importation resolves of the Continental Congress and the war itself had thrown the colonists upon their own resources, and had really laid the foundation of American manufactures. During the war some industries had failed, owing to the scarcity and high price of labor, while those whose products were called for by the necessities of the war were greatly

stimulated; household industries became profitable, and were greatly extended. With peace came a reaction, and the temporary success engendered by the war gave place to a general depression, which was aggravated by the flooding of our markets with immense importations of the products of British workshops. This condition of affairs, the desire of the people to become independent of the mother country industrially as well as politically, and the appeals from the merchants and manufacturers for commercial restrictions upon imports, caused the first Congress which assembled under the new Constitution to turn its attention to the protection of manufactures, and its second act (passed July 4, 1789) was "for laying a duty on goods, wares, and merchandise imported into the United States." Patriotism and statute law thus paved the way for the importation of the factory system of labor; its institution here, as well as in England, was the result of both moral and economical influences.

The honor of the introduction of power-spinning machines in this country, and of their early use here, is shared by the States of Massachusetts and Rhode Island; for while the first-named State claims the first experiments in embodying the principles of Arkwright's inventions and the first cotton factory in America, Rhode Island claims the first factory in which perfected machinery, after the English models, was practically employed. This was the factory built by Samuel Slater in 1790. From that date progress in the establishment of the factory system of manufactures in America was uninterrupted, save by temporary causes. The invention of the power-loom, however, really gave the completing characteristic to the factory system. Francis Lowell, at Waltham, Mass., was the first man in the world, so far as record shows, to carry the raw material through all the manipulations and processes necessary to produce finished goods in one factory, and by one complete series of processes. (See Article COTTON, Chapter IV.)

The inauguration of the factory system in the United States was some fifteen years later than its birth in England; but the extension of the system here has been far more rapid, and its application has embraced many more industries than in the mother country. For many years the system embraced only textile manufactures, but as parties engaged in other branches saw the wonderful results of systematic labor by its division, they gradually adopted the factory system, until now, of nearly 3,000,000 people employed in the mechanical industries of the United States, at least four-fifths are working under the factory system; indeed, the statistics of the industries of the country are the statistics of that system. It is quite impossible to estimate accurately the number of persons the old individual system would require to produce the goods made by the present factory workers, but careful computations in some branches of work indicate that each factory employé in 1884 represents at least 100 workmen under the former system. Hence it would require 300,000,000 working under the old domestic system to produce the goods made by the 3,000,000 factory-workers of the United States.

The last quarter of a century has witnessed wonderful instances of the adoption of the factory system. The little shoe-shop has disappeared, and the shoe-factory has taken its place. The expensive hand-made watches, which only the few could buy, have been replaced by the better article, the product of the factory, which the many can afford. Pianos, house-organs, tapestry-carpets, in fact nearly all the articles which the rich only could enjoy, are now enjoyed by the masses, because they are produced under the factory system. Even the slaughtering of hogs is now accomplished under the system of consecutive processes, and dairy products now issue from the factory.

The rapid extension of the factory system, absorbing as it does small enterprises, and crushing out the ideal

domestic system of labor, has not been accomplished without great social changes affecting the morals as well as the politics and the legislation of the countries in which it has been established. No one disputes the economic advantages of the modern system; few admit that it is a moral force in the actual progress of civilization, yet the system is and has been an active element in the upbuilding of the character of the people involved in the changes inaugurated by it.

A superficial study of the system usually reveals what appear to be great evils, and the result is an indictment of the system under various counts, among which will be found the following: (1) that the factory system necessitates the employment of women and children to an injurious extent; (2) that consequently its tendency is to destroy family ties and domestic habits, and ultimately the home; (3) that it is productive of intemperance, unthrift, and poverty; (4) that it feeds prostitution and swells the criminal lists; (5) that it tends to intellectual degeneracy; (6) that factory employments are injurious to health. These are the leading disadvantages which many honestly believe to belong naturally to and to be inseparable from the system. The rise of a factory village is therefore contemplated with the same feelings that would follow the breaking out of a plague-spot.

While many disadvantages appear to attend the system, a careful study shows that they do not necessarily belong to it; that so-called factory evils cannot be attributed to the factory, but that existing evils may be congregated or brought to light by it. Whether the system inaugurates evils, or brings them out in the processes of the development of society, can be best understood by judging of the system in comparison with the separate or individual system which preceded it. To this end we will examine the separate items of alleged disadvantages already enumerated.

As to the assumption that the factory tends to destroy domestic ties and habits, it may be said that this charge against the factory grows out of another assumption: that the cottage of the domestic worker was the ideal home. It is poetry which calls such home a cottage; history rather calls it a hut. The home of the worker of old was the workshop also, and the wheels or looms disputed with the inmates for the room. Small, close, crowded, with bad air and bad surroundings, the hut was occupied day and night by a class which cannot find its kin under the factory system, for the operative of to-day, as a rule, occupies a home, even in the factory tenement or boarding-house, superior in every sense to the home of the domestic worker. The morals in all respects under the individual system were greatly below those of the factory operatives of to-day. The evils which became apparent during the early days of the factory system were simply the results of bringing together the labor which had become pauperized under the domestic system and in agricultural districts. The employment of children which so excited the philanthropists sixty years ago, while bad enough in itself, and while attended with many features which brought merited condemnation, really placed the children employed in a much better position than they occupied before, because it made them self-supporting. The congregation of bad elements under the new system enabled humane men to insist upon legislation which should correct evils.

The wrongs which accompanied the inauguration of the system never existed to such extent in this country as they did in England. But the home in the United States suffered more from the system than it did in England, for the reason that the factory there found a population ready to become factory workers, while here it was necessary to provide for a new population, and this gave rise to the tenement house and the factory boarding-house, two features of factory life quite unknown in England. Yet here the individual home is increasing in its influence in factory centres, for it is gradually taking the place of the tenement and board-

ing-house. With this growth there is a gradual decrease in the employment of married women in factories. In Massachusetts—a factory State—the married women employed in cotton-factories constitute but about 8 per cent. of the whole number of women so employed. The statistics in this direction are not available for other sections of the country. The employment of young children is now forbidden by law wherever the factory has gained a strong foothold. The factory has not so much destroyed the home as it has enabled members of broken families to earn a livelihood. If it has at times taken the mother from the care of her young children—the worst feature of the employment of married women—it has enabled more who had no home to become self-supporting.

Theft of material, drunkenness, laziness, and a state of morals now largely outgrown even by the lowest were accompaniments of the “ideal system” of labor. The worst factory was light and airy compared with the hand-weavers’ huts. And yet the transition from the old to the new system brought the same untold misery which every step in the progress of society brings, even when slaves are made freemen. The employment of women and children, except married women during and after pregnancy, is no longer an evil, thanks to machinery and wise legislation, and so the better home is more generally coming to have a higher influence. More than has been might still be done in this direction, but it is satisfactory to know that manufacturers are more keenly alive at the present time than ever before to the absolute benefits, both moral and economical, which accrue from happy conditions. Admitting all possible domestic evils which accompany low social conditions—the neglect of young children, and consequent high rates of infant mortality, the physical degeneracy which follows mechanical employments when engaged in by married women—and yet none of these can be attributed to the factory system as the creator of such evils. They belong to the ignorance of the substratum of society which the factory system is constantly lifting to another and a higher plane, and thereby lessening instead of increasing the misery of the world. We are deceived because the factory, by and through the perfection of machinery and the development of the division of labor, is constantly employing a less and less cultivated class of operatives. We remember the farmers’ daughters of a generation ago as constituting the factory population of Lowell and other towns, and contrast them with the present operatives, and are too apt to conclude that the factory degrades, when the fact is it has enabled the lower order to step up in the scale of employment, in living, and consequently in civilization. This process is constantly narrowing the limits of the class which occupies the lowest step in the progress of society. This mission alone stamps the factory system as an active element in the moral elevation of the race. Of course we speak of the factory under men who realize that they have some responsibility beyond declaring dividends. A narrow-minded, close-fisted employer, who regards his people as his machines, taking no pains relative to their moral well-being, never recognizing that by congregating labor for his own profit he owes it something besides wages, such an employer will have a factory which will convince any community that it is not an element in civilization. The man should be condemned, not the system.

If it could be shown that the factory leads to intemperate habits, it would follow conclusively that it is productive of unthrift and poverty—the sure conditions resulting from intemperance. It is true that a great deal of drunkenness exists in factory towns and among factory operatives; it is not true that the factory is the creator of this. On the other hand, the investigations of Louis Reybaud, a member of the institute of France, prove conclusively that the factory operatives are far more temperate than those engaged under the domestic system. The industries of France

afford the very best opportunities for comparative study in this respect. In the United States drunkenness has never been much of an obstacle in the way of the success of the factory. Factory towns support a large number of common laborers, and the intemperance of this class is usually attributed to the factory. It must be frankly and freely admitted that whatever of unthrift there may be among factory operatives is to a very large degree due to the habit of beer-drinking; but employers, overseers, and even the operatives themselves, are creating a sentiment which does not allow a habitual drunkard to remain in a factory. This sentiment is on the increase, and, as soon as proprietors will shut their doors to all drunkards, the factory will become a most powerful agent for the prevention of intemperance. Its power in this direction is now far greater than is generally known.

The charge that the factory feeds prostitution and swells the criminal lists is absolutely unfounded. This impression first grew from the condition of Manchester, England, where a large cellarage population, which has entirely disappeared, was attributed to the factory. It has been shown by the returns from the penitentiary of Manchester that the ranks of prostitution were not fed from the factory, 8 only out of 50 coming from the factory, and 29 out of 50 from domestic service. An extensive examination of the criminal records of a large number of British factory towns discloses the fact that neither the ranks of prostitution nor the criminal lists are increased to such extent from the factory population of these towns as from other classes. This is equally true in this country. It should be borne in mind that regular employment is conducive to regular living, and that regular employment does not harmonize with a life of prostitution, intemperance, and crime. The virtue of the factory women of this country and of Europe will compare favorably with that of any other class, and much better than with many departments of social life. Certainly there is nothing in factory employment conducive to vicious lives.

The impression that the factory tends to intellectual degeneracy is a greater fallacy than the preceding. Through the simplification of mechanical processes ignorant labor is congregated in factory centres, but, as we have said, it is not created nor induced by the factory. The fact that ignorant masses are enabled by the factory to engage in what it once took skilled labor to perform has given the widespread impression that the factory has degraded the skilled, when the truth is, it has lifted the unskilled; and this is the inevitable result of the factory everywhere. It is a curious fact that after the factory system was inaugurated in England, and the poor, degraded, and excessively ignorant pauper labor of the southern agricultural districts were lifted up to respectable and self-supporting employment, and to comparative self-respect, the factory was held to be responsible for the ignorance which it found; and so the laws of England and America have insisted upon the education of children as a prerequisite to factory employment. This may explain the superior intelligence of the children of factory towns in England as compared with those of agricultural localities. The half-timers of England and the factory children of America are laying a foundation, if proprietors will only recognize the power of moral forces in the conduct of individual enterprises, which will, in another quarter of a century, change the social complexion of our factory towns. If the advantages afforded in factory towns will stimulate rural districts to emulate the work of providing for the proper amusement and instruction of their children and young people, perhaps the constant depletion of such places may be checked, and the inhabitants of crowded towns attracted to the soil. The mental friction of the factory is not without its healthful influences. Certainly it is better for the persons engaged than the filthy little shop, occupied

by a few foul-talking people, which characterized the domestic system. Instead of dwarfing the minds and the skill of the skillful, as is often alleged, the factory enlarges the minds and increases the power of the unskillful. Louis Reybaud, to whose investigations we have referred, testifies that the abasement of intelligence, which is said to follow in proportion as tasks are subdivided, is a conjecture rather than a truth shown by experience, and is assumed rather than proven. To prove abasement from factory employment it would be necessary to prove, for example, that the hand-weaver, who throws the shuttle and gives motion to the loom, is of a class superior to the machine-weaver, who superintends such double movement. Employment of the muscles in several operations instead of one has nothing in it to elevate the faculties; and this is about all the opponents of the factory claim. In their view, says Reybaud, "the most imperfect machines—those which require the most effort—are the ones which sharpen the intellectual faculties to the greatest degree. We can easily see where this argument would carry us if pushed to the end." There is no abasement. On the contrary, it is from the influences resulting from the factory system that we discern the elevation of an increased proportion of working-people from the position of unskilled to that of skilled laborers, and the opening of an adequate field of remunerative employment to women—two of the most important improvements in the condition of the working masses which could be desired; and these improvements may be considered as among those most favorable to their more permanent advancement.

That some factory employments are injurious to health is true, but it is not true that factory employment as such, in comparison with any other mechanical employment, is unhealthy. The first requisites of a watch-factory are neatness and abundance of light. It is now recognized that no man can do his best work unless he is physically comfortable. Excess of heat or cold, a poor light, and, more than all, bad air, are positive hindrances to good work. Of two men equally skilled, one in a close, damp, or hot room, with a bad light, and the other in a dry, sweet, and healthful room, with the best of light, the man who has the most comfortable quarters will do the most and best work in a day. It is now seen that everything that contributes to the physical and mental comfort of workmen pays a good return on the cost, and certainly makes better citizens of the operatives. Intelligent employers of labor adopt all plans which can be devised for securing the health of their operatives. Factory legislation compels the ignorant employer to adopt them. If some means could be devised to make all the homes of the operatives as neat, clean, and wholesome as the factory, we should hear no more of the tendency of the factory to physical degeneracy.

We have considered briefly the main objections which are usually urged against the factory system. Its evils come mostly under the heads enumerated, but, as we have said, they are the evils which attend the development of the system; they are not its results. Before the system can be condemned in its entirety, it must be shown that it is worse than that which it displaced. We need not apologize for the weaknesses of the present, for they come mostly from ignorance, not from the system. It is not proof against the system to show that all the conditions of one or of a thousand factories are bad, nor that one factory town or a thousand have more criminals, more prostitutes, more drunkenness, more poverty, than other towns; for these things exist because men, either employers or operatives, or both, are bad, not because the system is bad. We might as well arraign the cause of religion as bad because some professors in a thousand are bad, as to condemn the factory system because greedy men have used it to grind the poor. Under enlightened men the factory system becomes every-

where a great moral power, and a positive, active, and potential element in the processes of civilization.

The remedy for the labor troubles which crop out too often under the system lies in the character of the men at the head of industrial enterprises, not in the destruction of the system. Whenever an employer of congregated labor adopts the Golden Rule as a business maxim, he not only has no labor troubles, but he finds satisfactory dividends from the employment of his capital, and labor finds contentment. The facts of history lift this statement of a remedy out of the limits of platitudes, for they prove that practically such conduct of the factory has raised luxuries to the rank of necessities, thus augmenting consumption, the very vital force of industry; it has raised wages, comparatively, making such consumption practicable; it has reduced working time, rendering such consumption enjoyable; it has narrowed the limits of the lowest ranks of labor, thereby reducing misery. It has done all this for the many. The few have suffered, as the few always suffer, during necessary transition from old to new systems.

II. FACTORY LEGISLATION IN AMERICA.

The influence of the factory system upon legislation has not been so marked in America as in England. In no State is there so elaborate a code as the British "Factory and Workshop Act" of 1878 (41 Vict., chap. 16), which is an act consolidating all the factory acts of England since Sir Robert Peel's Act of 1802. There is not now, nor has there ever been, that state of affairs in factory communities in this country which existed in England at the time of her first protective laws, and which prompted Peel's measure. The miserable condition of children employed in English factories during the earlier years of the factory system has rarely, if ever, met with a parallel in the United States, and yet in nearly all the States in which the factory has become firmly established there is some legislation relative to the employment of women and minors. The State of Massachusetts has taken advanced ground in this respect, and her laws relating to employment in mechanical establishments are not only quite full, but she has provided inspectors for their enforcement.

It is now fully recognized that there is no question as to the constitutional right of the people to enact all requisite factory laws, and of such a character that the object sought to be reached can be reached effectually. It is true also that our people recognize the force of the position that it is better for all concerned if the conditions sought to be secured by factory laws can be secured without law, but by the hearty endeavors of employers and employed.

A brief summary of the factory laws of the different States will indicate to what extent the principles of English factory legislation have been adopted in America. The States named are the only ones in which factory laws exist.

Maine.—No child can be employed or suffered to work in a cotton or woollen manufactory without having attended a public or private school, if under the age of 12 years, four months; if over 12 and under 15 years of age, three months, of the 12 next preceding such employment in each year. A teacher's sworn certificate of attendance, filed with the employer, constitutes the proof of schooling. A fine of \$100 is imposed for a violation, on the part of the employer, of the provisions of the law. No person under the age of 16 years can be employed by any corporation more than ten hours of a day. The penalty for violating this provision is \$100. Factories more than two stories in height, when workmen are employed above the first story, must be provided with outside fire-escapes satisfactory to municipal officers.

New Hampshire.—No child under 15 years of age shall be employed more than ten hours per day without the written consent of parent or guardian. No person is to be employed more than ten hours per day, except in pursuance of an express contract requiring longer time. No child

under 10 is to be employed by any manufacturing corporation. Children under 16 are not to be employed in factories unless they have attended school twelve weeks during the preceding year, and no child under said age shall be employed (except in vacation time) who cannot write legibly, and read fluently in readers of the third grade. No child under 14 is to be employed unless he has attended school six months, or the school of his district the whole time it was kept; and no child under 12 who has not attended the school of his district the whole time it was kept.

Vermont.—Children under 10 years of age are not to be employed at all; under 15 not more than ten hours per day; between 10 and 15 they are not to be employed in mill or factory unless they have received three months' schooling during the preceding year.

Massachusetts.—No child under 10 years of age shall be employed in any manufacturing, mechanical, or mercantile establishment in the commonwealth. No child under 14 years of age shall be so employed, except during the vacations of the public schools, unless during the year preceding such employment he has for at least twenty weeks attended some public or private day-school; nor shall such employment continue, unless such child in each and every year attends school as aforesaid; and no child shall be so employed who does not present a certificate of his attendance at school as provided. Employers shall require and keep on file a certificate of the age and place of birth of every child under 16 years of age employed therein, and the amount of his school attendance during the year next preceding such employment. The penalty for employing children contrary to these provisions is from \$20 to \$50. Truant-officers are obliged to visit establishments and inquire into the situation of the children employed, and may demand the names of children and the certificates of age and school attendance. Children under 14 years of age who cannot read and write are not to be employed while public schools are in session; parents or guardians permitting such employment are subject to a fine of not less than \$20 nor more than \$50.

Employers requiring from employés, under penalty of forfeiture of wages earned, a notice of intention to leave shall be liable to like forfeiture if an employé be discharged without similar notice. Whoever by intimidation or force prevents or seeks to prevent a person from entering into or continuing in the employment of a person or corporation shall be punished by fine of not more than \$100. Employers are not to contract with employés for exemption from liability for injuries resulting from employer's own negligence.

No minor under 18 years of age and no woman shall be employed in laboring in any manufacturing establishment more than ten hours in any one day, except when it is necessary to make repairs to prevent the interruption of the ordinary running of the machinery, or when a different apportionment of the hours of labor is made for the sole purpose of making a shorter day's work for one day of the week; and in no case shall the hours of labor exceed sixty in a week. The penalty for violating this provision is from \$50 to \$100.

The belting, shafting, gearing, and drums of all factories, when so placed as to be dangerous to persons employed therein while engaged in their ordinary duties, shall be as far as practicable securely guarded. No machinery, other than steam-engines, in a factory, shall be cleaned while running, if objected to in writing by an inspector. All factories shall be well ventilated and kept clean. The openings of all hoistways, hatchways, elevators, and well-holes, upon every floor of a factory, or mercantile or public building, shall be protected by good and sufficient trap-doors, or self-closing hatches and safety-catches. All elevator cabs or cars shall be provided with some suitable device for securely holding the cabs in case of accident to the hoisting machinery.

All manufacturing establishments, three or more stories in height, in which 40 or more persons are employed, unless supplied with a sufficient number of tower stairways, shall be provided with sufficient fire-escapes, properly constructed upon the outside thereof, and connected with the interior by doors or windows, with suitable landings at every story above the first, including the attic, if the same is occupied for work-rooms. Such fire-escapes shall be kept in good repair and free from obstruction. All main doors, both inside and outside, must open outwardly; and each story must be amply supplied with means for extinguishing fires. Every building three or more stories in height, in whole or in part used as a tenement for more than four families, or a lodging-house, shall be provided with a sufficient means of escape in case of fire. No explosive or inflammable compound shall be used in any factory in such place or manner as to obstruct or render hazardous the egress of operatives in case of fire. Persons violating these provisions, as to

buildings and means of escape, are liable to a fine of from \$50 to \$100.

Females employed in manufacturing establishments must be provided with seats, and permitted to use them when not engaged in the duties for which they are employed. This also applies to stores.

For the enforcement of all these provisions the governor appoints inspectors of factories and public buildings. They may enter all buildings used for public or manufacturing purposes, examine methods of protection from accident, means of escape from fire, and make investigations as to the employment of women and children. Fire-escapes, etc., are to be constructed under the approval of one of these inspectors.

Rhode Island.—No child under 12 years of age can be employed in any manufacturing establishment; no child under 15 unless he has attended school at least three months during the preceding year; and no such child shall be employed for more than nine months in any year. No child between 12 and 15 years of age shall be employed in any factory more than eleven hours in any day, nor before 5 A. M., nor after 7.30 P. M. The violation of these provisions is punishable by a fine of \$20. Ten hours' work in any one day constitutes a legal day's work, unless otherwise agreed by the parties to the contract for the same. Town and city councils may pass ordinances requiring fire-escapes on factories in which workmen are employed above the second-story.

Connecticut.—No child under 14 shall be employed in any business, unless such child shall have attended some day-school for 60 days during the preceding year, six weeks of such attendance to be consecutive. It is the duty of school visitors in every town, once or more in each year, to examine into the situation of children employed in manufacturing establishments, to see if the provisions of law are complied with. Parents and guardians must send children to school the legal time, and violations are punishable by a fine of \$5 for each week's neglect. Employers of children under 14 must have a certificate of each child's attendance at school according to law. No child under 15 is to be employed in factories more than ten hours per day, or fifty-eight per week, under a penalty of \$50. Eight hours constitute a legal day's work, unless otherwise agreed upon.

Each story above the second-story of factories and workshops must be provided with more than one flight of stairs inside, or with outside fire-escapes satisfactory to the selectmen or fire marshal of towns.

New York.—Children under 14 are not to be employed during school-hours, unless they have attended school at least 14 weeks during the year preceding; the employer to have a certificate of such school attendance. Eight hours constitute a legal day's work, except for farm and domestic labor, but overwork for extra compensation is permitted.

New Jersey.—No child under 10 years of age shall be admitted to work in any factory, and no minor shall be holden or required to work more than ten hours on any day, or sixty hours in any week. The penalty for violation of the latter provision is \$50. Ten hours per day constitute a legal day's work in all cotton, woollen, silk, paper, glass, and flax factories, and in manufactories of iron and brass.

Pennsylvania.—Eight hours constitute a legal day's work in absence of special contract, except for farm labor and labor by the year, month, or week. Ten hours constitute a legal day's work in cotton, woollen, silk, paper, bagging, and flax factories. No minor under 13 shall be employed in any such factory, under penalty of \$50. No child between 13 and 16 years of age shall be employed more than nine months in any one year, who shall not have attended school at least three consecutive months in the same year. No minor shall by any contract be employed in any of said factories for more than sixty hours per week or an average of ten hours per day; penalty for violation of this provision not to exceed \$50.

Factories in which employés are at work in the third or higher stories must have permanent external fire-escapes, satisfactory to the fire commissioners and fire marshal of the district.

Maryland.—The law prohibits the employment of children under 16 years of age in factories for more than ten hours per day, under penalty not exceeding \$50.

Ohio.—No child under 14 shall be employed in mills or mines during school-hours, unless he has received at least twelve weeks' schooling during the year preceding, and employers must have a certificate to that effect. Two weeks attendance at a half-time or night-school is to be considered equivalent to one week at a day-school.

Whoever compels a woman or a child under 18, or permits a child under 14, to labor in a mechanical or manufacturing business more than ten hours per day, may be fined from \$5 to \$50.

(C. D. W.)



The Encyclopaedia Americana A Supplemental Dictionary of Arts, Sciences,
and General Literature. Illustrated

Bd.: 2

New York, Philalphia, London 1885

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